

Design as a Tool to Address Loneliness: An approach to the elderly through Cultural Probes.

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El diseño como herramienta para abordar la soledad: un acercamiento a las personas mayores a través de los Cultural Probes (Sondeos Culturales).

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ABSTRACT

Loneliness among older adults represents a complex and growing challenge, with significant emotional and social repercussions. In this context, the Co-bien project adopts a co-design approach to address this issue through empathy, active listening, and socially meaningful technology. The aim of this study is to develop an adapted engagement protocol that enables the exploration of experiences, needs, and expectations of older adults at risk of experiencing loneliness. Qualitative methods such as Cultural Probes and in-depth interviews were employed within participatory workshops involving older adults from diverse contexts. Preliminary findings suggest that these tools foster self-reflection, build trust, and facilitate access to subjective meanings that are difficult to capture through traditional methods. Preliminary results suggest that combining Cultural Probes and in-depth interviews not only enables access to intimate experiences usually inaccessible to traditional methods, but also increases motivation, trust and participants' sense of agency—laying the groundwork for co-design processes that are ethically stronger and more operationally robust.

Keywords: Cultural Probes, Loneliness, Elderly, Co-design, Participatory Design, Social Technology.

RESUMEN

La soledad entre los adultos mayores representa un desafío complejo y creciente, con importantes repercusiones emocionales y sociales. En este contexto, el proyecto Co-bien adopta un enfoque de codiseño para abordar este problema a través de la empatía, la escucha activa y una tecnología socialmente significativa. El objetivo de este estudio es desarrollar un protocolo de participación adaptado que permita explorar las experiencias, necesidades y expectativas de los adultos mayores en riesgo de sufrir soledad.

Se emplearon métodos cualitativos como los *Cultural Probes* (Sondeos Culturales) y entrevistas en profundidad en talleres participativos con adultos mayores de diversos contextos. Los hallazgos preliminares sugieren que estas herramientas fomentan la autorreflexión, generan confianza y facilitan el acceso a significados subjetivos difíciles de captar mediante métodos tradicionales.

Los resultados preliminares indican que combinar los *Cultural Probes* y las entrevistas en profundidad no solo permite acceder a experiencias íntimas habitualmente inaccesibles para los métodos convencionales, sino que también aumenta la motivación, la confianza y el sentido de agencia de los participantes, sentando



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las bases para procesos de codiseño éticamente más sólidos y operativamente más robustos. propuestos.

Palabra clave: Sondeos culturales, Soledad, Personas mayores, Codiseño, Diseño participativo, Tecnología social.

RESUM

La soledad en la gente mayor representa un reto complejo y creciente, con repercusiones emocionales y sociales significativas. En este contexto, el proyecto *Co-bien* adopta un enfoque de diseño para abordar esta cuestión combinando la empatía, la escucha activa y una tecnología socialmente significativa. El objetivo de este estudio es desarrollar un protocolo de participación adaptado que permita la exploración de experiencias, necesidades y expectativas de las personas mayores con el fin de reducir la soledad.

Se utilizaron métodos cualitativos como las sondas culturales (*Cultural Probes*) y entrevistas en profundidad en el marco de talleres participativos con personas mayores de diversos contextos. Los resultados preliminares sugieren que la combinación de sondas culturales y entrevistas en profundidad no solo permite el acceso a experiencias íntimas —habitualmente inaccesibles por los métodos tradicionales—, sino que también aumenta la motivación, la confianza y el sentido de agencia de los participantes, estableciendo las bases para procesos de diseño éticamente más sólidos y operativamente más robustos.

Palabras clave: Sondas culturales, soledad, gente mayor, diseño, diseño participativo, tecnología social.

1. INTRODUCTION

Human beings are inherently social, driven by fundamental needs and desires for meaningful interpersonal connections¹. Social relatedness is not only a source of emotional well-being but also a cornerstone for survival, adaptation, and the development of complex societies². This social orientation defines and shapes the very essence of humanity, enabling societies to emerge and advance beyond purely individualistic interests^{3,4}. From this perspective, loneliness—defined as the perceived discrepancy between desired and actual social relationships—can be understood as a disruption of one of the most essential dimensions of human existence. Far from being a trivial or merely emotional state, loneliness undermines both individual health and collective cohesion, thus distorting the foundations on which civilisation progresses.

Loneliness, understood as the subjective perception of a gap between desired and actual social connections⁵ (in Spanish often distinguished as “soledad no deseada”¹), goes beyond the objective absence of social ties and support networks, more commonly referred to as social isolation. Precisely because of its subjective nature, loneliness is particularly challenging to address, as it depends not only on external circumstances but also on personal expectations and

interpretations⁶. While social isolation may have neutral or even positive aspects in certain contexts, loneliness is consistently associated with detrimental outcomes, including increased risks of depression, cognitive decline, and premature mortality^{7,8}. As awareness of its prevalence and societal impact grows, loneliness has attracted substantial attention across disciplines, demanding careful, sensitive, and interdisciplinary engagement⁹.

It is within this context that the Co-bien project—“Connected for Integral Wellbeing: Promoting Digital Technologies to Combat Loneliness and Social Isolation”—was established. Funded by the European Union, Co-bien brings together a consortium of public and private entities from France and Spain to identify cross-border needs and strategies for fostering social connectedness among older adults living in both countries. In this context, technology solutions refer broadly to both digital and material technologies aimed at supporting communication, autonomy, and everyday life among older adults, such as digital platforms for social connection, assistive technologies, or smart physical devices integrating embedded digital functionalities. The project is grounded in the recognition that **this** technology, when designed to be simple, useful, and usable, can act as a facilitator of meaningful human contact rather than a substitute for it^{10,11}. In doing so, Co-bien aligns with a growing body of research emphasising the role of socially meaningful technologies in promoting active ageing and reducing the risks associated with loneliness and social isolation^{12,13}.

As suggested by its name, collaboration through co-design constitutes the methodological foundation of the project. This involves the engagement of multidisciplinary professionals together with older adults and their support networks (including, among others, friends, caregivers, and family members) whose lived experiences provide essential insights for generating socially meaningful and context-sensitive solutions^{14,15}.

The present article seeks to analyse the role of design within this context, which can be categorised as a “wicked problem”^{16,17}: a complex and multifaceted issue still lacking a clear and adequate definition. On one hand, the concept of loneliness itself is a wicked problem, and on the other hand, approaching older adults is, on its own, a complex approach.

1.1. The multidimensionality of the term

Peplau and Caldwell¹⁸ established one of the classic definitions of loneliness, which has since been widely accepted as a general research principle. They describe it as a discrepancy between the social relationships a person has and those they desire: a mismatch between existing relationships, or their quality, and desired relationships, or their quality, with the latter being perceived as superior to the former¹⁹.

A wide range of studies have created a supportive and comprehensive space for exploring the multidimensional nature of loneliness. DiTommaso and Spinner²⁰ distinguish between social loneliness and emotional

loneliness, addressing factors related to general physical connectedness and family-related bonds, respectively.

It is important to differentiate the concept in its varied—yet natural—manifestations, as it occurs in different forms, at different times, and across different groups of people. Moreover, its causes, as well as existing strategies for prevention and intervention, also differ. As basic concepts, it can be concluded that not all individuals who suffer from loneliness are alone, and not all individuals who are alone suffer from loneliness^{21 22}. Furthermore, loneliness comprises multiple dimensions, both positive and negative, which must be addressed separately.

1.2. Something subjective, invisible, and intimate

Loneliness represents a major challenge because it is a subjective, invisible, and intimate condition. Regarding its subjectivity, it is difficult to reach a consensual understanding of the concept, to measure it, and to intervene effectively^{23 24 25}. Moreover, it is a deeply personal perception, which inevitably introduces a wide range of biases and conditioning factors, closely tied to individual expectations. Combined with its invisibility, this makes it a situation that is hard to verify and difficult for individuals to recognise in themselves.

The intimacy associated with loneliness acts as a barrier that wraps the concept in mystery and assumption, making it a problem that is difficult to admit and even more complex to address. People often conceal it out of fear of being judged or perceived as weak, which in turn reinforces isolation and allows the situation to go unnoticed both by their social environment and by support systems. This emotional barrier hinders both detection and intervention^{26 27}.

1.3. “Causes” and/or “consequences”

The growing interest in loneliness research is partly driven by the emergence of the politics of emotions, which has fostered greater awareness of the impact of this feeling on both mental and physical health. Loneliness has been associated with high levels of anxiety²⁸, low self-esteem²⁹, diminished self-worth³⁰, low self-sufficiency³¹, thoughts of insignificance³², emotional instability and economic resources, self-compassion and social dissonance^{33 34}, withdrawal from social interaction³⁵, and difficulties in achieving social harmony³⁶.

Nevertheless, both the nature of the term and the individuals experiencing it are highly complex, and they cannot be understood in isolation from their context. Consequently, these factors can be interpreted bidirectionally: a person may experience loneliness as a result of low self-esteem, just as they may develop low self-esteem from experiencing loneliness, or even both simultaneously, reinforcing one another. Causality thus significantly biases the data, particularly when loneliness is discussed in terms of “consequences”. The reported impacts may simply reflect the most statistically significant results arising from diverse contexts and priorities.

Loneliness often arises in unexpected and sometimes seemingly contradictory—or indeed genuinely contradictory—contexts. It can no longer be asserted with

absolute certainty whether loneliness is more indicative of rural or urban settings, of one gender or another, of advanced age or youth, or of social media use or non-use. This is because the factors involved often have both positive and negative effects, influencing each individual and context differently.

1.4. A cautious approach

Rubio³⁷ proposes an encouraging new perspective for addressing the situation—not from the concept itself, which has proven to be highly complex, but from expectations, understood as the origin of loneliness, and one of the few relatively simple notions in this field of research: “When we look at the horizon at sunset, we see the intense red on clear evenings, but the red is only the reflection; behind it lies the cause, the SUN, the source of that light”³⁷.

Peplau and Caldwell’s¹⁸ definition of loneliness as a discrepancy of expectations can easily be supported from a cultural perspective. Lykes and Kimmelmeier³⁸ highlight the impact of cultural norms, showing that, although it might initially seem contradictory, higher levels of loneliness are found in collectivist countries than in individualist ones. This can also be corroborated from the perspective of older adults, for whom discrepancies between expectations and reality are often most evident, making them popularly perceived as the group most associated with loneliness.

The “sun behind the red of the sunset”—that is, expectations behind loneliness—are, for older adults, generally shaped by social and structural changes. Among them are the decline in intergenerational interactions, changes in lifestyle, increasingly compartmentalised and individualistic societies, faster-paced living, weakening intrafamilial relationships, the role of technology, urban growth and rural exodus, and public spaces that are antisocial and hostile^{39 40}.

1.5. Objective of the study

Although loneliness is not exclusively associated with older adults, it is one of the main adverse consequences of ageing⁴¹. This is evidenced in the report of the Institute for Older Persons and Social Services (IMSERSO - Instituto de Mayores y Servicios Sociales),⁴² on loneliness rates in the Spanish population, which shows that as people age, they increasingly find themselves alone. This problem, already significant, is exacerbated by the fact that population ageing is a growing global phenomenon. Due to both declining birth rates and increasing life expectancy, organisations such as the World Health Organisation and the United Nations warn that population ageing is accelerating, particularly in more developed countries.

Given the relevance of the issue and the sensitivity of both the topic and the population concerned, the objective of this study is to design an appropriate engagement protocol through which solutions can be co-designed with older adults. The aim is to explore how the situation of loneliness among older adults can be addressed from the perspective of design, based on the hypothesis that design as a discipline can successfully manage complex social challenges.

2. MATERIALS AND METHODS

The multidimensionality nature of loneliness, shaped by emotional, social, and contextual factors^{43 20}, combined with the broad spectrum of expectations surrounding it, gives rise to a complex and multifaceted challenge. Addressing this phenomenon requires transversality, both in terms of disciplines and methodological approaches⁵.

Within this framework, design—particularly in its social and collaborative dimension, assumes a central role, offering tools to integrate diverse perspectives and facilitate meaningful engagement^{44 45}.

2.1. Design Thinking

The methodological framework used for designing the protocol for gathering information from participants was Participatory Design. From this premise, the focus is placed on the co-construction and co-interpretation of artefacts that serve both as vehicles and as outcomes of emerging knowledge⁴⁶. Following the methodological approach of Participatory Design described by Spinuzzi, the present project is conceived as an iterative process of co-research and co-design that makes tacit knowledge visible among participants, in order to identify unmet needs and co-design artefacts and processes that authentically respond to the values and needs of older adults through conscious innovation⁴⁷.

Design Thinking is a human-centred methodology that makes use of tools employed in design practice⁴⁸. It applies the sensitivity of designers to integrate people's needs with what is technologically feasible and viable from a business strategy perspective, translating them into value for users and market opportunities. As a result, it emphasises empathy with users, problem definition, ideation, rapid prototyping, and continuous iteration⁴⁹.

Participatory Design is based on the belief that people are experts in their own everyday lives and can therefore contribute to and inform the development of technologies intended to support them. It highlights the importance of cooperating with future users to design products and services that align with their needs.

Considering the characteristics of the Co-bien project, and with the aim of defining a data collection protocol, an initial proposal was developed: the combined use of Cultural Probes and in-depth interviews within participatory sessions.

2.2. Cultural Probes

Cultural Probes are a qualitative tool developed in the field of design to investigate participants' everyday realities through creative self-expression and subjective recording. Developed by Gaver, Dunne, and Pacenti⁵⁰, this form of data collection does not seek reliable or quantitative information but rather aims to provoke new design perspectives, foster empathy, and create spaces of open meaning. Its value lies in offering cultural fragments that reflect participants' attitudes, values, and desires, thereby stimulating the designer's sensitivity rather than their analytical logic.

When design research is grounded in ethical frameworks such as appreciative inquiry, communicative methodology, or the ethics of care⁵¹, the use of Cultural Probes can contribute to strengthening participants' self-determination by fostering autonomy, competence, and relatedness.

The use of Cultural Probes has proven particularly relevant in design contexts involving older adults. Maas and Buchmüller⁵² emphasise their ability to generate trust, support sustained participation, and establish a "Third Space"⁵³: a common ground where designers and participants co-construct meanings from symmetrical positions. Far from being simple data collection artefacts, probes function as "boundary objects," capable of initiating deep conversations, revealing tacit knowledge, and legitimising the voices of those who rarely participate in technological innovation processes.

A practical advantage of this methodology is that it can also uncover situations at home, social dynamics, and design opportunities that may not be evident through more structured approaches. Thoring, Luippold, and Mueller⁵⁴ suggest that interviews additionally provide an opportunity to partly overcome older adults' perceived limitations in conceiving technologically abstract concepts. Theorisation of everyday technology seems to suffer from a central gap: it tends to describe only technologies already integrated into people's lives, without systematically addressing the potential development of new or unfamiliar technologies or functions⁵⁵. In such contexts, combining methods helps make the process more accessible and equitable for all participants.

2.3. In-depth Interviews

In-depth interviews are a fundamental tool for understanding the lived experiences, motivations, and emotions of older adults. They also give voice to participants' perspectives in the design of solutions. Zhao et al.⁵⁶ combine interviews and participatory workshops to enrich findings and connect individual experiences with shared values and visions. They identify key values such as simplicity, continuity, and autonomy, which align with the present methodological approach.

The purpose is to listen actively and contextually: to inquire into older adults' everyday experiences, feelings, strategies, and values in order to obtain insights that guide innovation. This enables authentic articulation of needs and the building of an empathetic, situated foundation for design.

Process stages

1. Participant definition: Older adults representing diverse contexts (residences, social centres, and active participation centres), identified through direct contact with community facilitators.
2. Semi-structured script design: Open-ended questions supported by examples and contextual materials to facilitate reflective expression⁵⁷. Non-directivity allows for spontaneous narratives within a guided structure.
3. Preparation of materials and logistics: Development of tools to support communication, data collection, and setting, agreeing on the mode

of contact and location, with priority given to familiar and accessible environments.

4. Conducting the interviews: Carried out in a semi-structured or open qualitative format, adapted to participants' pace. The interviewer acts as a facilitator, promoting a climate of trust and joint exploration, and uses probing techniques to elicit implicit meanings.
5. Digitisation and analysis: Interviews are recorded, transcribed, and analysed using techniques such as inductive thematic analysis, identifying patterns of needs, values, and expectations⁵⁸.

This approach balances power between interviewer and participant, promoting ethical, meaningful, and participatory dialogue⁵⁷. In-depth interviews with older adults not only provide insights into their realities but also help imagine more inclusive solutions, grounded in their own experiences, respect, and autonomy.

3. RESULTS

The result of this process is the definition of the Cultural Probes and interviews for the adapted engagement with older adults. Additionally, the ICSO (Social Connection Indicator) and the structure of the participatory sessions have been defined to integrate all components.

3.1. ICSO

The ICSO was intended to be a combination of different questionnaires from the literature, in order to make a better contextualization of each participant's situation. It was designed by combining two key dimensions. On the one hand, social isolation, measured objectively, for example through the frequency of contacts. On the other hand, the perception of loneliness is measured subjectively using various scales. This strategy draws on the literature on the concept of loneliness, consistent with the complexity of the term and the difficulty of identifying its true causes and consequences²⁰.

The ICSO thus has the following structure:

- Loneliness Questionnaire (SELSA-S): Assesses the subjective perception of loneliness across different dimensions (social, family, and romantic) through statements about satisfaction in personal relationships and the desire for emotional companionship⁵⁹.
- Social Isolation Questionnaire (ESTE-II): Explores the participant's social network and environment quality, as well as their level of community participation, through questions about affective relationships, use of communication technologies, and daily social activities⁶⁰.
- Satisfaction With Life Scale (SWLS): Measures overall emotional well-being based on the participant's subjective evaluation of their own life, achievements, and sense of personal fulfilment⁶¹.
- Geriatric Depression Scale (GDS-15): Detects depressive symptoms in older adults through questions about mood, motivation, self-assessment, and enjoyment of daily activities⁶².

- Geriatric Anxiety Inventory (GAI-20): Evaluates the presence of anxiety in older adults, focusing on persistent worries, nervousness, feelings of threat, or difficulty relaxing⁶².
- General Emotional State Indicators (tests by Hughes, Kool and Geenen, and Abdel Kahael): Includes items that capture the frequency and intensity of feelings such as loneliness, sadness, anxiety, and happiness, providing a comprehensive view of the participant's recent emotional state.

This set of scales and tests addresses a broad range of factors related to loneliness.

3.2. Session Design

For the approach to the older adults, the ethnographic methods of Cultural Probes and in-depth interviews have been developed and combined with two participatory workshops for each group, scheduled one week apart. The intention is to better understand the daily lives of older adults at risk of experiencing loneliness, their frustrations, needs, desires, and especially their expectations, through an approach as close, warm, and relaxed as possible.

In the first participatory workshop session, the team and the project are presented, emphasising the importance of participants' contributions and the value of their opinions. This is followed by an ice-breaking activity consisting of a question-and-answer game, and then another activity called the "needs cards," designed internally by a team member with a background in psychology, in which participants evaluate the necessity of different needs presented to them (Figure 1).

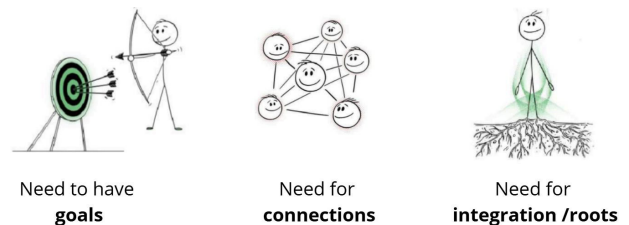


Figure 1. Three examples of the needs cards used in the study.

At the end of the first session, the Cultural Probes tool is explained in terms of its purpose, functionality, and how to participate. Each participant then receives a kit containing all necessary materials to engage in the activity.

One week later, during the second participatory workshop session, the ice-breaking question-and-answer game is repeated. Participants then share their experiences with the diary, after which the interviews are conducted.

3.3. Kit

The central element of the Cultural Probes is the kit. The kit developed for this study includes the diary, materials and instructions related to the diary and

the project plus a totefabric bag and a project-branded mug as gifts.

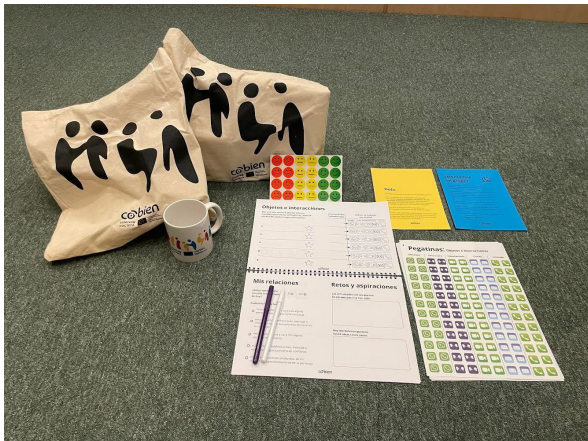


Figure 2. Personal kit for participation in the Cultural Probes.

The diary is the main tool within the kit, designed to encourage reflection on daily life and social interactions. Participants are asked to fill in the diary over the seven days between the first and second workshop sessions, ideally at the end of each day. To make the activity more engaging, the diary is designed in a playful manner, allowing participants to use stickers and colored markers which are also provided.

The diary consists of two daily sheets. On the first sheet, “A Day in My Life,” participants indicate the activities or tasks they consider most relevant from their day, whether performed inside or outside the home—for example, eating, walking, shopping, reading, or watching television. Participants also reflect on how they felt during each activity, using emotion icons to represent the primary feeling associated with the activity. Participants can use the emotion stickers or, if they prefer, draw the emotions themselves (Figure 3).

The second sheet, “Objects and Interactions,” requires participants to list the five objects (items or furniture) they used most during the day. They are asked to select their favourite object by filling in the corresponding star—for example, a book, a piece of furniture, or an appliance. Additionally, participants indicate with whom they had conversations during the day and specify the medium used for each interaction: messaging, face-to-face, video call, mail, or phone call. Multiple options can be selected per person using colored markers.

3.4. Interviews

Special care was taken in designing the interview guide, considering both the profile of older adult participants and the topic. The guide was designed as a flexible reference, prioritising the natural flow of conversation to adapt each interview to the unique situation of each participant.

Regarding the topics defined in the previous section, specific questions were established for each point (Table 1). The approach ensures that interviews are both participant-centred and responsive, allowing for

Un día en mi vida

Indica las 5 actividades y/o tareas más relevantes (para ti) que has realizado hoy, tanto dentro como fuera de casa, y reflexiona sobre cómo te has sentido. Si quieres, puedes utilizar las pegatinas de emociones para cada acción.

	1	2	3	4	5
¿Qué he hecho hoy?					
¿Cómo me he sentido?					

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Un día en mi vida

Indica las 4 actividades y/o tareas más relevantes (para ti) que has realizado hoy, tanto dentro como fuera de casa, y reflexiona sobre cómo te has sentido. Si quieres, puedes utilizar las pegatinas de emociones para cada acción.

	1	2	3	4
¿Qué he hecho hoy?	Limpiar fallos del jardín	Salir a pasear con mi perro	Ver malas noticias en la tele	Quedar con un amigo a tomar algo
¿Cómo me he sentido?	😊	😞	😡	😊

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Figure 3. On the above, the template of Sheet 1, “A Day in My Life,” and on the below, an example of the completed sheet.

Objetos e interacciones

Haz una lista con los 5 objetos (cosas o muebles) que más has utilizado hoy. Pinta la estrella del objeto que más te gusta:

	¿Con quién he hablado hoy?	¿Cómo he hablado con él/ella?
1	☆	Mensajes A cara Videollamada Correo Llamada
2	☆	Mensajes A cara Videollamada Correo Llamada
3	☆	Mensajes A cara Videollamada Correo Llamada
4	☆	Mensajes A cara Videollamada Correo Llamada
5	☆	Mensajes A cara Videollamada Correo Llamada

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Objetos e interacciones

Haz una lista con los 5 objetos (cosas o muebles) que más has utilizado hoy. Pinta la estrella del objeto que más te gusta:

	¿Con quién he hablado hoy?	¿Cómo he hablado con él/ella?
1 LIBRO	☆	Mensajes A cara Videollamada Correo Llamada
2 MECEDORA	★	Mensajes A cara Videollamada Correo Llamada
3 ORDENADOR	☆	Mensajes A cara Videollamada Correo Llamada
4 CACHARRA	☆	Mensajes A cara Videollamada Correo Llamada
5 MÓVIL	☆	Mensajes A cara Videollamada Correo Llamada

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Figure 4. On the above, the template of Sheet 2, “Objects and Interactions,” and on the below, an example of the completed sheet.

nuanced exploration of experiences, motivations, and perceptions.

Table 1. Flexible reference guide organised by topics of interest.

Topics	Questions
About the Diary Experience	<ol style="list-style-type: none"> 1. <i>How did it go?</i> 2. <i>How did you feel?</i> 3. <i>What was the most difficult part? And what did you enjoy the most?</i> 4. <i>Where in your home did you fill in the Cultural Probes?</i>
About Everyday	<ol style="list-style-type: none"> 5. <i>Was this a typical week for you? Is this what your daily life is usually like?</i>
Activities	<ol style="list-style-type: none"> 6. <i>What would you say are your most frequent daily activities? Talking about preferences, needs, difficulties...</i> 7. <i>Why do you do them? Which one motivates or pleases you the most?</i> 8. <i>What challenges or difficulties do you encounter in your day-to-day life?</i>
About Moments and Spaces at Home	<ol style="list-style-type: none"> 9. <i>What kinds of moments do you spend at home?</i> 10. <i>What activities do you do?</i> 11. <i>Which are the most commonly used spaces or rooms? And your favourites?</i>
About Household Objects	<ol style="list-style-type: none"> 12. <i>Regarding the objects you mentioned using at home — do you use them out of necessity or for pleasure?</i> 13. <i>What are your favourite everyday objects? Why are they your favourites?</i>
About Social Interaction and Community Participation	<p>We consult the diary to see who you interacted with, how, and how they felt: emotions, frustrations, and how they would have liked things to go.</p> <ol style="list-style-type: none"> 14. <i>How were your interactions/relationships with people this week?</i>
About Technology	<ol style="list-style-type: none"> 15. <i>What does technology mean to you?</i> 16. <i>What devices do you interact with daily?</i> 17. <i>How do you manage with them? What challenges do you face?</i>
Perceptions and Experiences of Loneliness	<p><i>There is a myth that everyone who lives alone feels lonely — and we know that's not always the case. In this section, we want to talk with you about your perception of loneliness.</i></p> <ol style="list-style-type: none"> 18. <i>Have you reflected on this?</i> 19. <i>What does loneliness mean to you?</i> 20. <i>Is it a negative or positive feeling?</i> 21. <i>Is there anything that concerns you about living alone? It could also be something related to the future or loneliness...</i>
Future Plans and Perspectives	<ol style="list-style-type: none"> 22. <i>What plans do you have for the future?</i> 23. <i>What concerns you about the future?</i> 24. <i>If you could have a device that would help you socialise (connect with others), how would you imagine it? What would you like it to do for you?</i> 25. <i>If you had to have a technological device at home, what would you use it for? Or what would you like it to help you with?</i> 26. <i>We're wrapping up. Is there anything else you'd like to add?</i>

4. DISCUSSION

The incorporation of design methods into engineering projects with social implications represents an approach

that goes beyond mere technical application. In this context, the phase of engaging older adults through ethnographic methods such as Cultural Probes and in-depth interviews is conceived as the first link in a continuous co-design process. From a methodological perspective, this approach aims to demonstrate that design can strengthen early project phases, contributing to a richer definition of needs, clearer objectives, and a greater appreciation of the experiences of the users involved.

4.1. Findings and Contribution

The use of the Cultural Probes protocol generated insights that would not have emerged through conventional interviews or quantitative assessment tools. Beyond collecting descriptive accounts of loneliness, the process enabled participants to express its nuances indirectly—through routines, memories, material objects and emotional reflections—revealing patterns that have informed the current direction of the Co-bien project.

The protocol made visible that loneliness is not determined solely by whether one lives alone, in a residence, or with others. Instead, each context generates a specific configuration of emotional and relational tensions. Those living alone often reported silence and lack of reciprocity, while those living in shared or institutional environments expressed loneliness despite constant presence of others, pointing to a lack of intimacy, autonomy or recognition. This challenges the assumption that cohabitation inherently protects against unwanted loneliness, stressing the need for tailored rather than uniform technological responses.

Rather than being described as a standalone feeling, loneliness consistently appeared intertwined with a constellation of eight recurrent dimensions, which surfaced through the reflective nature of the diaries:

- Dependence: Not only physical but also functional and emotional dependence, shifting relationships from reciprocal to assistive.
- Past farewells: Accumulated losses and unresolved goodbyes, where loneliness acts as a silent continuation of grief.
- Quality of conversations: Loneliness persisted even in frequent interaction when exchanges lacked depth, authenticity or active listening.
- Sense of uselessness: A perceived loss of role or function led to withdrawal; this theme would likely remain unspoken in direct questioning.
- Abandonment: Not always material abandonment but a subjective sense of being forgotten or deprioritised.
- Self-esteem: Low self-worth reinforced avoidance of contact, generating cycles of self-perpetuating isolation.
- Routine: Daily repetition was described simultaneously as stabilising and suffocating, acting as both refuge and cage.
- Coexistence: Living with others did not guarantee belonging; proximity without recognition still resulted in emotional solitude.

These findings have prompted the engineering team within Co-bien to broaden their design scope. Rather

than treating unwanted loneliness as a single target condition, they are now considering technological interventions that address its adjacent dimensions—such as fostering meaningful interaction, supporting autonomy or enabling acknowledgement of personal histories—as potential entry points for impact.

4.2 Protocol Discussion

The Cultural Probes protocol proved to be more than a data-gathering device; it functioned as an engagement mechanism that fostered reflection, participation and emotional readiness. The diary component, in particular, played a preparatory role between sessions, allowing participants to articulate their feelings gradually rather than being asked to do so abruptly in an interview setting. This pre-reflective layer was essential for eliciting honest accounts of loneliness, especially given its often implicit or shame-associated nature.

Preliminary pilot experiences suggest that older adults responded positively to the probes, perceiving them as both enjoyable and meaningful. Rather than framing them as clinical or extractive instruments, they operated as gestures of appreciation, signalling that participants' voices were valued. This sense of recognition is especially relevant in vulnerable populations where past interactions with institutions may have been paternalistic or dismissive.

The protocol also enabled access to lived dimensions that traditional technical assessments would have overlooked. Diaries and photographic prompts revealed subtle routines, emotional attachments to objects and environments, and heterogeneous relationships with technology. Some participants relied primarily on radio or television, while others made occasional use of tablets or e-books—but the decisive factor was not access, but confidence and relevance. Similarly, entries referencing medication, comfort items or specific domestic spaces pointed to design opportunities beyond communication platforms alone.

These findings support the broader argument that design-driven methodologies bring added value to engineering-led projects by reframing “users” not merely as data points but as co-constructors of meaning. In early stages, such protocols help clarify participation expectations, dignify contribution, and establish a shared vocabulary before moving toward more concrete stages of prototyping or testing. However, it must be acknowledged that this method represents only the first step of a larger participatory continuum. Its validity lies in being sustained across later phases—through co-creation workshops, prototype iteration and impact evaluation—rather than remaining a one-off engagement gesture.

Ultimately, the feasibility and resonance observed in pilot tests indicate that the protocol constitutes a viable foundation for ongoing collaboration with older adults within Co-bien. By intentionally integrating emotional, material and relational aspects of daily life, it lays the groundwork for interventions that are not only technically functional but socially and affectively grounded.

CONCLUSION

In conclusion, it is important to emphasize that this approach has not been merely a methodological exercise, but a way of positioning oneself in the face of the complexity of loneliness among older adults. Design, from its social and participatory perspective, has proven to be a valuable tool not only for understanding but also for accompanying participants. The combination of the ethnographic methods Cultural Probes and in-depth interviews allows access to a layer of personal meanings that rarely emerges through more traditional methods, offering fragments of reality imbued with sensitivity, memory, and desire.

Although Co-bien is framed within the realm of technological innovation, it focuses on active listening and relationships. In addressing such an intimate and multifaceted issue, adopting an approach that integrates empathy, time, and respect is more than a strategy—it is a necessity. Designing with older adults, rather than merely for them, emerges not only as an ethical gesture but also as a methodological requirement for generating truly relevant solutions.

This first step, still under development, reaffirms an intuition that permeates the entire project: behind every described daily routine, every object mentioned, and every shared emotion, there is a story that deserves to be heard. If technological solutions can approach and amplify these stories with respect, progress will be made toward solutions that are more human, closer to the lived experience, and, above all, more just.

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