Study on the Acceptability of an ICT Platform for Older Adults with Mild Cognitive Impairment

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PATIENT FACING SYSTEMS

Study on the Acceptability of an ICT Platform for Older Adults with Mild Cognitive Impairment

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Abstract

EhcoBUTLER is an Information and Communication Technology (ICT) solution funded by the European Union (H2020; ID: 643566) and intended especially for elderly people with mild cognitive impairment (MCI) to improve their health, independence and quality of life, particularly at the social level. The purpose of this study is to assess the acceptability of ehcoBUTLER based on a survey delivered to potential users and actors involved in their care, exploring their expectations and preferences, while anticipating the system's functional requirements. The survey was delivered online to 313 participants (11% end users, 25% informal caregivers, 48% formal caregivers and 16% administration/management staff) from eight countries. Participants rated the different functionalities of ehcoBUTLER positively, 86.1% perceiving it as an interesting and useful system. Likewise, they assessed it as a commercially attractive product (75.1%). End users expressed a stronger preference for the social module. Nevertheless, they would be ready to pay a low monthly price for ehcoBUTLER. Professionals would be willing to pay choosing its functionalities modularly, but they would also expect it to be funded by the National Health System, centres or businesses. The conclusion is that all participants found ehcoBUTLER interesting, useful and ergonomic. However, to effectively implement it, it is necessary to bridge the digital gap and address the issue of insufficient investment in products aimed at older adults with cognitive impairment. To supplement cognitive training systems with social, emotional or entertainment functionalities could improve adherence to their use.

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Introduction

The world population is ageing [1] and it impacts on social welfare, government finances and labour markets [2]. A common characteristic of ageing is the onset of physical or cognitive problems [3]. Forms of mild cognitive impairment (MCI) are common [4]: epidemiological studies on MCI in different continents show a prevalence between 5.0% - 36.7% [5]. MCI is often found to be a transitional stage between normal aging and dementia [6], and can result in memory loss or distraction issues [7]. The next step from cognitive impairment is dementia, which is characterized by increased memory loss, decreased attention span and loss of skills for performing daily activities [8].

Older people are also vulnerable to social isolation [9, 10], which poses a threat to independent living [11] and increases their mortality [12]. Lack of social interaction can be a consequence of the onset of cognitive and physical impairment, retirement, death of loved ones, living on their own or in institutions [13]. It is essential, therefore, to promote healthy

Table 1   Services and applications of the ehcoBUTLER system

Service	Goal	Applications within the service
Emotional tools [28]	Early prevention and detection of anxiety and/or depression symptoms	Screening for Anxiety/Depression My Memories Cheerful and Relaxing Nature Book of Life
Social tools [29]	Foster social relationships and increase social capital	Videoconference E-mail Friend Search News Social Profile Share on Book of Life
Leisure tools [29]	Facilitate access to new Internet applications	EhcoBUTLER Compatible Apps Market Internet Access Bookmarks
Cognitive training tools [31, 32]	Leisure tools for prevention Professional tools for intervention	Leisure GRADIOR Therapy GRADIOR
Lifestyle [33–35]	Promote healthy lifestyles	Nutrition Fall Detection Activity Calendar
Ergonomics [36, 37]	Facilitate autonomy and technological learning	Avatar –Written/Audio Support Ergonomic Design Multilanguage Features

ageing and optimize social participation [14]. This justifies the developing tools aimed at fostering social interaction as well as cognitive stimulation and training to improve the elderly population's quality of life [15, 16].

Information and Communication Technologies (ICT) are currently known to be useful to reduce social isolation in the elderly by allowing them keep in touch with the outside world, gain social support, participate in activities and boost their self-confidence [17, 18]. Furthermore, older adults who use computers have been observed to be at a lower risk of receiving a diagnosis of dementia up to 8.5 years later [19].

EhcoBUTLER is an ICT platform in development, aimed at facing the challenge of active and healthy aging, especially in elderly with MCI at social level, with different services and modules in which each user can choose the tools that they wish to use. However, its potential benefits can be negatively affected by social issues, interest, motivation, cognitive/physical capacity or the place where they live [16], so it is necessary to examine variables that allow predicting the acceptability that its functionalities will have in the direct and indirect users. The Technology Acceptance Model provides the theoretical background for a methodology to assess users' acceptance [20]. The variables perceived ease-of-use and perceived usefulness are important in the shaping of attitudes, behavioural intention and final decision to use the technology concerned [21, 22]. The elderly's acceptance

Table 2   Modules for each stakeholder

Stakeholders	Modules
End users	Ergonomic design Free time and leisure module Cognitive module Lifestyle model Emotional care model Social care module
Formal caregivers	Main module for patient management and telecare Lifestyle management module Physical training management module Module for the management of emotional monitoring Module for the management of social networking tools Module for the management of cognitive training
Informal caregivers	Support for the family care module Social module for families
Administration and management staff	Management of the centre Patient management module Free time and leisure management module Module for the management of cognitive training tools Multimedia management module

Table 3   Variables measured for all users

Variable	Response scale
Interest as a system	0–10 (0 = None, 10 = High)
Perceived usefulness	0–10 (0 = None, 10 = High)
Future purchase intention	0–4 (0 = Definitely not, 4 = Very probably)
Interest in purchasing hardware	a. I would rather use my own b. I would rather have all the devices installed (computer, touchscreen, ergonomic keyboard, etc.)
How much would you pay for the system?	Open question
Interest as a product	a. Yes, I think it's interesting b. No, I don't need it c. No, it's too complex d. No, I wouldn't pay for the hardware e. Other

Fig. 1 Stakeholders sample
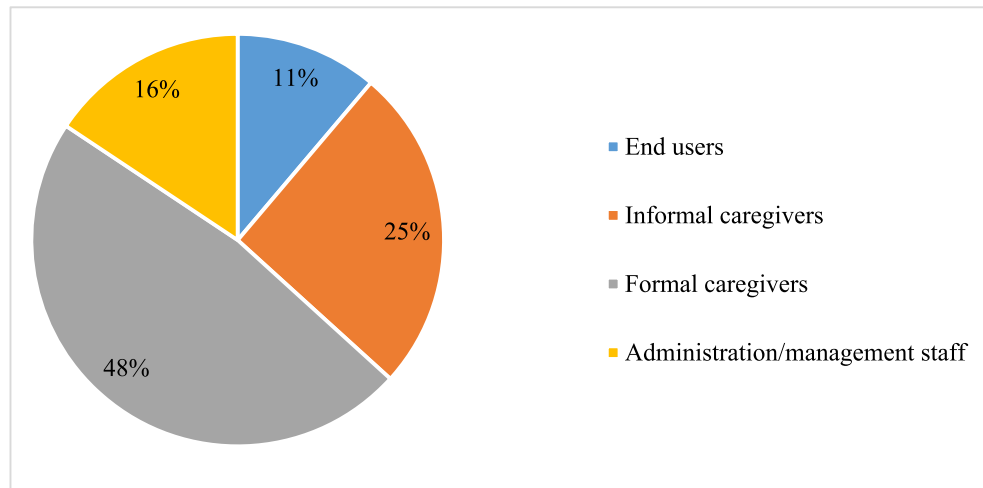
of technology is also influenced by reliability, cost and technological expertise [23]. Therefore, it is crucial for technologies, like ehcoBUTLER, to be developed according to user's needs, abilities and interests. Likewise, helping older people to bridge the digital divide will bring greater integration and will benefit all society [24].

The purpose of this study is to assess the acceptability of ehcoBUTLER by means of a survey delivered to potential users and actors involved in their care, as essential part of its development in the European project.

Method

This qualitative study was based on an ad hoc online survey, because it allows gathering and analyzing information of the characteristics and attributes of a larger representative sample [25] which, in line with the human-centred design, will enable the identification of system's functional requirements and

develop an useful and acceptable technological tool according to the needs and conditions of users and interested actors [26].

Participants

The survey was completed by 375 individuals. To recruit them, each project partner selected representative users who were going to be subjected to the tool (business model). Therefore, the sample conformed was naturalistic of each partner, in which 5 partners were from Spain, 2 from Italy and 1 from Greece, Netherlands, Slovenia, France, Serbia and Israel respectively. The participants were categorized into end users, informal caregivers, formal caregivers and administration/management staff.

Inclusion criteria

- End users: individuals over the age of 60 with MCI who had obtained scores between 23 and 27 on the Mini-Mental State Examination (MMSE) [27].

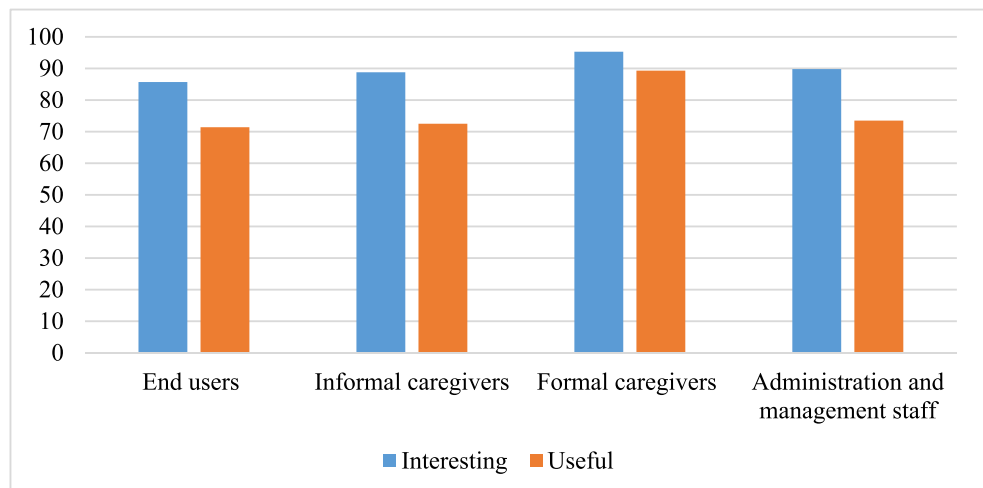Fig. 2 Stakeholders' interest and perceived usefulness for ehcoBUTLER

Table 4   Stakeholders' ehcoBUTLER purchase probabilities

	Purchase probability	End users	Informal caregivers	Formal caregivers	Administration/management staff
Negative score	Not at all likely	1 (2.9%)	2 (2.5%)	2 (1.3%)	1 (2.0%)
	Unlikely	5 (14.3%)	15 (18.8%)	16 (10.7%)	2 (4.1%)
	I don't know	11 (31.4%)	15 (18.8%)	44 (29.5%)	16 (32.7%)
	Total	17 (48.6%)	32 (40.0%)	62 (41.6%)	19 (38.8%)
Positive score	Probable	14 (40.0%)	32 (40.0%)	64 (43.0%)	18 (36.7%)
	Very likely	4 (11.4%)	16 (20.0%)	23 (15.4%)	12 (24.5%)
	Total	18 (51.4%)	48 (60.0%)	87 (58.4%)	30 (61.2%)

- Informal caregivers: family, friends or neighbours providing care and support to elderly with MCI.
- Formal caregivers: individuals with professional qualifications or training to meet the needs of the elderly population (social workers, healthcare providers, people in the area of social welfare, outpatient care, members of activity centres or charities).
- Administration/management staff: people whose role consists of administering and facilitating their products/services to the elderly population (telehealth/telecare companies, hospitals and insurance companies).

Materials

Online survey

An ad hoc online survey was produced for each stakeholder with the purpose of exploring their general views on ehcoBUTLER. End users were administered a version that also assessed their opinion of each module. Sociodemographic data were collected from all participants. The survey was developed using SurveyMonkey cloud-based software (https://es.surveymonkey.com/r/QYW6ST6).

Video demonstration

The versions of the survey included an initial video displaying all the functionalities and customized modules of ehcoBUTLER. Table 1 shows the services and applications

offered by it. Most of these have been validated in previous studies and refactored to fit this project:

Procedure

Survey preparation and dissemination

An ad hoc online survey was developed for this study, including variables that indicated interest in the tool [36], perceived usefulness and economic parameters for the analysis of marketing opportunities. Finally, there were questions to gather qualitative information about ehcoBUTLER.

The survey was developed in English and each partner translated it into the official language of its country (Spanish, Dutch, French, Italian, Greek, Hebrew, Serbian and Slovenian). Subsequently, SurveyMonkey was used to distribute the survey in each country. Each partner prepared a list of potential users according to their own business model. Stakeholders were contacted via an e-mail requesting their participation in the survey through a personalized link. When such means was not available or was not the most suitable method of contact, psychologists/team partners conducted telephone or face-to-face interviews asking for their participation and assessment. Respondents were selected through convenience sampling.

Description of the Survey

The introduction to the survey consisted of a video demonstration of ehcoBUTLER and its modules, explaining the

Table 5 Stakeholders' preferences for using their own devices or for ehcoBUTLER to provide them

Stakeholders	Use their own devices	Use ehcoBUTLER devices	No answer
End users	15 (42.9%)	16 (45.7%)	4 (11.4%)
Informal caregivers	44 (55.0%)	29 (36.3%)	7 (8.8%)
Formal caregivers	66 (44.3%)	79 (53.0%)	4 (2.7%)
Administration /management staff	14 (28.6%)	30 (61.2%)	5 (10.2%)
Total	139 (44.4%)	154 (49.2%)	20 (6.4%)

Table 6   Intention to purchase the ehcoBUTLER system

	n (%)	Amount willing to pay	Do not know (%)
End users	30 (85.7%)	9.50€/month	5 (14.3%)
Informal caregivers	73 (91.3%)	20€/ month	7 (8.8%)
Formal caregivers	98 (65.8%)	35€/ month	51 (34.2%)
Administration/management staff	37 (75.5%)	50€/month	12 (24.5%)

Note: **n** = Sample

purpose, main features and details of the design. This was followed by the collection of sociodemographic data. Subsequently, the versions of the survey were delivered according to user type and all included a brief description of ehcoBUTLER's modules, which was different for each of the stakeholders (Table 2).

All stakeholders were required to give their general opinion of the platform in the survey, which included 5 questions (Table 3).

End users were additionally required to assess each module using 5 categories (interesting, useful, necessary, satisfies your needs and improves the care you receive) on a 6-point Likert scale (0 = Not at all; 6 = Absolutely) (Appendix, Table 14). This is how whether there were any modules requiring adaptations according to end users' needs and expectations was explored.

Results

Participants

Of the 375 individuals who completed the survey, 62 were excluded from the analysis: 56 for incomplete data and 6 end users for not meeting the MMSE score inclusion criterion. Analyses were conducted on the basis of the answers obtained from 313 participants, most of them were formal caregivers as shown in Fig. 1.

Most of the participants were Spanish women with university qualifications. The average age for caregivers and administration/management staff was 44.6 (±12.3),

while that of end users was 76.3 (±8.3). Most of the latter and of the formal caregivers coincided in having income levels between 10,000 and 20,000 €. Only part of the informal caregivers was within such income range, while another coincided with the standard income of administration/management staff (between 20,000 and 40,000 €) (Appendix, Table 15).

General survey

To improve understanding of the results, scores were divided into positive and negative. The results of the general survey show high means of positive scores in all ehcoBUTLER modules: 91.7% of the participants considered it to be an interesting system and 80.5% assessed it as useful (Fig. 2).

Most of the participants (58.5%) showed an interest in buying ehcoBUTLER, especially formal caregivers, followed by informal caregivers, administration/management staff and end users (Table 4).

Most formal carers and administration/management staff would rather ehcoBUTLER provided them with the hardware required to use the platform. Half of the end users also preferred this option, but informal caregivers would rather use their own devices (Table 5).

76% of the stakeholders (n = 238) would be willing to pay monthly for having ehcoBUTLER. Administration/management staff was willing to pay the highest amount for it, while end users would pay the least (Table 6).

Among the participants who were uncertain of how much they would be prepared to pay (n = 75, 24%), formal caregivers had the greatest difficulty in deciding, invoking reasons such as that the price would depend on the number of modules and usefulness, or that they expected the programme to be financed by the National Health System (NHS), centres or companies.

As for ehcoBUTLER's commercial potential, most of stakeholders believed that it was an interesting product. Formal caregivers showed the highest interest, followed by informal caregivers, administration/management staff and end users (Table 7).

Table 7   Stakeholders' perception of ehcoBUTLER as an interesting product

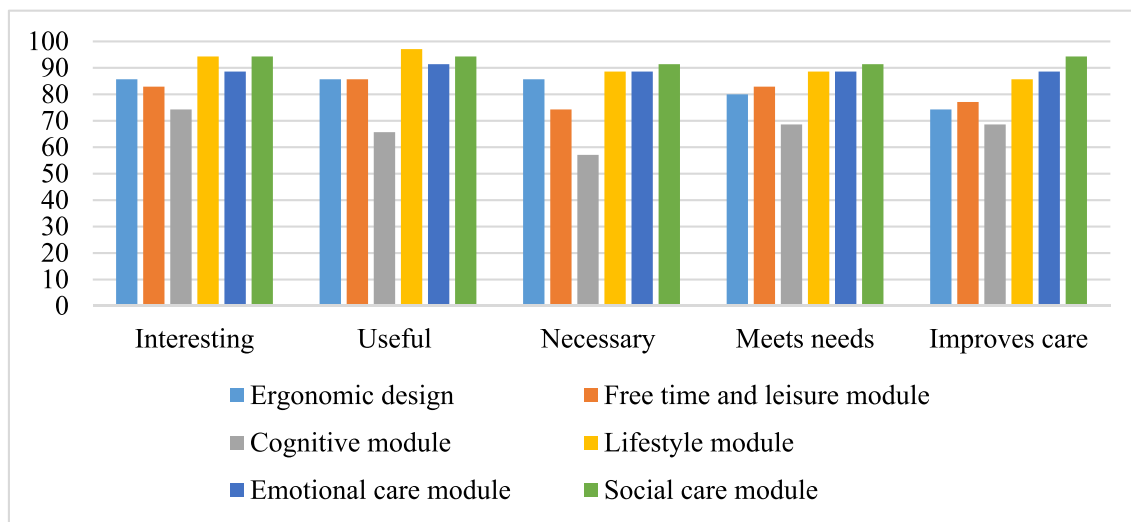| Stakeholders	Yes, it's interesting	No, I don't need it	No, it's complicated	No, you must pay	Other	No answer
End users	27 (77.1%)	0	1 (2.9%)	1 (2.9%)	2 (5.7%)	4 (11.4%)
Informal caregivers	60 (75.0%)	4 (5.0%)	4 (5.0%)	4 (5.0%)	1 (1.3%)	7 (8.8%)
Formal caregivers	112 (75.2%)	16 (10.7%)	2 (1.3%)	11 (7.4%)	3 (2.0%)	5 (3.4%)
Administration/management staff	36 (73.5%)	1 (2.0%)	1 (2.0%)	2 (4.1%)	3 (6.1%)	6 (12.2%)
Total	235 (75.1%)	21 (6.7%)	8 (2.6%)	18 (5.8%)	9 (2.9%)	22 (7.0%)

Fig. 3 End users' assessment for each module

End User Survey

End users were surveyed on each ehcoBUTLER's module, assessing on a 6-point Likert scale the following categories for each module: interest, usefulness, need for such service, extent to which it meets their needs and improvement in the care they are receiving (Appendix, Table 14). To make understanding of the results easier, scores were divided into negative (0–3) and positive (4–6).

All modules achieved positive scores. The social care module scored the highest, with 93.1% of the users assessing it positively, while the cognitive module was assessed positively by 66.9% of the users (Fig. 3).

As regards categories, all modules generally received very positive scores, with interesting (86.6%) and useful (86.6%) scoring the highest, while necessary achieved 80.9%. (Fig. 3).

As regards ehcoBUTLER's ergonomic design, intended for easy and autonomous usage, most end users agreed that it was interesting, useful and necessary (85.7% in all cases). The second place was taken by their considering that it could

meet their needs and, in the third place was that it would improve the care they were receiving (Table 8).

The free time and leisure module, designed to foster participation in different activities, was mostly assessed as useful by end users (85.7%). In second place, they agreed that it was interesting and might meet their needs, in third place came that it could improve their care, and last of all, their belief that it was necessary (Table 9).

End users made a positive assessment of the cognitive module, aimed at facilitating exercises designed and supervised by professionals to train cognition. The category interesting was the most positively valued (74.3%), followed by the claim that it could meet their needs and that it could improve the care they were receiving. Next came useful and, last, necessary (Table 10).

The lifestyle module, aimed at supporting the performance of everyday activities, was assessed by end users as useful (97.1%). Second came the category of interesting, and third those of necessary and capable of meeting their needs. Improvement of their care came last (Table 11).

Table 8   End users' opinion on the ergonomic design of ehcoBUTLER

Ergonomic design			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	0	0	1 (2.9%)	0	1 (2.9%)
	1	Hardly	0	1 (2.9%)	0	1 (2.9%)	1 (2.9%)
	2	Not much	1 (2.9%)	0	3 (8.6%)	2 (5.7%)	4 (11.4%)
	3	Somewhat	4 (11.4%)	4 (11.4%)	1 (2.9%)	4 (11.4%)	3 (8.6%)
	Total		5 (14.3%)	5 (14.3%)	5 (14.3%)	7 (20.0%)	9 (25.7%)
Positive score	4	Sufficient	10 (28.6%)	13 (37.1%)	11 (31.4%)	13 (37.1%)	9 (25.7%)
	5	A lot	10 (28.6%)	8 (22.9%)	13 (37.1%)	9 (25.7%)	8 (22.9%)
	6	Absolutely	10 (28.6%)	9 (25.7%)	6 (17.1%)	6 (17.1%)	9 (25.7%)
	Total		30 (85.7%)	30 (85.7%)	30 (85.7%)	28 (80.0%)	26 (74.3%)

Table 9 End users' opinion on ehcoBUTLER's free time and leisure module

Free time and leisure module			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	0	0	1 (2.9%)	0	1 (2.9%)
	1	Hardly	1 (2.9%)	1 (2.9%)	0	0	0
	2	Not much	2 (5.7%)	1 (2.9%)	3 (8.6%)	1 (2.9%)	1 (2.9%)
	3	Somewhat	3 (8.6%)	3 (8.6%)	5 (14.3%)	5 (14.3%)	6 (17.1%)
	Total		6 (17.1%)	5 (14.3%)	9 (25.7%)	6 (17.1%)	8 (22.9%)
Positive score	4	Sufficient	10 (28.6%)	10 (28.6%)	7 (20.0%)	11 (31.4%)	9 (25.7%)
	5	A lot	13 (37.1%)	13 (37.1%)	14 (40.0%)	11 (31.4%)	11 (31.4%)
	6	Absolutely	6 (17.1%)	7 (20.0%)	5 (14.3%)	7 (20.0%)	7 (20.0%)
	Total		29 (82.9%)	30 (85.7%)	26 (74.3%)	29 (82.9%)	27 (77.1%)

The emotional care module, which includes activities aimed at improving mood and fostering positive feelings, was positively assessed by end users. Most of them (91.4%) thought it was useful and coincided in the rest of scores qualifying it as interesting, necessary, capable of meeting their needs and capable of improving the care they were receiving (Table 12).

The social care module includes tools suitable for elderly people that will allow them to communicate with others via the Internet. Most end users considered it interesting, useful and capable of improving their care (94.3% respectively). They also assessed it as necessary and capable of meeting their needs (Table 13).

Discussion

An ad hoc survey was prepared for the purpose of this study and delivered online to learn the degree of acceptability of ehcoBUTLER by elderly people with MCI and by all those involved in their care. EhcoBUTLER is an ICT platform that is currently under development and whose aim is to promote health, independence and quality of life, though mainly at the social level, in elderly people with MCI. The survey was conducted in different countries and respondents were potential direct users (end users with MCI) and indirect users (formal/informal caregivers and administration/management staff), with the purpose of involving them in the development of what is required from ehcoBUTLER.

The findings show that ehcoBUTLER was well accepted as an interesting and useful platform by all the participants. In the general survey, formal caregivers allocated the highest positive scores in such categories: 95.3% assessed it as interesting and 89.3% as useful. This information is relevant, since good acceptance by professionals is essential for any technology's implementation in the healthcare area [37]. In the end users' survey version, the categories of interesting and useful also obtained high positive scores (86.6% respectively). This study is in line with other studies in that the development of new technologies such as ehcoBUTLER may appeal to the elderly population. There is evidence that elderly people tend express high interest in technologies for cognitive stimulation [38] and training [39]. Moreover, users with cognitive impairment perceive cognitive and social support technologies as the most useful tools, also expressing greater willingness to use them [40].

Table 10 End users' opinion on ehcoBUTLER's cognitive module

Cognitive module			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	2 (5.7%)	1 (2.9%)	2 (5.7%)	1 (2.9%)	1 (2.9%)
	1	Hardly	2 (5.7%)	2 (5.7%)	2 (5.7%)	2 (5.7%)	3 (8.6%)
	2	Not much	3 (8.6%)	4 (11.4%)	6 (17.1%)	6 (17.1%)	6 (17.1%)
	3	Somewhat	2 (5.7%)	5 (14.3%)	5 (14.3%)	2 (5.7%)	1 (2.9%)
	Total		9 (25.7%)	12 (34.3%)	15 (42.9%)	11 (31.4%)	11 (31.4%)
Positive score	4	Sufficient	12 (34.3%)	9 (25.7%)	10 (28.6%)	11 (31.4%)	11 (31.4%)
	5	A lot	9 (25.7%)	7 (20.0%)	7 (20.0%)	11 (31.4%)	9 (25.7%)
	6	Absolutely	5 (14.3%)	7 (20.0%)	3 (8.6%)	2 (5.7%)	4 (11.4%)
	Total		26 (74.3%)	23 (65.7%)	20 (57.1%)	24 (68.6%)	24 (68.6%)

Table 11   End users' opinion on ehcoBUTLER's lifestyle module

Lifestyle module			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	0	0	0	0	1 (2.9%)
	1	Hardly	0	0	0	0	0
	2	Not much	0	0	0	0	0
	3	Somewhat	2 (5.7%)	1 (2.9%)	4 (11.4%)	4 (11.4%)	4 (11.4%)
	Total		2 (5.7%)	1 (2.9%)	4 (11.4%)	4 (11.4%)	5 (14.3%)
Positive score	4	Sufficient	7 (20.0%)	10 (28.6%)	5 (14.3%)	11 (31.4%)	9 (25.7%)
	5	A lot	17 (48.6%)	15 (42.9%)	20 (57.1%)	13 (37.1%)	12 (34.3%)
	6	Absolutely	9 (25.7%)	9 (25.7%)	6 (17.1%)	7 (20.0%)	9 (25.7%)
	Total		33 (94.3%)	34 (97.1%)	31 (88.6%)	31 (88.6%)	30 (85.7%)

On the other hand, while the category of necessary was given a positive score by end users, the rest of categories obtained higher positive scores. The reason for this is that older adults might prefer face-to-face interventions because of the difficulties they find in technologies [41]. Elderly people's lack of experience with technologies reveal the existence of a digital divide, so that education and training in their usage should be a path to bridging it, which is one of ehcoBUTLER's objectives. Likewise, it is important for the design of this technology to focus on the users' perceived needs [40]. In this regard, ehcoBUTLER inherits all its ergonomic design from BUTLER, which in prior studies achieved very positive usability results among seniors [41–42], guiding users by linear navigation and an avatar.

This is endorsed by further studies that maintain that better performance can be expected from older adults (whether healthy or with MCI) if they are provided with a user-friendly introduction [43]. Although the elderly may at first be reluctant to participate for fear of doing it wrong, they can end up enjoying technological tools that motivate them to train their cognitive skills, share their positive experience with family [44] and keep up with the times in an ICT-driven society [45]. The scores achieved by these users on ehcoBUTLER are also encouraging and suggest that its use will be well accepted by its target users.

It is also significant that formal caregivers found the greatest difficulties in deciding the amount they were willing to pay for ehcoBUTLER, stating that they would expect it to be funded by the NHS, centres or companies. This is consistent with the fact that administration/management staff was willing to pay more for the platform, while end users were less willing to pay. These attitude could be explained by the impoverishment that comes with old age due to the reduction/interruption of labour activities [46]. In this regard, the United Nations [47] called for the collaboration of governments, organizations and the private sector suggesting that technology might contribute to an independent life, reduce loneliness

Table 12   End users' opinion on the emotional care module

Emotional care module			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	1 (2.9%)	0	0	0	2 (5.7%)
	1	Hardly	0	0	1 (2.9%)	0	0
	2	Not much	0	2 (5.7%)	2 (5.7%)	0	0
	3	Somewhat	3 (8.6%)	1 (2.9%)	1 (2.9%)	4 (11.4%)	2 (5.7%)
	Total		4 (11.4%)	3 (8.6%)	4 (11.4%)	4 (11.4%)	4 (11.4%)
Positive score	4	Sufficient	9 (25.7%)	7 (20.0%)	11 (31.4%)	15 (42.9%)	10 (28.6%)
	5	A lot	13 (37.1%)	16 (45.7%)	12 (34.3%)	13 (37.1%)	18 (51.4%)
	6	Absolutely	9 (25.7%)	9 (25.7%)	8 (22.9%)	3 (8.6%)	3 (8.6%)
	Total		31 (88.6%)	32 (91.4%)	31 (88.6%)	31 (88.6%)	31 (88.6%)

Table 13 End users' opinion on ehcoBUTLER's social care module

Social care module			Interesting	Useful	Necessary	Meets needs	Improves care
Negative score	0	Not at all	0	0	1 (2.9%)	1 (2.9%)	1 (2.9%)
	1	Hardly	0	0	0	0	0
	2	Not much	2 (5.7%)	2 (5.7%)	2 (5.7%)	0	0
	3	Somewhat	0	0	0	2 (5.7%)	1 (2.9%)
	Total		2 (5.7%)	2 (5.7%)	3 (8.6%)	3 (8.6%)	2 (5.7%)
Positive score	4	Sufficient	3 (8.6%)	7 (20.0%)	4 (11.4%)	6 (17.1%)	8 (22.9%)
	5	A lot	14 (40.0%)	8 (22.9%)	10 (28.6%)	15 (42.9%)	10 (28.6%)
	6	Absolutely	16 (45.7%)	18 (51.4%)	18 (51.4%)	11 (31.4%)	15 (42.9%)
	Total		33 (94.3%)	33 (94.3%)	32 (91.4%)	32 (91.4%)	33 (94.3%)

and bridge the age gap. Thus, it is necessary to overcome the digital divide and also that of investment in ageing.

Regarding the study of each module, social care scored the highest (93.1%), while the cognitive module obtained a positive score of 66.9%. These results are proof of the usefulness of social participation and relationships [48], which is the main objective of ehcoBUTLER: counter social isolation in people with MCI; and is how potential users also seem to see it. Nevertheless, a clinical trial on GRADIOR (stimulation, training and cognitive rehabilitation programme, which ehcoBUTLER is associated with) has been scheduled to compare the value of psychostimulation through social participation against direct cognitive stimulation and against the association of both.

Conversely, the above result could have been influenced by the fact that most of the sample were women, who have stronger inclinations towards social integration than men [49]. Likewise, women have been found to be more resilient to age-related cognitive impairment [50].

Finally, it is important to consider this study's limitations. First, samples of each stakeholder were unequal in each country, so it was no possible to compare the results per countries. However, samples were free from selection biases and representative of the population for whom the platform was intended, as well as naturalistic of every project partner according to their business models. The high percentage of positive opinions on ehcoBUTLER substantiate that sample increases would have no impact on the rating obtained.

Another limitation is that there have been missing values for certain variables, especially in the questions related to ehcoBUTLER's commercial potential. Nevertheless, even these questions were answered by more than half of the respondents.

Conclusions

The purpose of this study was to assess the acceptability of ehcoBUTLER. The conclusion drawn is that it is an ergonomic, interesting and useful tool for all the participating users. The social module was considered to be the most useful by older adults, a result that could suggest that clinical tools could improve their acceptability by offering further social functionalities and improving elderly's access to information and social communication skills.

Another important aspect yielded by the study is evidence of an investment gap in products designed for older people with MCI. Care and services for this population requires investment in healthcare tools that may improve autonomy in the use of technologies, so it should be designed according to the capacities of this users and aimed at improving their quality of life at different levels.

Compliance with Ethical Standards

Conflict of Interest   None.

Appendix

Table 14 Categories for each module assessed by end users

	Not at all 0	Hardly 1	Not much 2	Somewhat 3	Sufficient 4	A lot 5	Absolutely 6
Interesting							
Useful							
Necessary							
Meets target population's needs							
Improves care of elderly people in this aspect							

Table 15   Stakeholders' sociodemographic characteristics

Stakeholders	Country	n (Sex)	Age (S.D.)	Education	Income
End users	15 Spain 4 Netherlands 2 Italy 2 France 4 Israel 5 Serbia 3 Slovenia	35(21 W, 14 M)	76.3 $\pm$ 8.3	3 P/S 14 PU/VT 18 UD	3 < 10,000€ 11 10,000 – 20,000€ 9 20,000 – 30,000€ 7 30,000 – 40,000€ 5 > 40,000€
Informal caregivers	24 Spain 5 Greece 7 Netherlands 5 Italy 11 France 3 Israel 9 Serbia 16 Slovenia	80 (45 W, 35 M)	46.8 $\pm$ 13.1	1 P/S 18 PU/VT 61 UD	12 < 10,000€ 20 10,000 – 20,000€ 19 20,000 – 30,000€ 10 30,000 – 40,000€ 19 > 40,000€
Formal caregivers	77 Spain 29 Greece 4 Netherlands 26 Italy 2 France 5 Israel 5 Serbia 1 Slovenia	149 (89 W, 60 M)	43.3 $\pm$ 12.1	1 P/S 7 PU/VT 141 UD	14 < 10,000 46 10,000 – 20,000€ 29 20,000 – 30,000€ 23 30,000 – 40,000€ 37 > 40,000€
Administration/management staff	22 Spain 5 Greece 5 Netherlands 9 Italy 7 France 1 Serbia	49 (29 W, 20 M)	44.7 $\pm$ 11.0	1 P/S 0 PU/VT 48 UD	2 < 10,000€ 10 10,000 – 20,000€ 13 20,000 – 30,000€ 13 30,000 – 40,000€ 12 > 40,000€

Note: **n** = Sample; **W** = Women; **M** = Men; **P/S** = Primary/Secondary; **PU/VT** = Pre-university Education/Vocational training; **UD** = University degree; **S.D.** = Standard deviation

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