Reflections on the usability and user experience of 'CARIMO'

The views of care workers, volunteers and informal carers of home care service users

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To cite this paper:

Blüher, Marlene; Trukeschitz, Birgit (2018): Reflections on the usability and user experience of 'CARIMO': the views of care workers, volunteers and informal carers of home care service users, Discussion Paper No. 4/2018 of the AAL-project CareInMovement (CiM) and Discussion Paper No. 7/2018 of the Research Institute for Economics of Aging, Vienna University of Economics and Business (WU), Vienna.

1 Introduction

1.1 Background

The provision of long-term care in non-institutional settings, i.e. in the homes of older, frail adults, requires the combined effort of professional care providers and the personal environment of the care-dependent person (Büscher et al. 2011). A central goal of long-term care is to maintain care-dependent people's quality of life. To achieve this goal, the joint effort of all people involved in caring (care workers, informal carers, etc.) is necessary.

In recent years, various assistive technologies and mobile apps have been developed and presented as **collaborative solutions** for current challenges in the **care sector**. International examples are the British app "Jointly"[1], which is associated with the NHS (National Health Service), or the private start-up 'Konnektis'[2]. In Austria, 'youtoo'[3], a web-based app for family carers, aims to facilitate coordination of help after a relative's hospital release.

To improve older people's living conditions and to cope with demographically induced rising demand of care, it is essential to develop support and devices that help to **maintain or even improve the physical and mental fitness** of care recipients and contribute to a better quality of life despite limitations. **Digital solutions**, such as videos and exercise plans, and importantly, wearable fitness trackers and mobile fitness apps, are widespread tools used to increase physical activity and support exercise on a regular basis for the general population. Ultimately, their goal is to enhance physical fitness and promote a healthy lifestyle. With the right design, taking into account the specific needs of the target group, such devices and apps may also be beneficial to older adults (van het Reve et al. 2014).

The European AAL project 'CareInMovement – Empowering communities to care by combining smart technology and personal help to maintain mobility (CiM)' set out to develop a tablet-based app for older recipients of long-term care services and their care network. The app, **'CARIMO'**, developed by the CiM-consortium, aimed to **improve the physical fitness** of the older service users and to **facilitate the involvement and communication of the different members of the care network**. CARIMO had been tested in the provinces of Salzburg (Austria) and Lombardy (Italy) for 8 months by 84 care recipients and 39 informal carers. Home care service users and their relatives were supported by 46 care workers, so-called 'CiM-Assistants', and 11 volunteers. Volunteers were involved to support informal carers and to facilitate the acceptance of CARIMO by home care users. Within the project and the CARIMO app, the informal carers, social care workers and volunteers were referred to as the 'CARIMO-Team'.

For home care service users, CARIMO consisted of a tablet and a fitness tracker in the form of a bracelet (for details on the system see also Schneider and Rieser (2018)). Both the tablet and the fitness tracker utilized in the project are commercially available products, which were prepared and customized for use by the trial participants. The app was distributed to the CARIMO users pre-installed as a launcher on the tablet, so CARIMO was the home screen on

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[1] https://www.jointlyapp.com/ (last accessed 2018-09-10)
[2] https://www.konnektis.com/ (last accessed 2018-09-10)
[3] https://ooe.orf.at/news/stories/2900748/ (last accessed 2018-09-10)

this device. The fitness tracker came with a customized CARIMO surface. For more information, see Trukeschitz and Blüher (2018).

CARIMO offered home care service users different features addressing **'body and mind'**. The core feature was a 10-minute daily alternating exercise program for older adults with specifically selected exercise videos, performed by older actors. With the fitness bracelet, test users were able to track their daily steps and, optionally, their walking route via GPS. Activities, such as walking or cycling, were recorded automatically, but users could also use the tablet to manually enter any physical activities during their day. To see whether daily goals were achieved, CARIMO also provided an activity overview showing completed exercises, steps, and other physical activities. CARIMO aimed to motivate users to increase their physical activity by rewarding them with motivational feedback at the end of the exercise program, virtual trophies according to their daily and weekly achievements, and weekly tips with ideas for outdoor activities and suggestions on how to incorporate physical activity into their daily routines. In addition, CARIMO's features also address entertainment and joy by offering a selection of games, regional newspapers, and access to the internet. A CARIMO system tutorial was provided with instructions and explanations of the different features of the CARIMO app (see Trukeschitz and Blüher 2018).

To **facilitate collaboration between members of the care network**, i.e. care workers, informal carers and volunteers, specific CARIMO features also run on a web portal. The CARIMO web portal was available via web browser on any device. The CARIMO-Team received personal login accounts for the CARIMO web application and for the CARIMO tablet. Through the web portal and on the tablet, they could enter appointments for future visits with the service users, or use the activities and notes feature. This feature allowed them to document any support activities they did in the home of the service users, to write notes for other members of the CARIMO-Team or the service users and to read activities and notes written by others. CiM-Assistants, informal carers and volunteers were also provided with a system tutorial, as well as a selection of courses regarding care/related issues[4] via the web portal as well as the CARIMO tablet. The courses were only available for 4 months, the final half of the CARIMO trial phase.

The CARIMO-Team received different instructions about using CARIMO and teaching it to the home care service users in Austria and in Italy. In Austria, the preparation and training materials were more extensive: after being instructed about CARIMO, how to use it and how to support the CARIMO service users, the CiM-Assistants spent the first 6 weeks of the CARIMO test period training the service users in the use of CARIMO (following a step-by-step training protocol provided by SRFG). In Austria, but not in Italy, informal carers and volunteers also received a short introduction to CARIMO, and a support hotline was set up for participants in both countries.

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[4] The courses available to the CARIMO-Team were:
- Care guidelines for support during everyday activities,
- First aid in the context of care,
- Volunteering at the social care organizations,
- How to help older adults be mobile, and
- Tips and tricks in using CARIMO.

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1.2 Aims of this discussion paper

In this working paper, we evaluate the usability and user experience of CARIMO, a fitness and entertainment app for older users of home care services and their care team, from the perspectives of their formal and informal carers. We intend to determine whether CARIMO is a suitable technology for this target group, whether it can be adequately introduced to them within the home care context, and whether it would be supported by the members of the care network. Thus, with an emphasis of the analysis on usability and user experience, we focus on three research questions:

1. How did the members of the CARIMO care network perceive the usability and user experience of CARIMO for their older clients or relatives?

2. How did CiM-Assistants and informal carers support older people using CARIMO, and how did the carers perceive this effort?

3. How did the members of the CARIMO care network perceive the user experience and usability of CARIMO as a tool for coordination and organization of care work?

Subsequently, we investigate how the CARIMO-Team, i.e. CiM-Assistants, informal carers and volunteers, perceived the CARIMO app, and whether their perceptions differed according to their roles in the project.

This discussion paper is structured as follows: in Chapter 2, we address the methodology and sample characteristics on the evaluation is based. In Chapter 3, we show how the CARIMO-Team assessed CARIMO as a fitness and entertainment app for older, care-dependent adults, including the efforts required from the users to learn how to use CARIMO as well as from the CARIMO-Team supporting users. Chapter 4 focuses on how the CARIMO-Team perceived the CARIMO web portal for carers, and Chapter 5 follows up with how they used CARIMO, the tablet or the web portal, to exchange information with other members of the CARIMO-Team or the CARIMO service users. In Chapter 6, we discuss our findings and their implications for further research and development of digital support tools for care networks. In the discussion section of this working paper, we included the results from our analysis of the usability and user experience assessment of older people using CARIMO (see Trukeschitz and Blüher 2018).

2 Methods

In this chapter, we outline our approach to the evaluation of the usability and user experience of CARIMO from the perspectives of the different members of the CARIMO-Team. First, we address the concepts and measures at the basis of our evaluation (Section 2.1). Then we provide an explanation of our approach to data collection and analysis (Section 2.2), and a description of the sample of respondents who participated in the surveys for CiM-Assistants, informal carers and volunteers (Section 2.3).

2.1 Concepts

The purpose of our evaluation was to find out whether CARIMO is a suitable system for care-dependent older adults and their care networks. In addition to the usability and user experience of CARIMO for home care service users (see Trukeschitz and Blüher (2018)), we were

interested in the perspectives of CiM-Assistants, informal carers and volunteers for two reasons. On the one hand, CiM-Assistants (care workers) and to some extent also volunteers are involved in the lives of the home care service users – thus, they were qualified to assess CARIMO from a "stakeholder perspective". This perspective could contribute to a more comprehensive understanding of CARIMO's usability and user experience for older people. On the other hand, CARIMO also offered communication and coordination tools to use for their own care work, which we also sought to evaluate.

In the following, we will present our working definitions of the concepts "usability" and "user experience", and then briefly touch upon our conceptualization of usability and user experience of CARIMO for home care service users. Furthermore, we will address how we conceptualized the carers' effort to support service users with CARIMO and, finally, explain our approach to assessing the usability and user experience of the CARIMO web portal for carers.

Defining usability and user experience

"Usability" and "user experience" are concepts used to describe the user perspective of technological products and digital apps. They can be applied to the design, as well as the evaluation, of a broad range of products (devices, software, apps), in a wide range of contexts (e.g. work, leisure time, health management).

Usability and user experience each focus on slightly different aspects of user perception:

Established definitions of *usability* typically concern the pragmatic side of using a product. ISO 9241 (2010) provides a widely used conceptualization of usability, describing it as the "extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use."

In contrast, *user experience* goes beyond the instrumental aspect that is emphasized by usability. It takes a more holistic approach and focuses on the user's emotive and experiential perception and responses related to the usage of a product. User experience considers the context of usage to be an important element of the experience of use. Proponents of the user experience concept emphasize the capacity of a product to be stimulating, i.e. engaging the user in learning new things or developing new habits, or help the user express a part of their identity (Hassenzahl, Burmester, and Koller 2003, Hassenzahl and Tractinsky 2006).

For the evaluation of CARIMO, the concepts of usability and user experience were adapted to reflect the specific needs, requirements, and goals of the target groups (the service users as well as the care team) and to address the specific characteristics of CARIMO. This was necessary, as the existing measures of usability and user experience for software and digital apps do not fit the study parameters in several ways:

- Existing measures are often too generic (so they can be used for assessing a variety of products in different contexts);
- They assume digital skills and experience (as well as the ability to use the correct terminology);
- It is sometimes unclear whether they expect the individual user's personal perspective or a general assessment.

Thus, those measures could not be applied in their original form. For our tailored approach to illuminating the perspectives of the care network, we reviewed and adapted existing measures of usability and combined them with our own questions. In the following sections, we explain

how we adapted selected measures for our CARIMO usability and user experience questionnaires.

Usability and user experience of CARIMO for the home care service users

Evaluating the usability of CARIMO for home care service users, we focused on CARIMO's accessibility to people with limited digital skills and physical or cognitive limitations, learnability or the effort to learn using CARIMO, perceived ease of use, and whether it was perceived as helping them increase their level of exercise and physical activity. User experience was assessed by addressing enjoyment, attractiveness, comfort, and appreciation of different CARIMO features. For a more detailed explanation of our conceptual approach to the evaluation of the usability and user experience of CARIMO from the perspective of home care service users, see Trukeschitz and Blüher (2018).

As part of our evaluation, we aimed to relate the assessment of the CARIMO-Team to the results from the usability evaluation of the service user perspective. For this, we replicated some of the service users' questions about the general attractiveness and learnability of CARIMO and applied them to the perspective of the CARIMO-Team (e.g. for the service users: "I find CARIMO…" would be adapted for the CiM-Assistants: "I find CARIMO for the majority of my clients…" or for informal carers: "I find CARIMO for my relative…").

Table 1 illustrates the questions we adapted from the AttrakDiff by Hassenzahl, Burmester, and Koller (2003) for the usability surveys to determine the attractiveness of CARIMO for all user groups. As with the service user questionnaire, the number of response options for the CARIMO-Team was reduced to indicate only a positive (e.g. "…rather entertaining") or a negative response (e.g. "…rather boring"), or "don't know", if the respondent could not/did not want to decide.

Table 1: Selected items from the AttrakDiff questionnaire

	-3	-2	-1	0	1	2	3	
lahm → boring	☐	☐	☐	☐	☐	☐	☐	*fesselnd* → entertaining
kompliziert → complicated	☐	☐	☐	☐	☐	☐	☐	*einfach* → easy

Source: Hassenzahl, Burmester, and Koller (2003), own table and own translation

Table 2 shows the questions from the ISO 9241-based questionnaire by Prümper and Anft (1993), which influenced the design of our questions regarding the learnability of CARIMO. Whereas the questions only offered had the response options "Yes", "No", or "Don't know" for the CARIMO service users, we opted for a 4-point response scale indicating different levels of agreement with the CARIMO-Team.

Table 2: Example of the ISO-9241-based usability questionnaire

The software…	---	--	-	-/+	+	++	+++	The software…
requires a lot of time to learn	☐	☐	☐	☐	☐	☐	☐	requires little time to learn
requires the memorization of many details	☐	☐	☐	☐	☐	☐	☐	does not require the memorization of many details

Source: Prümper and Anft (1993), own table and own translation

Another measure, which was not referred to in the questionnaire for the service users, but which we considered a useful addition to the carer questionnaires, was a content-specific rating scale for mobile health apps. Stoyanov et al. (2015) developed the Mobile App Rating Scale (MARS) for the classification and quality assessment of mobile health apps. MARS also incorporated common aspects of usability and user experience, such as entertainment, interest, ease of use, and design. In addition to the regular items on the rating scale, the MARS questionnaire can be extended to include additional items about "*the perceived impact of the app on knowledge, attitudes, intentions to change as well as the likelihood of actual change in the target health behavior.*" (Stoyanov et al. 2015, Appendix). As CARIMO aims to address several of these issues with the ultimate goal of helping users increase their level of exercise and physical activity, we adapted and included two items from this instrument (see Table 3).

Table 3: Selected items from the MARS questionnaire

Awareness: This app is likely to increase awareness of the importance of addressing [insert target health behavior]				
Strongly disagree				Strongly agree
1	2	3	4	5
Intention to change: This app is likely to increase intentions/motivation to address [insert target health behavior]				
Strongly disagree				Strongly agree
1	2	3	4	5

Source: Adapted from Stoyanov et al. (2015)

Usability and user experience of the CARIMO web portal

Selected items of the AttrakDiff questionnaire by Hassenzahl, Burmester, and Koller (2003), which were already used for the evaluation of the service user perspectives in an adapted form, were also used to capture the attractiveness of the CARIMO web portal for the members of the CARIMO-Team (see Table 4).

Table 4: Selection of questions from AttrakDiff applied to evaluate user experience of the CARIMO web portal for the CARIMO-Team

				-			+					
Original	**CiM survey**	**translation**	3	2	1	0	1	2	3	**translation**	**CiM-survey**	**Original**
kompliziert	*kompliziert*	complicated	□	□	□	□	□	□	□	simple to use	*einfach zu nutzen*	*einfach*
unpraktisch	*unpraktisch*	unpractical	□	□	□	□	□	□	□	practical	*praktisch*	*praktisch*
verwirrend	*verwirrend*	confusing	□	□	□	□	□	□	□	clear	*übersichtlich*	*übersichtlich*
hässlich	*optisch nicht ansprechend*	not aesthetically appealing	□	□	□	□	□	□	□	aesthetically appealing	*optisch an-sprechend*	*schön*
umständlich	*umständlich*	awkward	□	□	□	□	□	□	□	comfortable	*komfortabel*	*direkt*
-	*nicht sinnvoll*	not useful	□	□	□	□	□	□	□	useful	*sinnvoll*	-

Source: Adapted from Hassenzahl, Burmester and Koller (2003 own translation into English

2.2 Data collection and analysis

In this section, we outline our methodology in terms of data collection and analysis. The study design of the CARIMO trial was approved by the ethics committee of the University of Salzburg (EK-GZ 30/2016).

To gather the perceptions of the different roles within the CARIMO-Teams, we used online questionnaires. In Section 2.2.1, we describe our reasoning for this approach, as well as the steps we took to ensure a positive experience for the respondents while answering the surveys, and thus satisfactory response rates for our evaluation. Section 2.2.2 presents our assessment of this approach based on the respective response rates of each group, followed by a description of our analytical methods in Section 2.2.4.

2.2.1 Online surveys for gathering perceptions of the CARIMO-Team

The usability surveys for the members of the CARIMO care team were administered digitally via the online survey tool LimeSurvey[5]. We decided to collect the data using online surveys to take advantage of the benefits of digital questionnaires as opposed to the pen-and-paper format (Greenlaw and Brown-Welty 2009). Particularly, the reduction of human error during all stages of data collection – when filling out the questionnaire (missing or invalid answers, overlooked pages), during data collection and data entry – seemed attractive. Online surveys are also known as cost-efficient in terms of delivery, collection and data entry.

Similarly to the online survey for older adults (see Trukeschitz and Blüher 2018), we adapted the survey tool according to the needs and requirements of the CARIMO-Team. The link to the survey was integrated into the CARIMO web app as well as the tablet version. This way, CiM-Assistants, informal carers and volunteers received the survey link on both platforms and could complete it wherever they found it more convenient. The availability of the survey on multiple CARIMO platforms meant that respondents would access it from different devices (i.e. smartphones, tablets, or personal computers), which had implications for the layout and graphic design of the survey.

A pop-up window with a reminder to participate in the usability survey appeared every time CiM-Assistants, informal carers, and volunteers logged on to CARIMO. They were able to access the usability survey after logging in to their account on the CARIMO tablet, or when using the CARIMO web app. The web app could be accessed from any device with a web browser, but was tailored for use on a smart phone.

The following considerations were used to guide the layout of the online surveys for the CARIMO-Team:

- ✓ Anticipating that especially CiM-Assistants would answer the survey from their company-issued smartphones, the survey layout was tailored to the smallest possible device, i.e. the common smartphone brand of Hilfswerk's care workers;
- ✓ Additionally, the survey only showed one question per page to maximize the space for each question and simultaneously minimize the need for scrolling;
- ✓ Images to illustrate the content were used sparingly;

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[5] www.limesurvey.org

✓ It was possible that CiM-Assistants, volunteers and informal carers did not use CARIMO daily, and some could not be reached directly to be reminded of the online survey. Thus, the care team received reminders to complete the survey after each every login to CARIMO.
✓ To allow for comparison with the CARIMO user responses, we phrased some of the questions and response options to align with the CARIMO service user survey.

2.2.2 Assessment of the online surveys for data collection

We assessed the implementation of the online surveys for the CARIMO-Team by looking at response times and response rates, as well as which devices they used to complete the surveys.

Response times and response rates

The questionnaires for each group within the CARIMO-Team were delivered after the initial CARIMO training period where CiM-Assistants trained the test users on how to use CARIMO. However, the surveys were activated on different dates for the three target groups (see Table 5, Table 6, and Table 7). Response rates were calculated according to the respective numbers of participants in each group of the CARIMO-Team.

For **CiM-Assistants** in Austria and in Italy, the surveys were activated mid-August 2017, with the last responses recorded at the beginning of October 2017. Despite an extended time period to account for absences due to the summer holidays, the care organizations were ultimately not able to mobilize all their employees who participated in CiM to complete the usability survey.

In total, 37 (86%) CiM-Assistants responded to the survey. Repeated reminders by care managers were needed to reach 81.5% in Austria, and 93.8% in Italy (see Table 5). In total, 9 CiM-Assistants did not complete the questionnaire. Thereof, three had been taking care of users who dropped out of the project before the survey was activated, and one CiM-Assistant had quit working at the care organization. Five (10.9%) CiM-Assistants did not participate without giving any reasons for the nonresponse. As online surveys worked well for older people using CARIMO (see Trukeschitz and Blüher 2018), we did not assume that the data collection process for employees of the care organizations would have emerged as such time consuming.

Table 5: Survey timelines for CiM-Assistants

	Response rate	Date activated	First response	Last response
Austria	22 (81.5%)	Aug 16th 2017	Aug 16th 2017	Oct 5th 2017
Italy	15 (93.8%)	Aug 16th 2017	Aug 24th 2017	Oct 3rd 2017
Total	37 (86%)			

Source: WU, CiM usability survey (CiM-A) 2017

In total, 20 (51.3%) **informal carers** who participated in the CiM-project completed the usability survey. The majority of respondents was from Austria. The survey for informal carers was activated mid-August 2017, with the last response recorded at the end of October 2017 (see Table 6). Except for the CARIMO system reminders prompted each time a user logged in, there was no other way to mobilize informal carers to complete the usability survey. The response rates for informal carers were comparatively low, which may be an indicator that they

were not as well integrated into the project as planned or that they did not perceive much benefit from participating in the project.

Table 6: Survey timelines for informal carers

	Response rate	Date activated	First response	Last response
Austria	19 (59.4%) *	Aug 16th 2017	Aug 16th 2017	Oct 28th 2017
Italy	1 (14.3%)	Sep 22nd 2017	Sep 27nd 2017	Sep 27nd 2017
Total	20 (51.3%)			
* One person who had a CARIMO informal carer account but was not registered formally (paper questionnaire) as a CiM informal carer was excluded from the analysis				

Source: WU, CiM usability survey (IC1) 2017

A particular challenge of the CiM project was the case of double roles of some participants. Some CiM-Assistants and CiM-Mentors (i.e. supervisors of CiM-Assistants) also participated as informal carers of CARIMO test users. Such double roles resulted from the difficulties care organizations faced in recruiting enough informal carers to participate in the trial phase. The multiple roles had implications for the evaluation of the project, e.g. one respondent answered both the survey for the CiM-Assistants as well as the survey for the informal carers. We left the responses in the data as this person seemingly was able to take different perspectives.

Volunteers became involved in the CiM-project as a later stage due to the difficulties care organizations faced recruiting this group. The survey for volunteers started at the end of September 2017 and finished mid-October 2017 (see Table 7). It was completed by all 11 active volunteers in Austria (at the time, no volunteers were active in the project in Italy).

Table 7: Survey timelines for volunteers

	Response rate	Date activated	First response	Last response
Austria	11	Sep 28th 2017	Sep 28th 2017	Oct 19th 2017

Source: WU, CiM-usability survey (VOL) 2017

Devices used for completing the online survey

The online survey was designed for optimal display on a smartphone; however, considering that the survey was accessible via web browser in addition to the CARIMO tablet meant it was possible for respondents to choose other devices to complete the questionnaire. The majority of the respondents used the CARIMO tablet in the homes of their clients or relatives to fill out the questionnaire. As expected, a fifth of CiM-Assistants also used their company-issued smartphones or private smartphones. Except for two respondents, all informal carers used the CARIMO tablet (see Figure 1).

Figure 1: Devices used for filling out usability survey
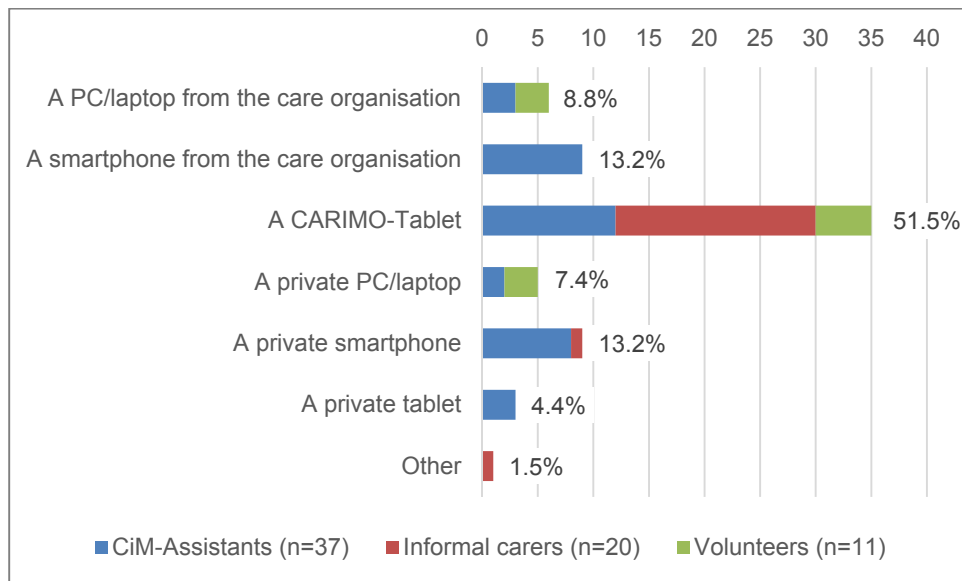
Source: WU, CiM usability surveys (CiM-A, IC, VOL) 2017

2.2.3 Data sets

The datasets from the individual questionnaires (CiM-Assistants in Austria and Italy, informal carers in Austria and Italy, volunteers in Austria) were exported from LimeSurvey and merged for further analysis using the statistical software STATA.

Data on the usability and user experience of CARIMO for CiM-Assistants is indicated by 'WU, CiM usability surveys (CiM-A) 2017', for informal carers 'WU, CiM usability surveys (IC1) 2017' and for volunteers 'WU, CiM usability surveys (VOL) 2017'. The data comprising all three perspectives on usability and user experience of CARIMO was labelled 'WU, CiM usability surveys (CiM-A, IC, VOL) 2017'.

2.2.4 Analysis

To gain an overview of how the CARIMO-Team perceived the usability and user experience of CARIMO, we first examined descriptive statistics (frequency tables, mean comparisons). Then, to determine any possible significant differences between the assessments of CiM-Assistants, informal carers and volunteers, we employed Chi² tests for categorical variables, Kruskal-Wallis-test, Mann-Whitney U test and Wilcoxon-signed-rank-test for ordinal variables.

We adjusted for multiple comparisons using the Benjamini-Hochberg method (Benjamini and Hochberg 1995).

The comments in the open text field questions, regarding positive and negative feedback from service users about CARIMO, were translated, paraphrased, and coded. Codes were arranged in different themes to form thematic maps. The frequency with which respondents addressed the different themes in the comments was examined to illustrate their prevalence in general.

2.3 Sample characteristics

2.3.1 Sample size

The CiM-project set off to include a total of 18 CiM-Assistants, 120 informal carers, and 80 volunteers. At the time of the usability survey, 42 CiM-Assistants were still participating in the project (4 had dropped out before the survey went online), thereof 37 (88.1%) completed the survey. 32 informal carers were part of the project. Thereof, 20 (51.3%) responded to the usability survey. 11 volunteers contributed to the project, all of whom responded to the survey.

Figure 2 gives an overview of the CARIMO-Team members who responded to the online survey, by country. Of 68 respondents to the CiM usability surveys for carers, 52 (76.5%) were from Austria, and 16 (23.5%) from Italy. 37 (54.4%) were CiM-Assistants, 20 (29.4%) were informal carers, and 11 (16.2%) were volunteers. In Italy, only one informal carer and, due to no Italian volunteers in the project at the time of the survey, no volunteers participated in the usability survey.

Figure 2: Distribution of respondents according to their role in CiM, Austria and Italy
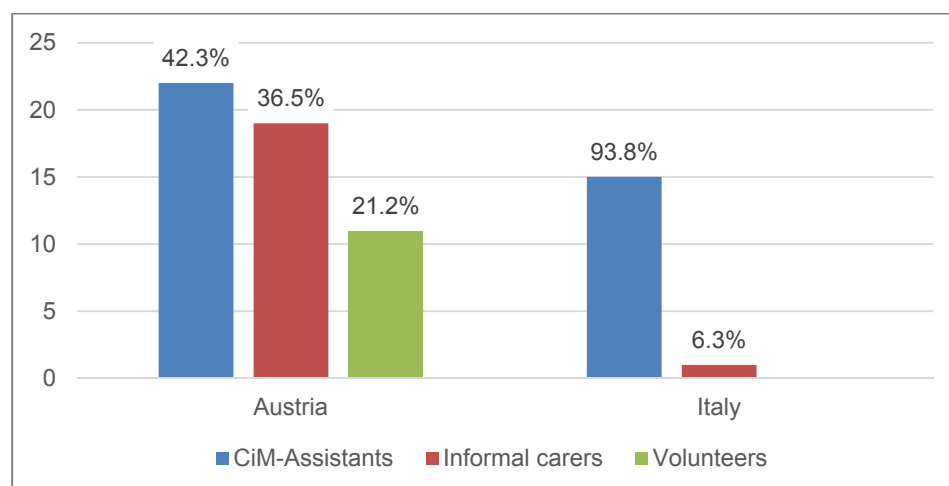
Source: WU, CiM usability surveys (CiM-A, IC, VOL) 2017

2.3.2 Characteristics of informal carers

The 20 informal carers were between 35 and 77 years old, with a mean age of 56.1 years. The majority of the respondents were women (85%) (see Table 8).

Table 8: Age and gender of informal carers in Austria and Italy

		Total	Austria	Italy
	n	20	19	1
Age	min – max	35 – 77	35 – 77	54
	mean	56.2	56.3	54
	median	54	54	54
	Women (%)	17 (85%)	16 (84.2%)	1 (100%)
	Men (%)	3 (15%)	3 (15.8%)	0

Source: WU effectiveness survey (IC) 2017

Table 9 shows the relationship between informal carers and CARIMO test users. More than half of the respondents supported their parents, mostly the mothers, followed by one third who supported their partner and one person taking care of their grandmother.

Table 9: Relationship to CARIMO users: Informal carer supported his/her…

	Total	%	Austria	%	Italy	%
n	20		19		1	
Mother	11	55%	10	52.6%	1	100%
Father	1	5%	1	5.3%		
Partner (female)	3	15%	3	15.8%		
Partner (male)	4	20%	4	21.1%		
Grandmother	1	5%	1	5.3%		

Source: WU effectiveness survey (IC) 2017

2.3.3 Characteristics of CiM-Assistants (employees of Hilfswerk and Aldia)

Except for one male participant, all CiM-Assistants who responded to the usability survey were women (see Table 10), which is also reflective of the gender relations in the professional care sector in general.

Table 10: Gender of CiM-Assistants

	Total	Austria	Italy
Women (%)	36 (97.3%)	22 (100%)	14 (93.3%)
Men (%)	1 (2.7%)		1 (6.7%)

Source: WU, CiM-usability survey (CiM-A) 2017

The CiM-project proposal stipulated the inclusion of 18 CiM-Assistants who were responsible for the 120 CARIMO clients, i.e. an average of 6-7 clients per CiM-Assistant. Altogether, the 36 CiM-Assistants who responded to the usability survey were responsible for 94 CARIMO clients. Two thirds of the CiM-Assistants were responsible for only one or two CARIMO clients, the rest worked with three or more CARIMO clients. One CiM-Assistant was responsible for 13 CARIMO clients, the others who worked with more than 2 clients were responsible for 3 to 7 clients (see Table 11).

Table 11: Number of CARIMO users supported by CiM-Assistants

	Total	Austria	Italy
Number of clients	94	60	34
min - max	1 – 13	1 – 13	1 – 6
mean (rounded)	2.5	2.7	2.3
median	2	2	2

Source: Hilfswerk Salzburg and ALDIA

2.3.4 Volunteers of Hilfswerk

At the time of the survey, CiM-Volunteers were only active in Austria. All 11 volunteers completed the usability survey. According to the CiM-project proposal, the aim was to recruit 80 volunteers, 40 in each country. The 11 Austrian volunteers were between 20 and 76 years old, on average 46.9 years old. Half of the respondents were 54 years old or older. Almost three quarters of the volunteers were women (see Table 12).

Table 12: Age and gender of CiM-Volunteers (Austria)

		Austria
	n	11
Age	min – max	20 – 76
	mean	46.9
	median	54
Gender	Women (%)	8 (72.7%)
	Men (%)	3 (27.3%)

Source: WU, CiM-usability survey (VOL) 2017

Three volunteers were completing their civil service term with the Austrian social care organization. The [military and] civil service in Austria is only compulsory for men. Only two of the other 8 CiM volunteers had not been employed by Hilfswerk (4 respondents) or another social care organization (2 respondents) before. Two of the volunteers were also CARIMO service users at the same time. Of all volunteers, one person had previous volunteering experience. The 11 volunteers were assigned to 13 CARIMO users.

2.3.5 Tech-savviness of CiM-Assistants, informal carers and volunteers

The general attitudes of CiM-Assistants, informal carers and volunteers towards technology were expected to play a role in whether and how well they could be involved in the project as well as how they approach and think about CARIMO. Karrer et al. (2009) defined 'tech-savviness' (*'Technikaffinität'*) as a personality trait that comprises a person's positive attitudes, enthusiasm and trust in technology.

Based on the multi-item tool developed by Karrer et al. (2009), we assessed the tech-savviness of the CARIMO-Team members. The tool is supposed to capture a person's tech-savviness by collecting their agreement with personal statements about technology and technological devices. To get a better idea with what kind of attitudes the informal carers, care workers and volunteers might approach CARIMO, we narrowed the term 'technical devices' down to the devices on which CARIMO was actually based: computer, smartphones and tablets.

We limited our assessment of technological affinity to 4 items (the questionnaire by Karrer et al. (2009) contained 19 items). From there, we focused on whether the CARIMO-Team members were generally enthusiastic about computers, smartphones and tablets, and whether they felt competent in the use of such devices, dedicating two items each to 'enthusiasm' and 'competence'.

Enthusiasm was captured by (1) whether the respondents kept informed about and were interested in computers, tablets and smartphones regardless of whether they intended to buy

a new device or not, and (2) whether they generally enjoyed trying out computers, tablets and smartphones.

Competence was captured by whether the respondents thought they knew most functions of the devices they owned or used, and whether they in general found it easy for them to learn to use computers, tablets and smartphones.

Altogether, the CARIMO-Team was less inclined to keep informed about computers, smartphones and tablets in general. However, more than half of the respondents generally enjoyed using these items (see Figure 3). The majority also felt relatively competent in using computers, smartphones, and tablets, reporting that they knew most of the functions of the devices they used and that they found it relatively easy to learn to use them (see Figure 4).

Possibly, due to the small sample sizes, we found no significant differences between CiM-Assistants, volunteers, and informal carers in terms of their technological affinity. Also resulting from small sample sizes, we could not detect any significant differences between respondents in Austria and in Italy with regard to any of the aspects of tech-savviness. There was, however, a slight tendency among CiM-Assistants in Italy towards lower technical affinity than their colleagues in Austria.

Figure 3: Enthusiasm about computers, smartphones and tablets

Source: WU, CiM-usability surveys (CiM-A, IC, VOL) 2017

Figure 4: Perceived competence in terms of computers, smartphones and tablets
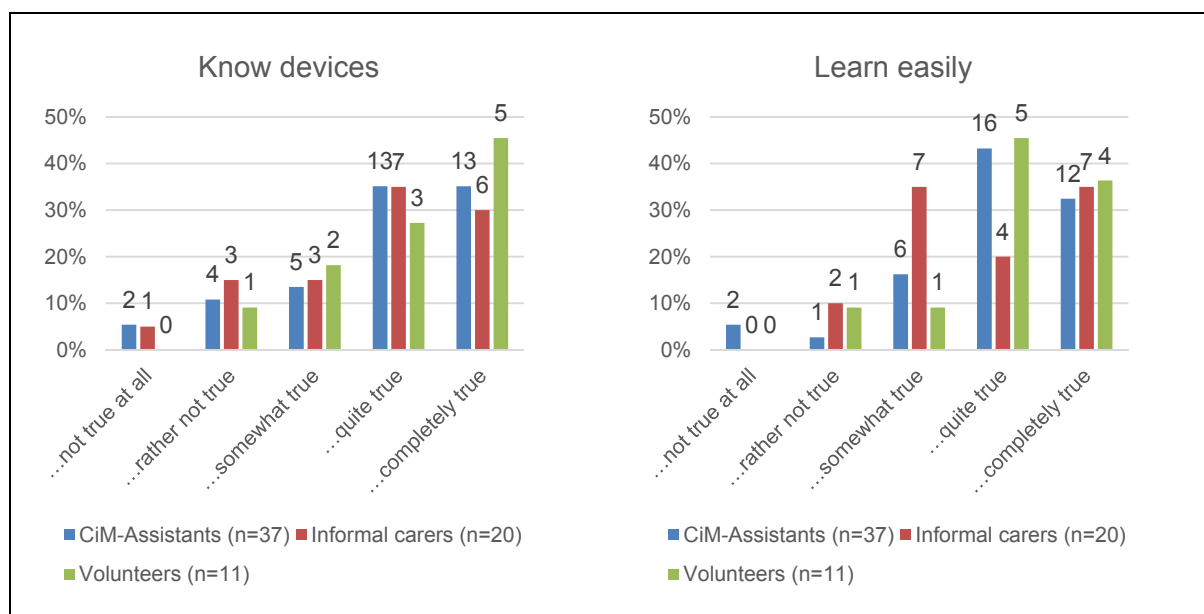
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017

3 CARIMO – the perspectives of CiM-Assistants, informal carers and volunteers

Introducing devices and a digital system that are new and likely unfamiliar to the target group calls for a dedicated training or introductory phase, as well as a continuous support system (Mitzner et al. 2008). In our evaluation of CARIMO as a fitness and entertainment app for older adults, we acknowledged the involvement of older test users' social environment in their adoption of new technology, and the importance of the perspective of these people. Therefore, the CiM-Consortium actively sought to involve the care network of the older adults participating in the project. In Austria, the CiM-Assistants, informal carers and volunteers received instructions and some training about CARIMO. They were encouraged (in the case of the CiM-Assistants, even expected) to use CARIMO together with the service users throughout the CiM project. In addition to the features targeted at older home care service users, CARIMO aimed to provide a platform for the care network to communicate with each other and the service users, and coordinate their tasks.

In this chapter, we present the results of our evaluation concerning the CARIMO-Team's perspectives and experiences with CARIMO for the older service users (how they evaluated the CARIMO features specifically for the care network will be addressed in Chapters 4 and 5). First, we address, from the perspectives of CiM-Assistants, informal carers and volunteers, whether CARIMO is a generally attractive and effective system for the older people they care for (see Section 3.1). Then, we detail how the CARIMO-Team perceived the effort for the service users to learn using CARIMO and where they saw difficulty and a need for assistance that went beyond the initial training phase (see Section 3.2). In the next section, we lay out how CiM-Assistants perceived the task of teaching CARIMO to the service users, and how informal carers supported their relatives with CARIMO (see Section 3.3). This chapter will be concluded with the discussion of the qualitative results from the comments, addressing positive

and negative feedback the CARIMO-Team heard from service users about CARIMO (see Section 3.4).

3.1 CARIMO for service users – the perspectives of the CARIMO-Team

The CARIMO-Team had several opportunities to watch home care service users using CARIMO. Most likely, this happened while teaching CARIMO to the CARIMO users or using CARIMO together. Accordingly, CiM-Assistants, informal carers and volunteers were able to observe the immediate reactions of the CARIMO test users to the system, whether they seemed particularly engaged and stimulated by CARIMO, in general or in terms of increasing their levels of exercise and physical activity. Thus, in particular, we were interested in whether the CARIMO-Team found CARIMO generally suitable and attractive, focusing on the app's capacity to generate interest and entertainment for the home care service users (see Section 3.1.1), what the CARIMO-Team considered to be particularly interesting for the service users (see Section 3.1.2), and whether CARIMO had any potential to motivate users to stay active (see Section 3.1.3).

3.1.1 General attractiveness

We asked the CiM-Assistants and the informal carers to assess the appeal and potential of CARIMO. As CiM-Assistants supported more than one CARIMO service user, we were interested in a more general assessment, taking into account the majority of their CARIMO clients. On the one hand, we aimed to find out if they rated CARIMO as a stimulating tool for their clients or relatives. On the other hand, we also asked them to make a more general assessment about whether they would also recommend CARIMO to other older people in similar circumstances.

Overall, 91.2% of all respondents found **CARIMO rather interesting**, and 82.5% found CARIMO **rather entertaining for the older CARIMO users**. In both cases, informal carers gave similar assessments to CiM-Assistants (see Figure 5 and Figure 6). The differences between the groups were not significant. CiM-Assistants in Italy rated CARIMO almost identically as their project colleagues in Austria.

Figure 5: CARIMO – rather uninteresting or interesting for service users
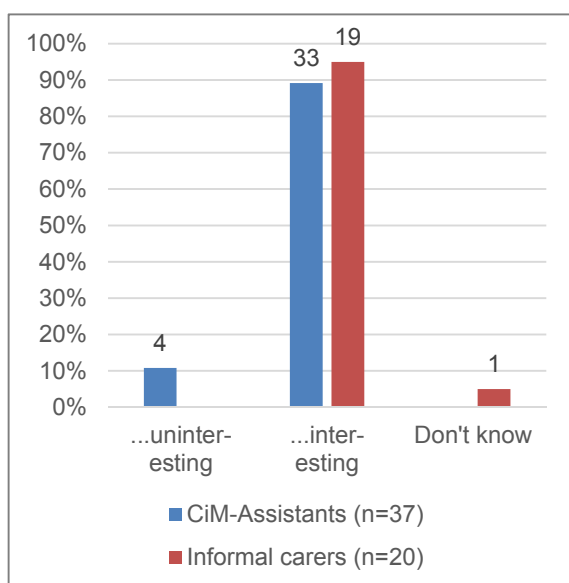
Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

Figure 6: CARIMO – rather boring or entertaining for service users
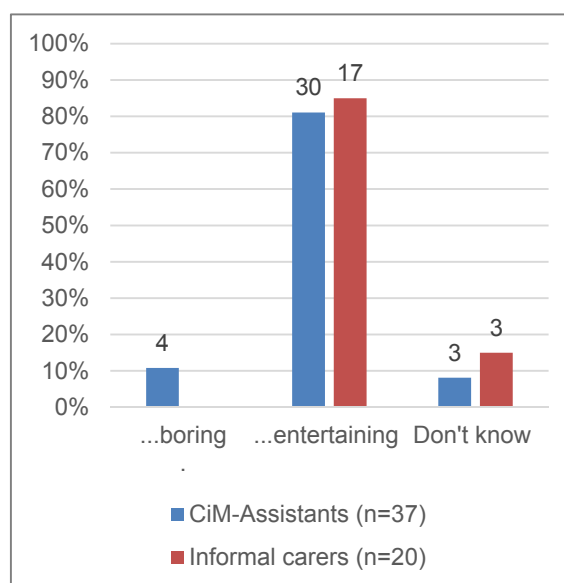
Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

The **net promoter score (NPS)** is originally used as a singular indicator to predict business performance. The concept is based on the influence of positive word-of-mouth for the success of a company or a product. The NPS asks customers to rate a business or a service on a scale from 0-10 for how likely they were to recommend it to others. Based on their assessment, respondents are classified as promotors (people who might convince their friends to also buy from this business), detractors (people who might keep others from buying), and passives (people who are likely to do neither). The net promoter score is calculated by subtracting the percentage of detractors from the share of promoters, and can range from -100 (only detractors) to +100 (only promoters) (Reichheld 2003).

The ratings of CiM-Assistants, informal carers, and volunteers across the net promoter scale are illustrated in

Figure 7. Specifically, the members of the CARIMO network were asked how likely they were to recommend CARIMO to other older adults and their relatives, indicating their position on a scale between lowest likelihood (0) and highest likelihood (10). Overall, roughly one third of the respondents could be classified as **CARIMO** promoters, passives, and detractors respectively, with slightly more **promoters (38%)** than passives (32%) and detractors (30%) (see Figure 8). Thus, the overall net promoter score of CARIMO among the CARIMO care team calculates as 8% (compared to 9.7% for older adults using CARIMO, see Trukeschitz and Blüher (2018)).

Figure 7: NPS ratings
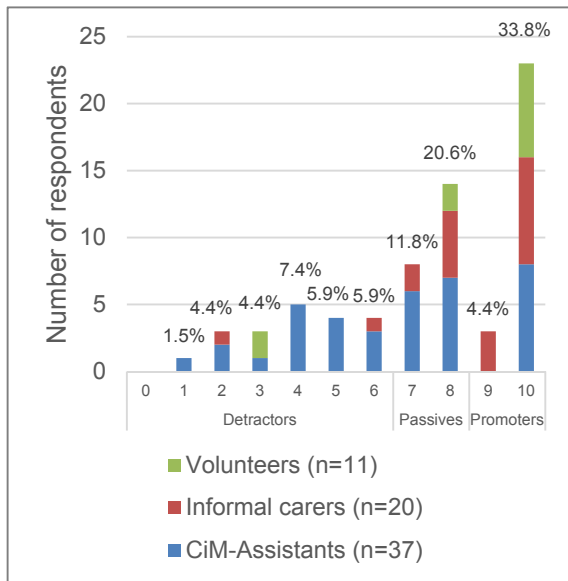
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

Figure 8: Distribution of care team members' net promoter score
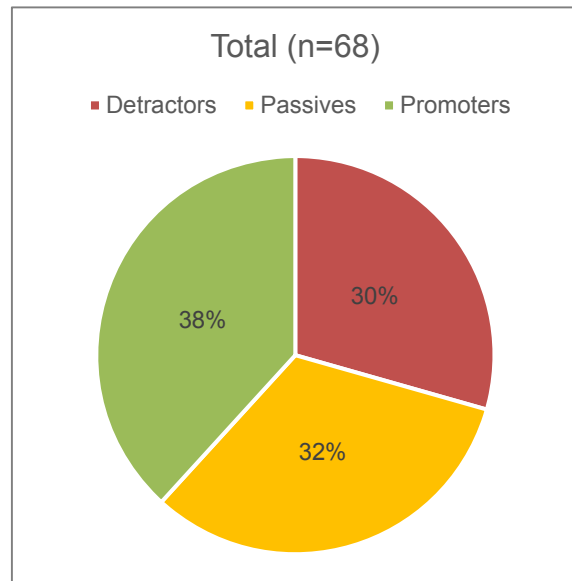
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

There was a significant difference in how CiM-Assistants, informal carers, and volunteers rated CARIMO on the net promoter scale (Kruskal-Wallis test p=0.014). Whereas more than **half (55%) of the informal carers**, and almost **two thirds (64%) of the volunteers** could be identified as **promoters of CARIMO**, only **22% of the CiM-Assistants** recommended CARIMO such that they could be classified as promoters. In fact, **most CiM-Assistants, 43%, were not at all, or not entirely convinced by CARIMO** (see Figure 9). In both countries, the detractors were the biggest group among CiM-Assistants, making up 53.3% in Italy and 36% in Austria (8 people each). Only 1 CiM-Assistant in Italy (6.7%) could be identified as a promoter of CARIMO, opposed to 7 (31.8%) in Austria.

Figure 9: Net promoter score distribution according to the different groups of the CARIMO network
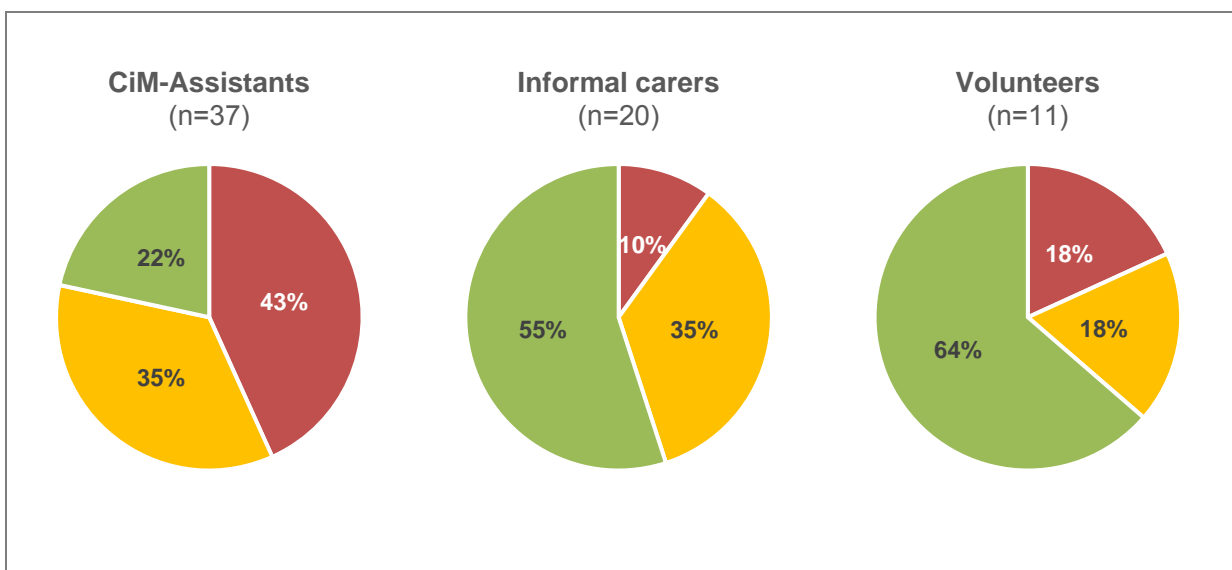
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

3.1.2 Favorite features

Given a list of the most prominent CARIMO features, the CiM-Assistants, informal carers and volunteers were asked which features of CARIMO they found especially interesting for their clients or relatives. The respondents were not restricted in how many features they could select. Overall, they chose between 1 and 10 features. CiM-Assistants picked at least 1 feature, volunteers at least 2 features, and informal carers at least 3 features. On average, the respondents in all groups selected around **4 different CARIMO features** they found particularly interesting for their assigned CARIMO users.

Most respondents (88.2%) found the **fitness exercises** especially interesting for the CARIMO users, followed by the **fitness bracelet** (72.1%) and the **activity overview** (61.8%). Slightly more than half of all CiM-Assistants, informal carers and volunteers also thought that newspapers and games were interesting features for the CARIMO service users. Around 40% considered the internet, activities and notes, and the weekly tips features particularly interesting, but only 14.7% saw value in the CARIMO appointment feature, and only 1 person selected the system tutorial (see Figure 10). Apart from the system tutorial, which was only interesting to one CiM-Assistant, but no one else, the informal carers, volunteers, and CiM-Assistants did not differ significantly in which functions they found particularly interesting for the service users.

Figure 10: CARIMO features that could be most interesting to clients/relatives/…
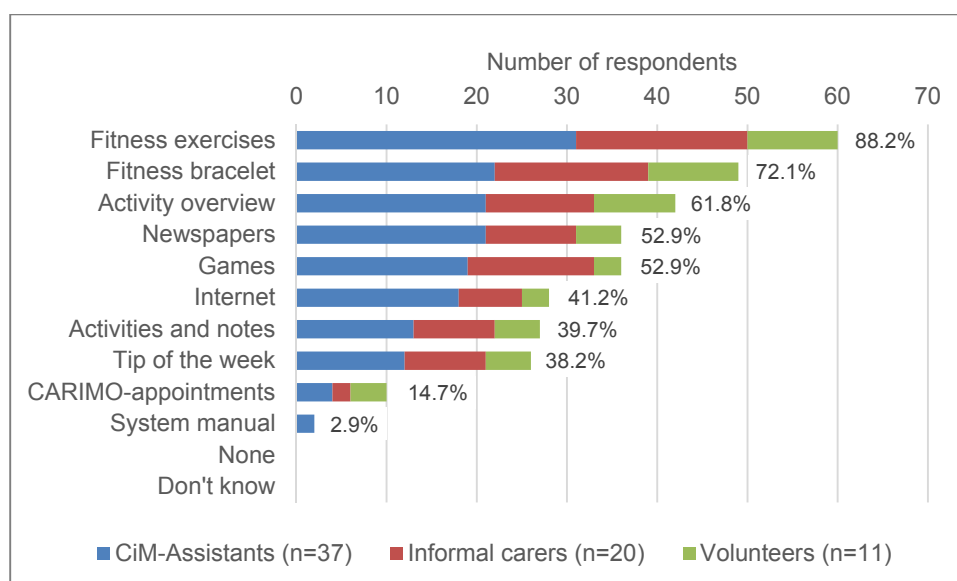
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

3.1.3 CARIMO – awareness and motivation to be active

One of the major goals of CARIMO was to motivate home care service users to increase their physical activity using direct and indirect means of influence. The daily alternating exercise program is one of the features aimed directly at inducing behavioral change, whereas other features more indirectly targeted the users' awareness of the importance of healthy exercise and their motivation to be more active. To promote awareness and motivation, CARIMO provided weekly tips on how to incorporate movement into daily life and ideas for outside

activities, as well as an activity overview showing recommended and actual activity levels. Furthermore, the tablet displayed an informative screensaver when charging.

CiM-Assistants and informal carers were expected to spend the most time with the CARIMO test users, and thus were expected to be able to assess any potential for behavioral change due to CARIMO use. We asked them to assess whether CARIMO was able to positively influence awareness and motivation of their clients or relatives to lead a healthy lifestyle.

All informal carers and the majority of CiM-Assistants who responded, agreed that CARIMO could, at least somewhat, raise the service users' and their relatives' **awareness about the importance of physical activity** in their daily lives (see Figure 11). Similarly, although not to the same extent, most informal carers and CiM-Assistants also agreed that **CARIMO could actually motivate the service users to be more active** in their everyday lives. Although there was no significant difference between CiM-Assistants and informal carers, when looking at Figure 11 and Figure 12, CiM-Assistants gave a somewhat more cautious assessment of CARIMO's potential.

Figure 11: CARIMO can raise awareness about the importance of physical activity
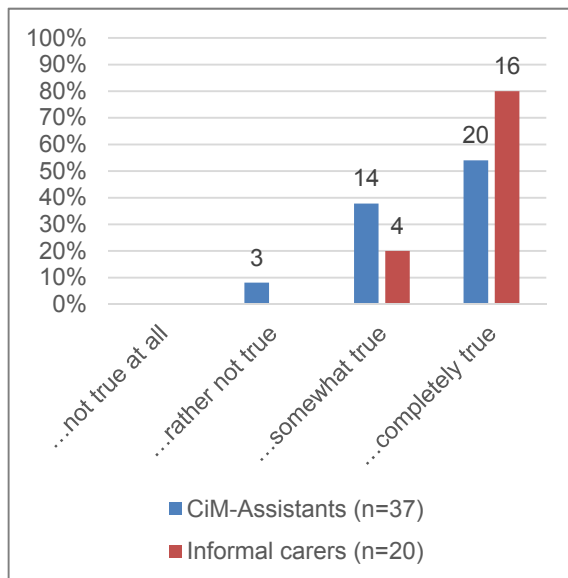
Figure 12: CARIMO can motivate to be active

Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57
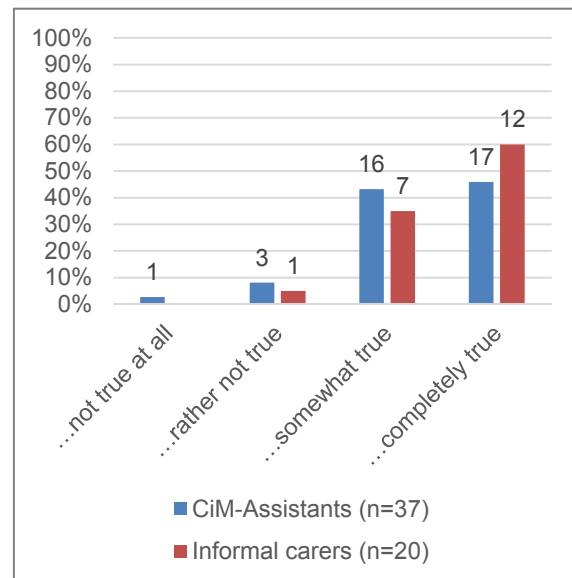
Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

3.2 Learning and using CARIMO – the perspective of the CARIMO-Team

The CiM-Assistants and informal carers played an important **role in teaching** the home care service users about CARIMO and **supporting** them throughout the project. Thus, they were expected to be able to give some valid insight into whether CARIMO was accessible and easy to learn for their clients and relatives. In their assessment, informal carers were asked to think of their respective relatives, whereas CiM-Assistants were asked to make an inference based on their impression from the majority of their clients.

Overall, both CiM-Assistants and informal carers found **CARIMO rather easy to learn** and **enjoyable to try out** for their clients and relatives, although the professional care workers turned out to be a bit more skeptical (but with no statistical relevance).

Blüher, M.; Trukeschitz, B. (2018): Reflections on usability and user experience of 'CARIMO'

Around two thirds of the CiM-Assistants, and almost one third of informal carers, agreed "somewhat" that CARIMO was easy to learn for their clients and relatives. The majority of informal carers, 50%, were even more confident and actually completely agreed that CARIMO was easy to learn for their relatives. However, 20% of the informal carers found this to be rather not true, and a small number of CiM-Assistants found CARIMO not at all easy to learn for the majority of their clients. Interestingly, one CiM-Assistant answered, "don't know", implying that she was not able to form an opinion (see Figure 13).

Similarly, more than half of the CiM-Assistants and almost a quarter of informal carers also "somewhat" agreed that their clients and relatives enjoyed tr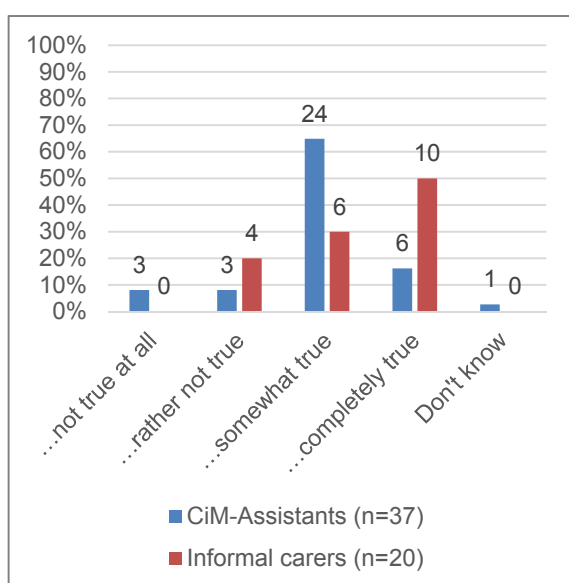ying out CARIMO. The majority of informal carers, more than 50%, and one third of the CiM-Assistants, completely agreed (see Figure 14).

Figure 13: CARIMO is easy to learn for clients

Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

Figure 14: Clients enjoy trying out CARIMO
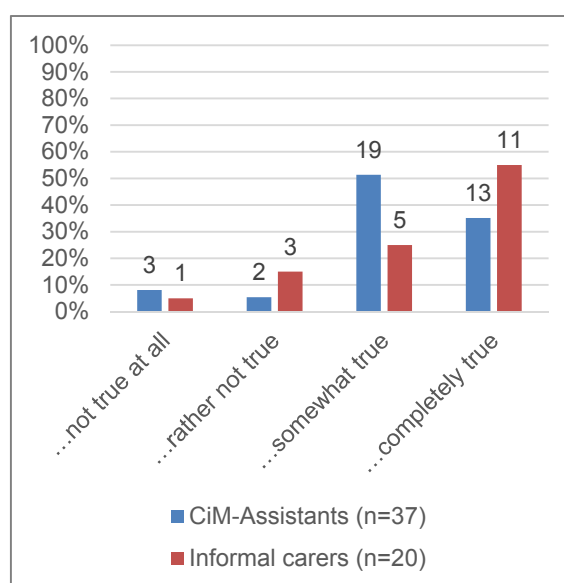
Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

3.2.1 Operating CARIMO

The CARIMO service users and the members of the CARIMO-Team were encouraged to use CARIMO together. On the one hand, CARIMO itself offered opportunities and incentives for common activities, i.e. exchanging notes, or weekly tips that sometimes included ideas for games two people could play together when out on a walk. On the other hand, this was meant to help the service users conquer any fears they might have had if they were left completely alone with a new and possibly unfamiliar device and technology.

Overall, however, the goal was to design CARIMO in a way that service users were able to use it on their own without major problems. This involved taking into account potential physical limitations and aiming for a system that is intuitive to a target group that is likely unfamiliar with common digital concepts. Thus, we specifically inquired about impressions from the CARIMO-Team as to whether CARIMO was accessible to the clients without a need for additional help.

First, we asked for a general assessment of CARIMO's ease of use. The majority of the respondents, more than two thirds of the CiM-Assistants and 80% of the informal carers, found

CARIMO rather easy to use for the service users. However, others were not so convinced, as over 20% of the CiM-Assistants, and 15% of informal carers reported that CARIMO was rather complicated to use for their CARIMO service users. Interestingly, there were also some CiM-Assistants who apparently did not know how to assess CARIMO in terms of ease of use, and one informal carer who also said that s/he did not know if CARIMO was easy to use. Although CiM-Assistants were overall more skeptical, the difference between the assessment of professional and informal carers was not significant (see Figure 15). Italian CiM-Assistants were slightly, but also not significantly, less convinced that CARIMO was easy to use than their Austrian counterparts.

Figure 15: CARIMO for the service users is …
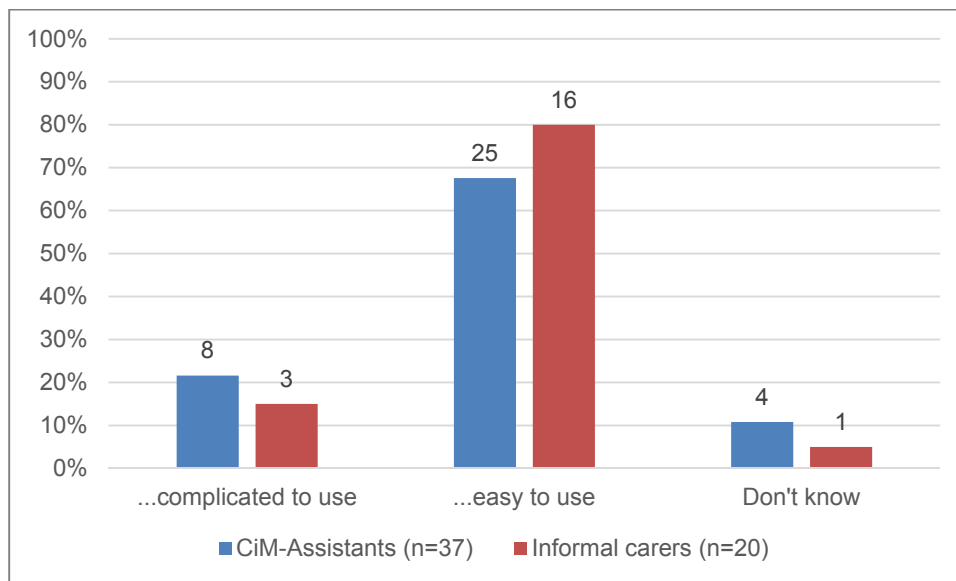
Source: WU, CiM-usability surveys (CiM-A, IC1) 2017, n=57

While the majority of CiM-Assistants and informal carers found CARIMO rather easy to use for their CARIMO service users, they, including volunteers, did agree that the CARIMO service users still sometimes needed help. In fact, almost half of all respondents viewed CARIMO as being designed in a way that their relatives or clients needed help from time to time, and a quarter even reported that the service users would need help on a regular basis. None of the CiM-Assistants found that the service users they worked with were able to operate CARIMO easily on their own. However, CiM-Assistants were the only group who found CARIMO was designed in a way that the users could hardly operate CARIMO, or even could not operate it at all (see Figure 16). As expected, there were some detectable differences between the groups of the CARIMO-Team. In comparison, CiM-Assistants and volunteers reported significantly different perceptions of the service users' ability to operate CARIMO (Kruskal-Wallis p=0.027, post hoc Conover-Iman p=0.013). CiM-Assistants were more cautious, while volunteers were more confident in the design of CARIMO and the service users' capabilities to operate it.

Figure 16: CARIMO is designed in a way that the person/people I know…
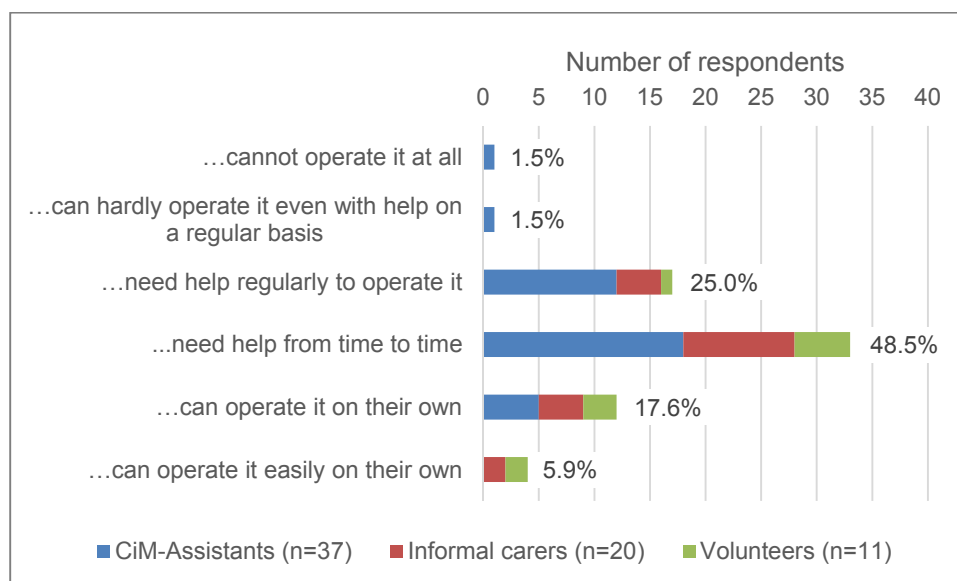
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

3.2.2 Difficulty after the initial training period with specific CARIMO features

During the 6-week training period after the beginning of the field trial, CiM-Assistants introduced CARIMO to the service users by following a weekly step-by-step protocol. After the training period, service users should have been able to use CARIMO on their own; however, as established in the previous section, CARIMO was still difficult for many users, who required additional help. There were two areas where CARIMO service users might have had issues with using and operating CARIMO. For one, the users might have still been struggling with certain CARIMO features. This may indicate that the design of CARIMO did not sufficiently meet the requirements of the target group, or that the training was not enough for the service users to learn how to use CARIMO without issue. Furthermore, we anticipated that there could be technical problems with the CARIMO devices themselves, i.e. the tablet or the fitness bracelet.

First, we asked the respondents whether they perceived any difficulty with particular CARIMO features for the CARIMO service users even after the training period. Almost 80% of the respondents (83.8% of CiM-Assistants, 80% of informal carers, and 63.6% of volunteers) agreed that there were still issues with the fitness bracelet. Considerably fewer respondents perceived the other CARIMO features as difficult for the service users. A quarter of the respondents reported problems with the activity overview as well as the activities and notes features, followed by the CARIMO internet access (22.1%). Almost 20% found that their service users still had issues with the CARIMO fitness exercises. Two respondents stated that they were not aware of any problems that their assigned CARIMO users still had after the training period. To a varied extent, CiM-Assistants saw their service users struggling with all of the CARIMO functions (see Figure 17).

All but two respondents detected some issues with the CARIMO features. They picked 1-10 features to indicate with how many aspects of CARIMO the service users still had some problems. On average, respondents reported two CARIMO features where service users still

had problems. In a comparison of the groups, CiM-Assistants tended to identify more problematic functions (mean 2.81) than informal carers (mean 1.68) and volunteers (mean 2.00). This could be explained by the fact that the CiM-Assistants had more clients, and thus a broader perspective.

Figure 17: CARIMO features still perceived to be difficult for CARIMO service users after training period
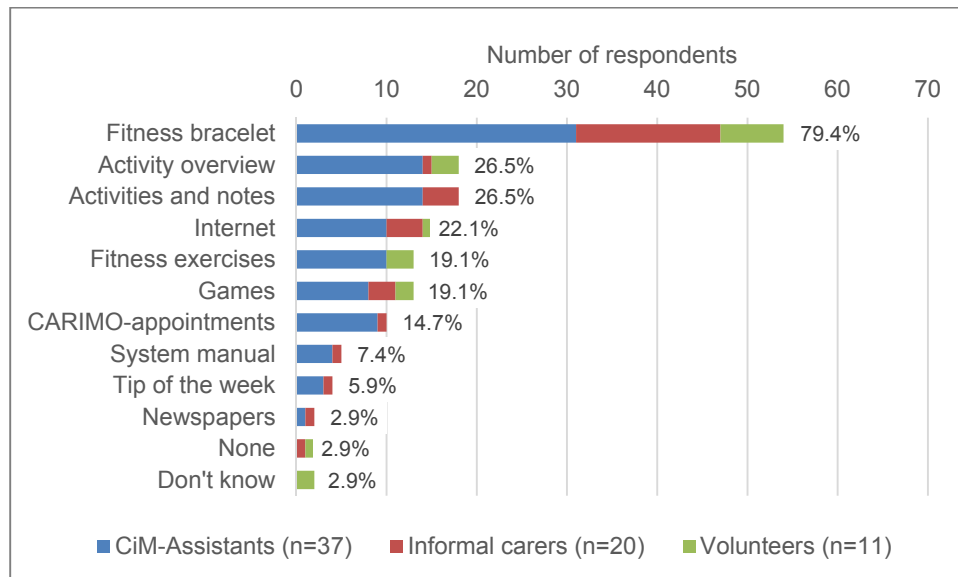
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

Second, respondents reported about the technical issues they found the service users still had with CARIMO after the six-week training phase. The respondents identified the most issues with using the touchscreen on the tablet (44.1%), followed by one third who reported problems with switching the fitness bracelet on and off, and more than 20% who saw issues with the internet connection and charging the fitness bracelet. CiM-Assistants reported more issues with swiping and selecting buttons on the touchscreen of the tablet than informal carers and volunteers. Ten respondents, almost 15%, cited other problems they did not see represented on our list. Seven of the "other problems" referred to the usage of the fitness bracelet, mentioning the GPS function and the transfer of the step count. One person noted that the font was too small (did not specify whether on the tablet or the fitness bracelet), another person noted some difficulty with the fitness exercises, and another person commented "overtaxing" (without further specification), implying that using CARIMO was overtaxing for their client. Eight respondents, or almost 12%, reported that they did not note any technical difficulties for the service users with using CARIMO. Only one out of 37 CiM-Assistants reported that their CARIMO test users had no technical problems with CARIMO, in contrast to 20% of the informal carers and 33% of the volunteers who did not register any technical problems (see Figure 18).

The respondents who did perceive some technical difficulties selected between 1 and 6 (CiM-Assistants) and 1 to 4 different problematic areas for their service users. On average, they reported 2 issues with not much difference between the groups in terms of the perceived amount of technical difficulties (means for CiM-Assistants: 1.94, informal carers 1.63 and volunteers 2.33).

Figure 18: Perceived technical difficulty CARIMO service users have with CARIMO
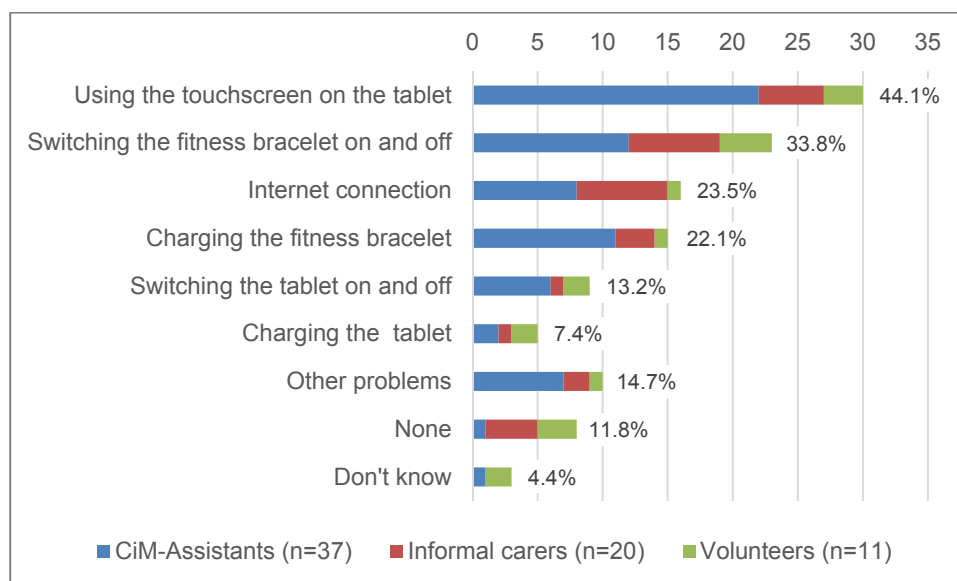
Source: WU, CiM-usability surveys (CiM-A, IC1, VOL) 2017, n=68

3.3 Supporting home care recipients using CARIMO

Without different sources of support, most importantly dedicated CiM-Assistants, the introduction of CARIMO to the home care service users would likely not have succeeded. To provide adequate support, it was necessary that helpers felt confident and competent enough about their own knowledge about CARIMO. All CARIMO test users received support in using CARIMO from CiM-Assistants, throughout the initial training period and also when needed afterwards. Additionally, around half of all test users in Austria, and almost 20% in Italy, participated in the project together with an informal carer, who also supported them with using CARIMO. Most of those service users were supported by their adult children (see 2.3.2). We were interested in how CiM-Assistants and informal carers perceived the effort to provide support to their CARIMO service users.

3.3.1 Teaching CARIMO – the CiM-Assistants' perspective

It is well known that care workers already have to cope with time pressure and challenging tasks. Additionally, CiM-Assistants were required to teach their clients how to use CARIMO. For this, the care organizations allocated extra time for each CARIMO test user for the training period. For the first 6 weeks of the CARIMO trial phase, the CiM-Assistants had trained service users in using CARIMO during weekly visits. We were interested in whether they felt well prepared, and if they had enough time to learn CARIMO in order to be able to advise their clients on how to use it. Furthermore, we also wanted to know how they personally perceived the effort of teaching CARIMO to their clients, as their attitude towards this task may have contributed to the clients' experience of CARIMO as well.

Only **a third** of the CiM-Assistants reported having had **enough time** to learn how to use the CARIMO tablet or fitness bracelet. For the **fitness bracelet, more than 20% felt they were not well prepared**, compared to about 5% who were not satisfied with the time they had to prepare for teaching the CARIMO tablet (see Figure 19). CiM-Assistants in Austria and in Italy

responded similarly as to whether they felt they had enough time to learn about both devices before teaching them to their CARIMO service users.

Figure 19: Time to learn about CARIMO for training
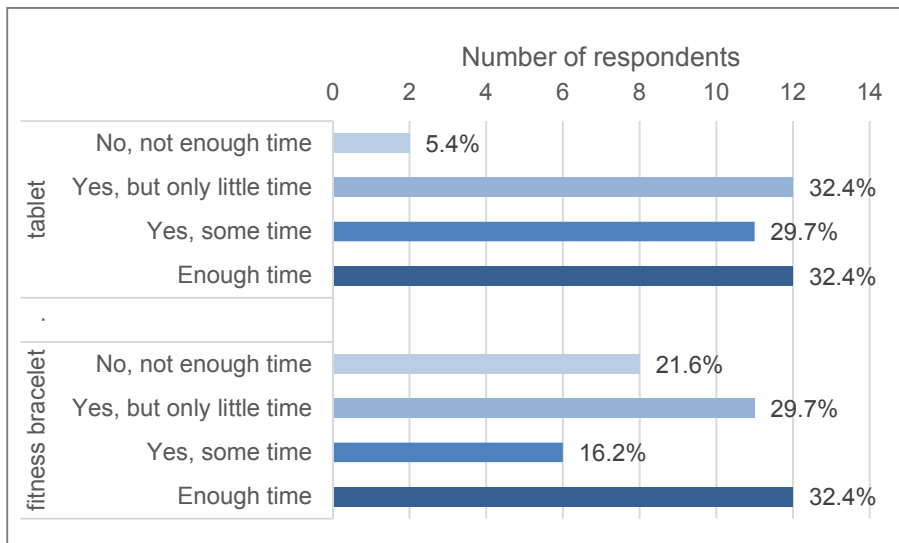
Source: WU, CiM usability survey (CiM-A) 2017, n=37

Overall, CiM-Assistants did not report a lot of difficulties when teaching users how to operate the CARIMO tablet, however about **one third** noted that they **experienced some difficulties** when explaining the CARIMO tablet to the service users. More than two thirds had mostly no difficulties (57%), or no difficulties at all (11%). In contrast, more than half of the CiM-Assistants had some (46%) or a lot (11%) of difficulties when teaching service users how to use the **fitness bracelet**. Almost 38% had mostly no difficulties, and only about 5% reported no difficulties at all with teaching the fitness bracelet (see Figure 20).

CiM-Assistants in Italy and in Austria found guiding users on how to use the bracelet similarly difficult to teach to service users, but **Italians reported more difficulties with the CARIMO tablet than Austrian CiM-Assistants** (Mann-Whitney U p<0.01).

Figure 20: CARIMO teaching experience
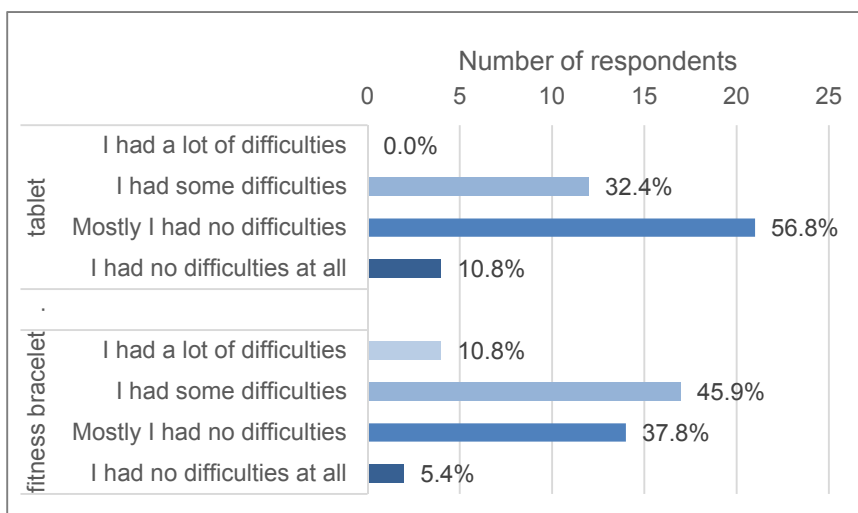
Source: WU, CiM usability survey (CiM-A) 2017, n=37

Many care workers have a personal interest in the well-being of their clients and aim for a positive relationship with them (Bjerregaard et al. 2015). Beyond its core purpose as a fitness and entertainment app for older adults, CARIMO provided an opportunity for the CiM-Assistants to interact and connect with clients apart from their daily care chores. We assumed that for some CiM-Assistants, teaching and using CARIMO together with their clients was something they enjoyed. At the same time, how the CiM-Assistants perceived the task of teaching CARIMO could serve as an indicator of their overall attitude towards the project and their willingness to make it succeed.

More than half of all CiM-Assistants reported that they really enjoyed teaching CARIMO to their clients, followed by 40.5% who reported that they somewhat enjoyed this task. Three CiM-Assistants, or 8.1%, stated that they did not really enjoy teaching CARIMO, but there was no one who definitively said that they did not enjoy it at all (see Figure 21). Generally, Austrian and Italian CiM-Assistants had similar attitudes about teaching CARIMO to their clients. However, the Austrians tended to report a more positive experience, with 59.1% reporting that they really enjoyed teaching CARIMO, compared to 40% in Italy.

Furthermore, fewer difficulties when teaching the CARIMO tablet moderately correlated with a higher level of general joy when teaching CARIMO (Spearman p=0.023, correlation coefficient 0.4228). However, joy when teaching CARIMO was not correlated with fewer difficulties when teaching the fitness bracelet or the feeling of being prepared to teach CARIMO with regards to either device.

Figure 21: Joy when teaching CARIMO
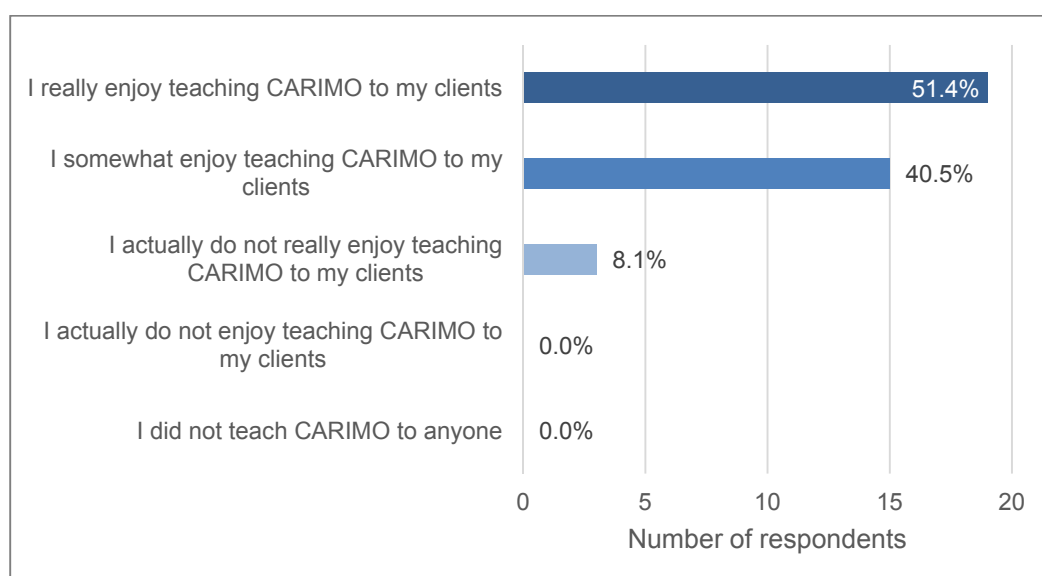
Source: WU, CiM usability survey (CiM-A) 2017, n=37

3.3.2 Support from informal carers

Apart from the 'planned' support from CiM-Assistants, some CARIMO test users also received help from relatives or friends with using CARIMO. In fact, after the initial training period more than half received support from friends or relatives with the tablet or the fitness bracelet. Towards the end of the CARIMO trial period, more than a third of the CARIMO service users still had help from relatives or friends (see Trukeschitz and Blüher 2018 for further information).

The informal carers who participated in the CiM-project fulfilled a particular role and were, more than others who did not participate in CiM, happy to help their relatives with using CARIMO. Contrary to the results from the Italian sample, the Austrian informal carers had received an initial system training as well as an individual login to access the CARIMO-Team feature of the app on the tablet.

Among the informal carers who participated in the survey, 75% reported that they had helped their relative with the **CARIMO tablet** (see Figure 22). Of those, three quarters were always **successfully able to help** and solve any kinds of problems, whereas the rest also managed to support their relatives, but not always. None of the informal carers who tried to help with CARIMO reported not being able to help at all (see Figure 23).

Figure 22: Help with CARIMO tablet
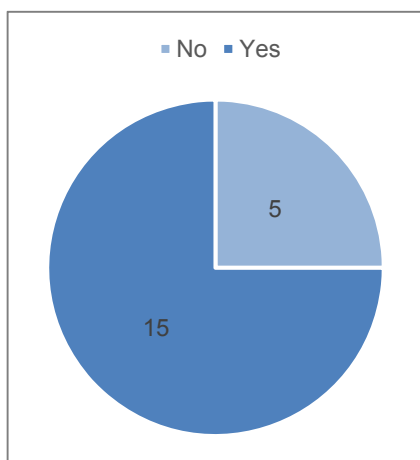
Source: WU, CiM usability survey (IC1) 2017, n=20

Figure 23: Were they able to help with the CARIMO tablet?
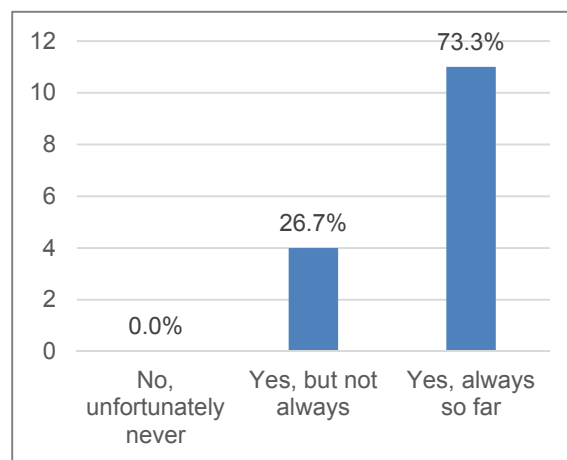
Source: WU, CiM usability survey (IC1) 2017, n=15

Similarly to the tablet, almost three quarters of the informal carers also tried to support their relatives with the CARIMO **fitness bracelet** (see Figure 24). However, they were comparably **less successful** in their attempts to help out; although nobody reported not being able to help at all, the majority, over 70%, stated that they were not always able to help, with only around 30% who had so far always been able to help (see Figure 25).

Figure 24: Help with CARIMO fitness bracelet
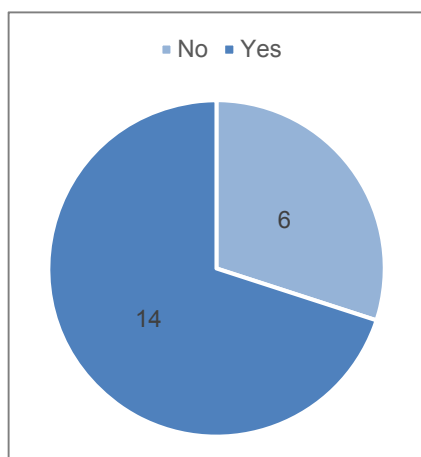
Source: WU, CiM usability survey (IC1) 2017, n=20

Figure 25: Ability to help with the CARIMO fitness bracelet
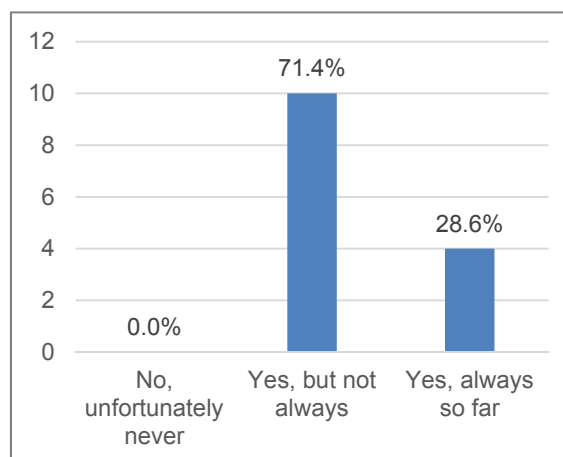
Source: WU, CiM usability survey (IC1) 2017, n=14

3.4 Feedback from clients about CARIMO

The CiM-Assistants, informal carers and volunteers were able to experience firsthand how the CARIMO service users felt about and dealt with CARIMO. Some aspects might not have been included in our questionnaire, but could still be relevant to the evaluation of CARIMO's usability and user experience. Therefore, we asked the respondents in two separate open-field questions about the positive and negative feedback they observed from CARIMO service users about CARIMO. This way, we were also able to capture the aspects of CARIMO that were most relevant to the service users and their CARIMO-Team.

While there was no possibility to skip the open text field questions, respondents were able to give no answer by simply entering a space in the text field, or writing a text with little substance. In the "positive feedback" question, 61 respondents, 89.7%, reported different aspects of positive feedback about CARIMO, and 7 respondents, or 10.3%, did not give an answer (4 empty fields, and 3 respondents stating that they had no [positive] feedback to report). Approximately two thirds (66.2%, 45 people) of the respondents noted some negative feedback about CARIMO. However, in this question 22.1% (15 persons) said they had nothing negative to report, and 11.8% (8 persons) chose to leave the field empty.

To show an accurate picture of the prevalence of issues reported, percentages in the following text are related to the entirety of the sample and not only those who chose to answer the open questions.

3.4.1 Positive feedback

The respondents mentioned different aspects of CARIMO that were received positively by the CARIMO service users. The most commonly referenced aspect was exercise and physical activity, followed by other CARIMO features, the positive influence CARIMO had on the lives of the test users, some impressions about the fitness bracelet, the service users' approach to learning and technology, and some general positive feedback (see Figure 26).

Figure 26: Positive feedback on CARIMO: themes addressed by the CARIMO-Team
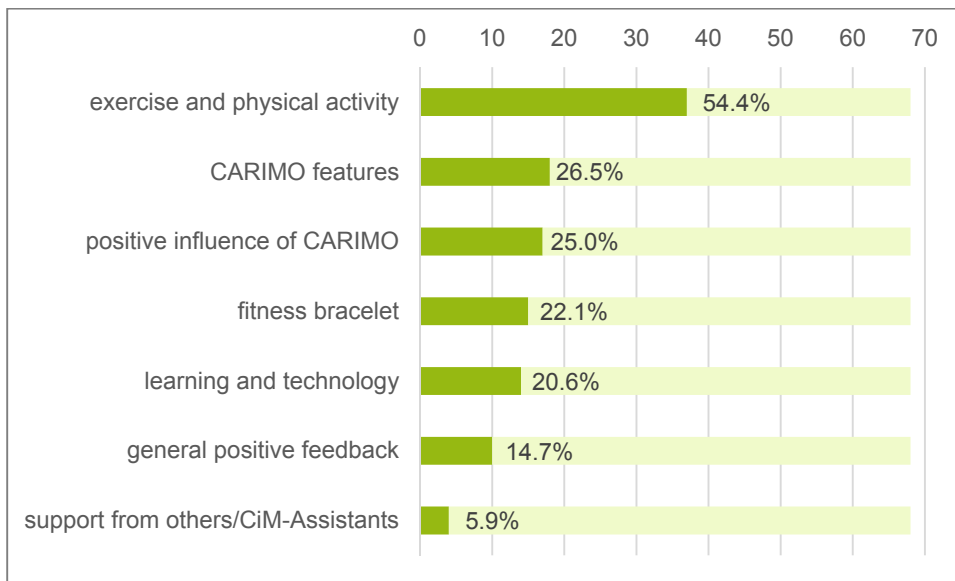
Exercise and physical activity

More than half of all respondents (37 persons) noted positive feedback in the context of the service users' usage of the CARIMO exercise feature.

Some simply gave **general feedback** (8 respondents), reporting that the exercise program was well received among their service users and relatives. Individual respondents noted that the fitness program was explained well, and appreciated the activity overview and the variety of the exercises.

More than 20% of respondents (14 persons) observed that CARIMO managed to **motivate** their service users and relatives to be physically active. Individually, they reported that the trophies and positive feedback from CARIMO were encouraging and CARIMO pushed their relative to go out for walks. Two respondents also added that the service users developed a personal ambition to complete the exercises on a daily basis. However, there was also one CiM-Assistant who found that something had to be changed to motivate her client.

Around 10% of respondents (8 persons) also noted that CARIMO contributed to **changing habits and awareness** among their service users and relatives in terms of physical activity and healthy exercise. They commented that CARIMO test users increased their levels of physical activity, and exercised (more) regularly. Furthermore, some noted that their service users and relatives were aware that the exercises were beneficial for both body and mind, and that they experienced physical activities and exercise differently – more mindfully. A relative remarked that the program encouraged discipline. One CiM-Assistant added that without CARIMO, her CARIMO service user would not exercise regularly.

Ten percent of respondents (7 persons), CiM-Assistants and volunteers, reported on different **physical benefits** the CARIMO service users experienced from using the system. Mostly, the service users saw improvement with everyday activities, such as climbing stairs or regaining flexibility in their necks.

Five respondents (7%), relatives and volunteers, mentioned that CARIMO helped the CARIMO test users **enjoy exercising and being active**. Individually, they noted that service users were happy about exercising and playing together, had fun trying out the weekly tips, and were enthusiastically sharing their progress and successes with exercising.

CARIMO features

More than a quarter of respondents (18 persons) reported positive feedback about the non-exercise-related CARIMO features. Mostly, they addressed the **games** feature (12 respondents, 18%) as something the service users enjoyed. They also mentioned **newspapers** (5 respondents), the **internet access**, especially because the tablet was more convenient than the computer (2 respondents), the **appointment feature** (1 respondent), and the **'activities and notes' feature**, stating that it was nice to be able to leave notes for each other (1 respondent).

Positive influence of CARIMO

One quarter of respondents (17 persons) found that CARIMO was a meaningful addition to the lives of the service users, apart from its potential for physical improvements. Mostly they found that CARIMO was a good way for their clients and relatives to access **entertainment**, with some adding that it was fun and a nice change of routine (9 respondents). Four respondents thought that CARIMO was beneficial in terms of **cognitive training**. One CiM-Assistant noted that CARIMO was already part of the service users' **daily routine**, and one relative added that it contributed to a more mindful approach towards planning the day. Furthermore, 4 respondents added that CARIMO brought the users **joy**, as it improved their mood and made them happy. A CiM-Assistant mentioned that the participation in the project was positive: CARIMO was "something new and at the same time interesting, that they were a part of something".

Fitness bracelet

More than 20% of respondents (15 persons) included the CARIMO fitness bracelet in their positive comments. Six CiM-Assistants made some general observations, adding that service users liked wearing the bracelet, liked the tracking feature, and found it useful and motivating. Eight respondents specifically referred to the **ability to count steps** with the fitness bracelet. They found that the service users were motivated to walk, they carefully watched their step count, and checked whether it had transferred correctly. One respondent noted that his or her relative found the monitoring of water intake, an additional feature of the bracelet, useful.

Learning and technology

Also more than 20% of respondents (14 persons) commented on how CARIMO influenced the service users' approach towards learning and technology. On the one hand, 8 respondents noted how service users viewed learning to use CARIMO as a positive challenge, something that might even change their approach towards technology in general: "…and that they at first didn't think they would be able to manage the tablet. Since then, they have all lost their timidity and excitedly try it out themselves" (CiM-Assistant). One CiM-Assistant even noted that a service user would have liked more opportunity to learn about health. On the other hand, 5 respondents also acknowledged that while the service users were excited to use CARIMO, they still needed help, with some using it only in the presence of the CiM-Assistants.

Individually, CiM-Assistants noted that after learning some basics, service users still had some issues.

Support from others/CiM-Assistants

Four CiM-Assistants noted that the service users enjoyed the presence of additional support in the context of the CARIMO field trial. One respondent noted that especially with help, service users are ambitious and can achieve a lot of progress.

General positive feedback

Finally, without going into detail, ten respondents additionally reported more general positive feedback. CARIMO was interesting for the service users and they liked using it, or were in some cases enthusiastic about the project. Relatives noted the clear design of CARIMO, and that they would recommend it to others as well.

3.4.2 Negative feedback

When asked about negative feedback from service users about CARIMO, the respondents referred to issues when dealing with the technology and the tablet in general, issues with the fitness bracelet in particular, games and newspapers, negative feelings, attitudes and motivation, and problems with the exercise feature (see Figure 27).

Figure 27: Negative feedback of CARIMO: themes addressed by the CARIMO-Team
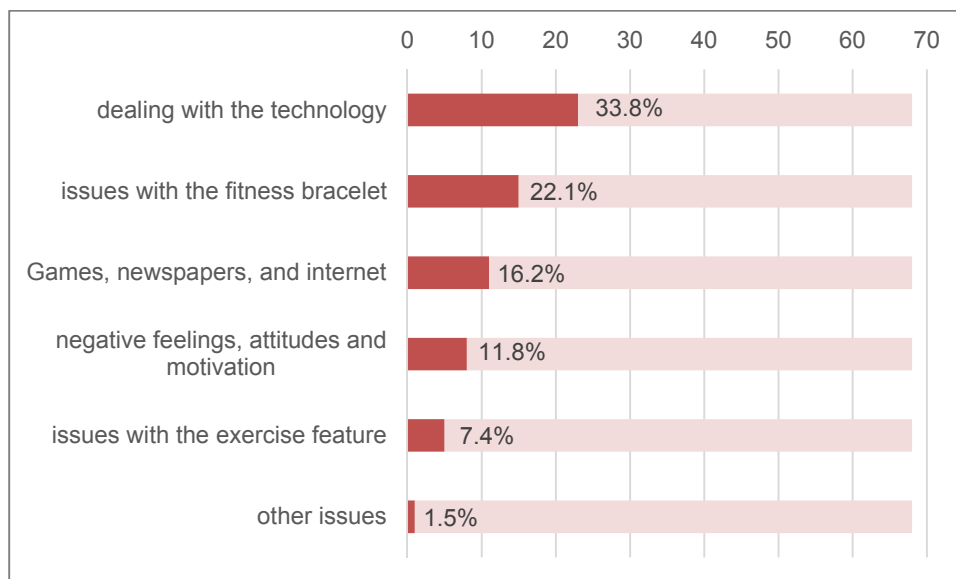
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=68

Dealing with the technology

Around one third of the respondents (23 persons) addressed technology-related issues as a source of negative service user feedback. More than 20% of the respondents commented that CARIMO appeared **too complicated** for the clients and relatives (only one informal carer made this observation). Some mentioned that CARIMO was difficult especially in the beginning, or when the service users were not yet used to it, while others noted that the font was too small, or mentioned the annoying, constant need to charge the tablets, or that clients were simply overwhelmed. On the other hand, one CiM-Assistant mentioned a client who was

already used to the typical app "desktop" from her smart phone, and was unhappy with the fixed installment of CARIMO as the home screen of the tablet. Seven CiM-Assistants remarked that issues also arose from **CARIMO not working properly**, e.g. members of the CARIMO-Team not being able to log into their accounts from home, bad connection and data transfer, or the need to send the tablet away for repair, which took several days. CiM-Assistants, volunteers and informal carers (4 persons) also mentioned that **operating the tablet**, notably the touchscreen, was difficult or impossible for some service users.

Issues with the fitness bracelet

More than 20% (15 persons) of the respondents noted negative feedback about the CARIMO fitness bracelet. Seven respondents, CiM-Assistants as well as informal carers, reported that their clients and relatives found the fitness bracelet **too difficult or too complicated to handle**. Individually, they mentioned that it had to be charged too often (especially when tracking routes), ending GPS tracking of a route was difficult, and with so many options and settings, users often unintentionally changed them and did not know how to "go back". Additionally, six respondents mentioned that the **bracelet was sometimes not working properly**, with three people referring to inaccurate or wrong step counts (which also took too long to transfer to the tablet). Finally, four CiM-Assistants indicated that the CARIMO fitness bracelet was **not sensitive enough to the specific challenges and requirements of the users**, stating that the bracelet (including its surface and buttons) was too small, especially for people with limited motor abilities and visual impairments and that steps were not counted properly when using a walking aid.

Games, newspapers, and internet

More than 15% of the respondents (11 persons) mentioned that the service users had issues with the CARIMO games feature or found the games and newspaper features **unnecessary**, and were unhappy with the way CARIMO provided access to the internet. Five respondents noted that the **games were perceived as too difficult** by their relatives or clients, two referred to issues with the advertisements, and two informal carers stated that for their relatives, the games were **too boring** – indicating a desire for more variety with this feature.

Negative feelings, attitudes and motivation

Negative feelings, attitudes and motivation associated with CARIMO and participation in the CiM-Project were mentioned by 8 respondents (12%). Most CiM-Assistants, and one volunteer, reported such issues. Three CiM-Assistants reported that their clients were **afraid** of technology, because it was difficult for them to use, or they were afraid to touch something and make a mistake. One person mentioned a **negative attitude towards technology**. Three respondents also noted that their clients were **not motivated** (anymore), tried to get out of using CARIMO ("not interested, maybe later") with the CiM-Assistant, or simply did not want to be active or do any exercises. Furthermore, two CiM-Assistants observed that their service users found their participation in the project **stressful**, feeling guilty for not doing exercises or being irritated by weekly visits and questions from the CiM-Assistants. Two respondents also noted that their service users had **privacy concerns**, a feeling of being controlled and intruded upon by the amount of questions in the context of the project.

Issues with the exercise feature

Some service users also reportedly had issues with the exercise feature. Four CiM-Assistants noted that their service users had difficulty **registering their completed exercises**, viewing the steps necessary to finish a session and save the exercises as too complicated. One CiM-Assistant noted that a client did the exercises without turning on the countdown, which may also lead to some frustration or insecurity in using CARIMO. Another CiM-Assistant indicated that exercises were repeated twice or three times, which may have irritated some service users.

Other issues

One CiM-Assistant brought up that when no CiM-Assistant visited the home care service user, and when they were not wearing the fitness bracelet, they could not tell whether the service user was actually doing the exercises.

4 The CARIMO web portal

The CARIMO web portal provided the CARIMO-Team with access to CARIMO without having to use the tablets in the homes of the service users. With the web portal, the CARIMO-Team could enter appointments, look at care-related courses, and exchange notes and activities with CARIMO service users or other members of the team. The web portal could be accessed on any device (computer, tablet computer, smartphone), but was optimized for stationary personal computers. On smaller screens such as those of mobile devices, the web app did not display the entire contents and was rather difficult to navigate.

The share of members of the CARIMO-Team who had already used the CARIMO web portal, and those who had not used it at the time of the survey, was approximately the same for CiM-Assistants, informal carers, and volunteers. In all groups, only slightly more than half had used the web portal at the time of the survey (see Figure 28).

Originally, CiM-Assistants received some training and instructions on how to use the CARIMO web app, and were encouraged to incorporate using the web app when caring for their CARIMO service user. However, only slightly more than half of the CiM-Assistants had used the web portal at the time of the survey. In Italy, the majority of CiM-Assistants (60%) had not used the web app at the time of the survey, opposed to 36.4% in Austria.

Figure 28: Members of the CARIMO-Team using the CARIMO web portal
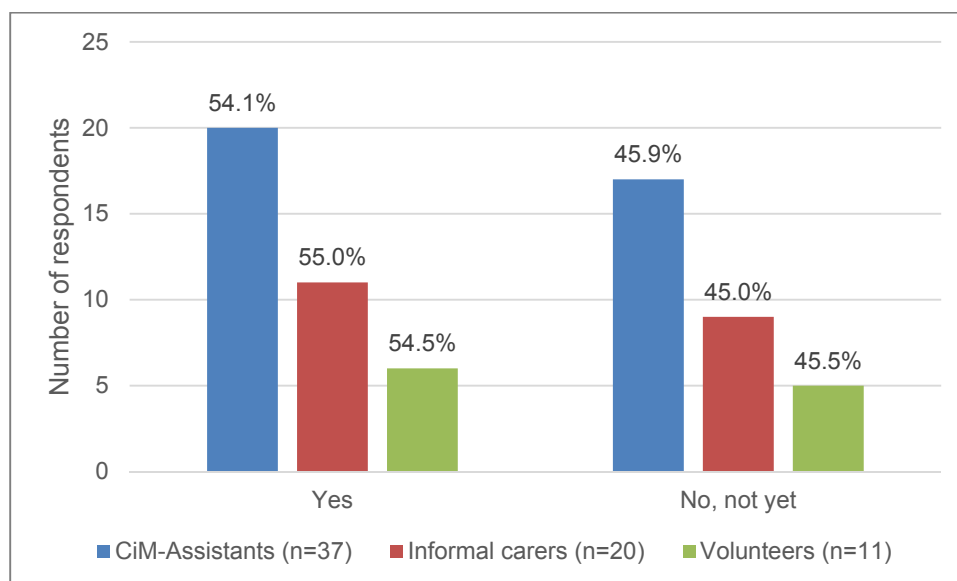
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=68

Non-users of the CARIMO web portal

We anticipated several different reasons for why some members of the CARIMO-Team would not have used the web portal.

Almost three quarters (74.2%) of the respondents selected one of the proposed reasons, 16.1% chose two reasons, 6.5% chose three reasons, and one person chose 6 reasons why he/she had not used the CARIMO web app. The most frequently chosen option was "I don't need the web portal", which was at least one of the reasons why 41.9% of the respondents reported that they had not yet used the CARIMO web portal. More than 20% answered that they were not sure what to use the web portal for, and almost 20% stated that they were not even aware of the web portal, including two CiM-Assistants. Four respondents stated that they did not know how to access the web portal, and four (including three CiM-Assistants) reported that nobody had shown them how the web portal works (see Figure 29).

More than 20% provided additional reasons why they had not used the web portal. Among the CiM-Assistants who selected this option, respondents stated that the client lacked understanding, they were unable to use the web app because of sickness, using the tablet was easier, or they did not have enough time. One CiM-Assistant answered that he/she did not know why. One informal carer also reported that the tablet was enough, he/she did not need anything else, and one volunteer replied that he/she did not have much to do with the program and thus had not been using the CARIMO web portal.

Figure 29: Reasons for non-use of the CARIMO web portal
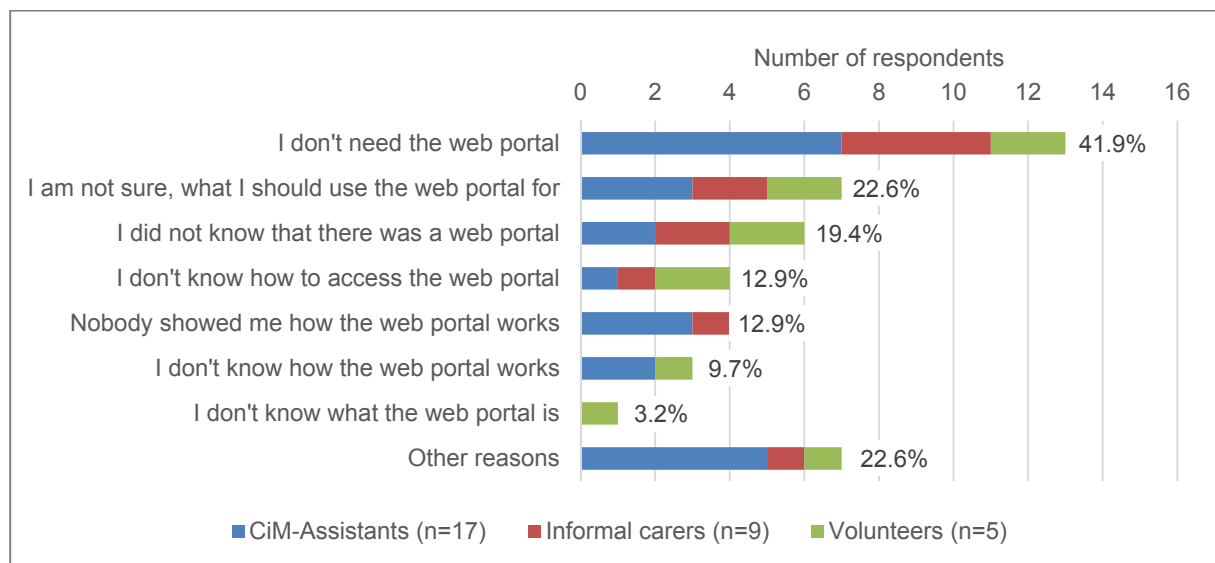
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=31

Users of the CARIMO web portal

There are different aspects and characteristics of a technological product that determine whether a user establishes continuous long-term usage. As well as being practical, Hassenzahl, Burmester, and Koller (2003) argue that it must also address the user's identity and need for stimulation (personal intent to learn and act). We selected 6 categories from the AttrakDiff to be rated by the respondents who were familiar with the CARIMO web portal. These characteristics comprise simplicity, practicality, clarity, aesthetic appeal, comfort, and perceived use. On a scale between -3 and +3 with two semantically opposite terms of a category at the extreme ends (e.g. very difficult to use: -3 and very simple to use: +3), the respondents were asked to evaluate the web portal.

The 37 respondents who had already used the CARIMO web app gave it overall favorable ratings. The mean ratings of each category were all positive and higher than one, although, as illustrated in Figure 30, the groups showed slight differences between them. In all categories, volunteers had the most positive impressions, followed by CiM-Assistants, and informal carers, who seemed more skeptical than the rest of the CARIMO-Team. Overall, informal carers appeared to be the group on the CARIMO-Team that was the least convinced of the CARIMO web portal, as their mean ratings were consistently lower than the ratings of the CiM-Assistants and volunteers. To determine whether there were significant differences between how the CiM-Assistants, informal carers, and volunteers rated the web app in terms of attractiveness, a Kruskal-Wallis H-test was performed for each item. The test showed no significant difference between the groups in any of the categories, however, the small sample size in the groups might have obfuscated clearer results.

Overall, the web portal received the best ratings in the categories of practicality and clarity (mean for both 2.24). Perceived ease of use and aesthetic appeal were, in comparison, not as well received (means of 2.0 and 1.89 respectively). CiM-Assistants agreed most in terms of practicality and simplicity (mean for both 2.4), informal carers gave the best ratings in the categories clarity and practicality (means of 1.82 and 1.73 respectively). However, they were less convinced that the web portal was simple to use and useful (means of 1.27 and 1.18

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respectively). Volunteers, on the other hand, gave the highest rating to the web app in terms of simplicity (mean of 2.833). Although the ratings of the volunteers should come with a word of caution due to the very small sample size.

Figure 30: General attractiveness of the CARIMO web portal for the CARIMO-Team (mean values)
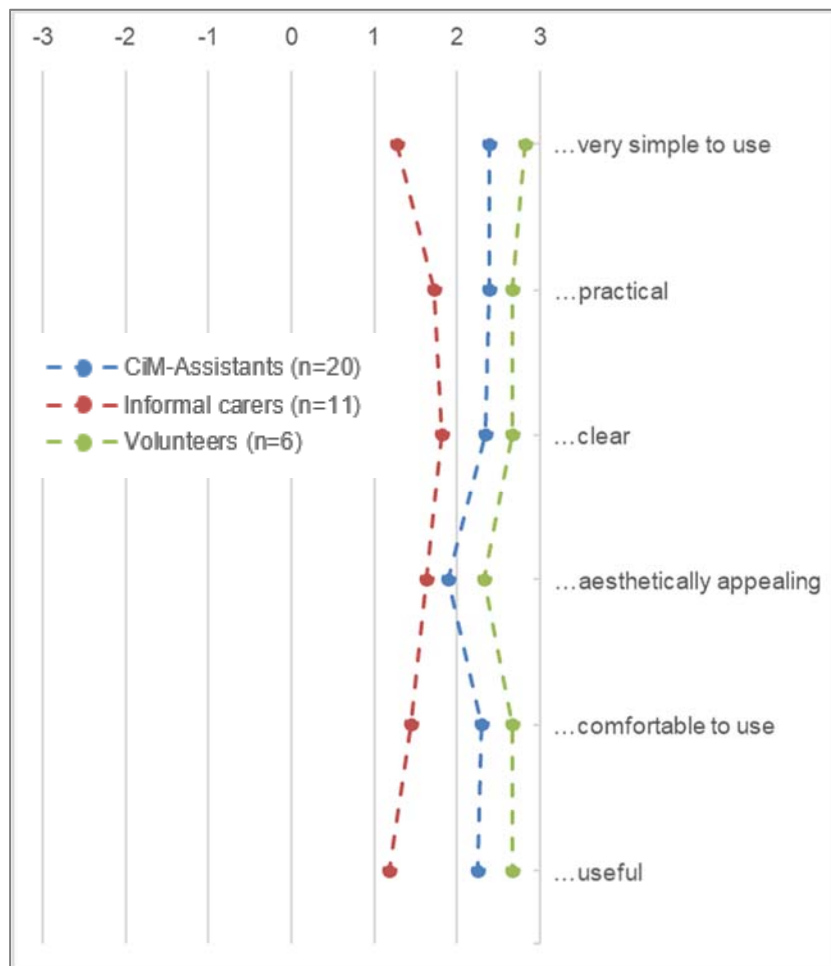
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=37

Figure 31 provides a more detailed overview of how the respondents rated the individual categories. Amongst themselves, informal carers tended to use the whole range of response options, indicating that they had more varied impressions of the CARIMO web app. Volunteers, who were the smallest group with 6 respondents, gave very positive ratings for all categories. For all categories except perceived use and aesthetic appeal, more than 60% of CiM-Assistants gave the most positive ratings of the CARIMO web portal.

Figure 31: Attractiveness of the CARIMO web portal

complicated → simple

impractical → practical

confusing → clear

not aesthetically appealing→ aesthetically appealing

awkward → comfortable

not useful → useful

Legend: CiM-Assistants (n=20), Informal carers (n=11), Volunteers (n=6)
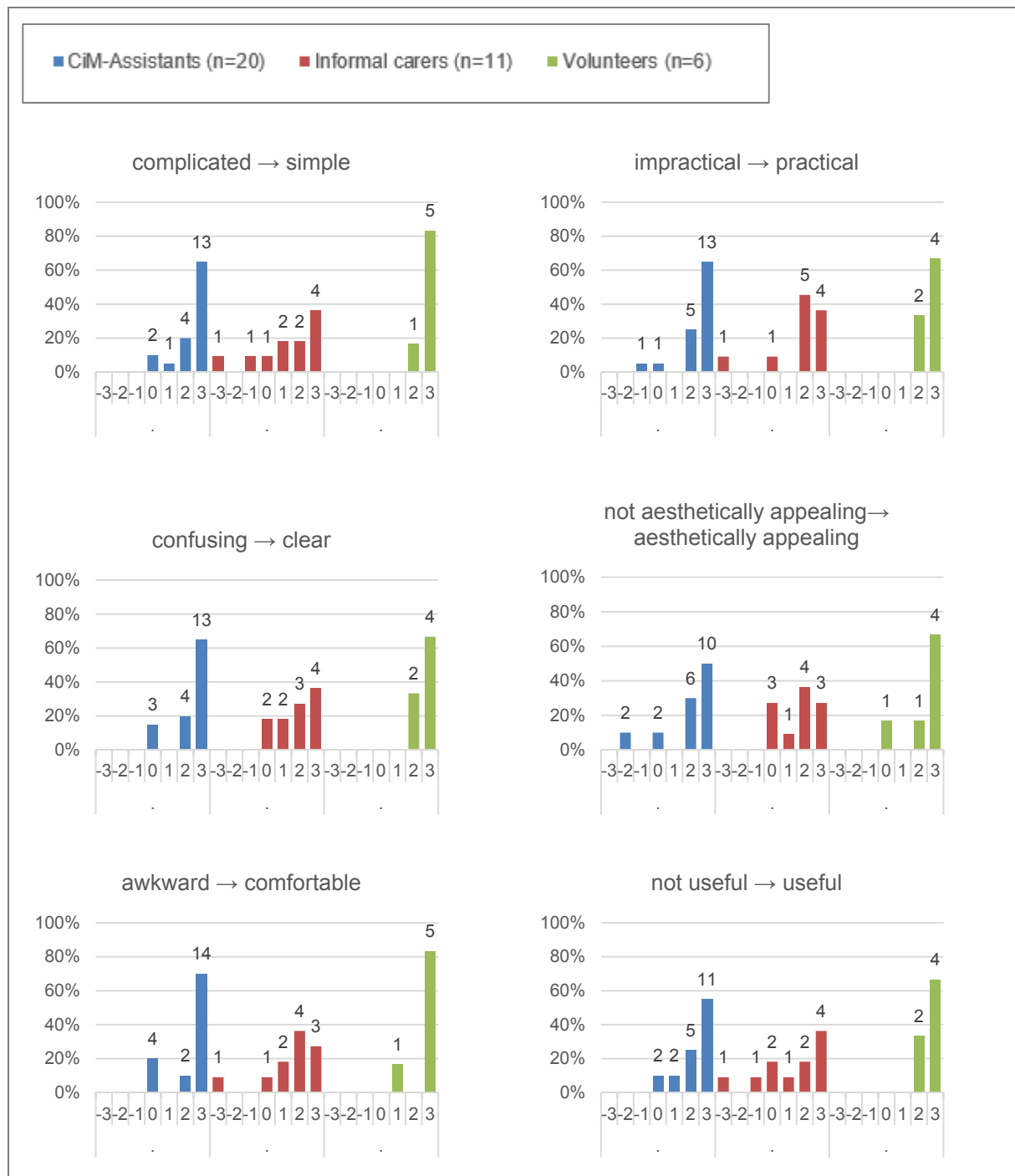
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=37

5 Information exchange via CARIMO

The main features of CARIMO for the CARIMO-Team specifically were the CARIMO-Appointments feature, as well as the 'activities and notes' feature. For the CARIMO-Appointments, the CARIMO-Team could use either the tablet or the web app to enter and look up appointments with their CARIMO clients or relatives. After entering an appointment, both the member of the CARIMO-Team who entered the appointment, as well as the CARIMO service user on their tablet, were able to see the date and time for the next series of

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appointments. The 'activities and notes' feature provided the opportunity to use the tablet or the web app to enter certain care-related activities or individual notes on a message board, where the respective CARIMO service user and other members of his or her CARIMO-Team were able to check and leave their own notes or activities.

Among all groups of the CARIMO-Team, the CARIMO tablet was the preferred platform to enter appointments with the service users, as well as for exchanging notes with others.

The majority of CiM-Assistants, almost 40%, used the CARIMO tablet to enter appointments with their clients, while only 10% actually preferred the web portal, and more than 20% used both. 30% of the CiM-Assistants did not use any of the platforms to arrange appointments with the CARIMO service users. Informal carers and volunteers also preferred the tablet overall, and did not really take advantage of the web portal on another device (see Figure 32).

Figure 32: Preferred CARIMO-platform for arranging appointments
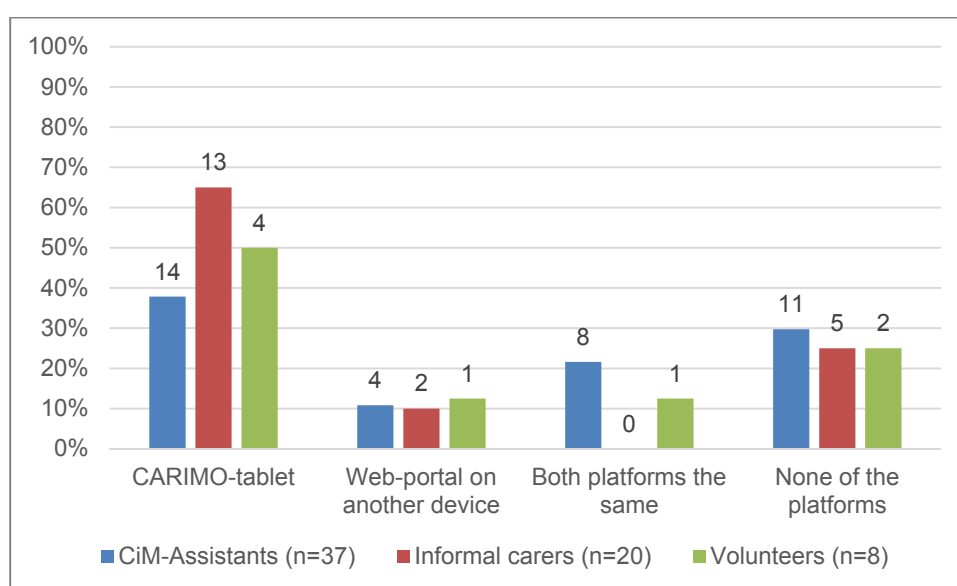
Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=65

Even clearer was the overall preference for the CARIMO tablet concerning the exchange of notes with other members of the CARIMO-Team or their CARIMO service user. Almost 70% of all respondents exchanged notes via the CARIMO tablet, whereas fewer than 10% preferred the web portal on another device. Five, or more than 20% of informal carers, did not use any of the platforms, indicating that they did not really perceive a need for the platform to communicate with other members of the CARIMO-Team or their relative (see Figure 33).
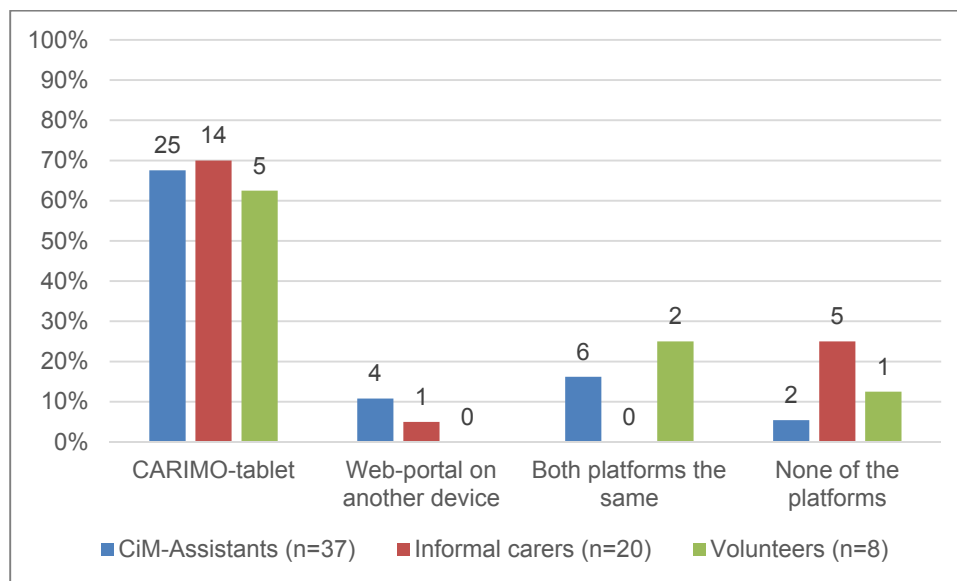
Figure 33: Preferred CARIMO-platform for exchanging notes

Source: WU, CiM usability surveys (CiM-A, IC1, VOL) 2017, n=65

6 Conclusions

The goal of this analysis was to evaluate the usability and user experience of the fitness app CARIMO for older adults from the perspectives of the different members of their care network. Care workers (CiM-Assistants), informal carers, and volunteers were involved in the CiM-project for two reasons. They supported older people in using CARIMO, the tablet and the fitness bracelet. In addition, they were encouraged to use CARIMO as an ICT-based tool to communicate with each other. To this end, each member of the CARIMO-Team got his or her own account to log on to the CARIMO tablet as well as on a separate CARIMO web portal.

Our evaluation of the usability and user experience of CARIMO from the perspective of the CARIMO-Team focused on three main research questions:

How did the members of the CARIMO care network perceive the usability and user experience of CARIMO for their older clients or relatives?

Overall, the **CARIMO-Team** perceived **CARIMO as (rather) attractive for the target group of older people** using home care: around 90% of CiM-Assistants and informal carers found CARIMO interesting for older people, and slightly over 80% found CARIMO (rather) entertaining. These ratings also compare to the ratings given by the home care service clients who used CARIMO (around 90% found CARIMO interesting towards the end of the trial period, and around 85% found it entertaining, for more information see Trukeschitz and Blüher (2018b)).

Similar to the home care service users, the CARIMO-Team also found the **exercise feature** to be the **most attractive function of CARIMO for the target group**: around 88% of the CARIMO-Team selected the fitness exercises as a favorite feature, compared to 85% of service users (towards the end of the CARIMO trial period, see Trukeschitz and Blüher 2018b).

CiM-Assistants and informal carers credited CARIMO with **more potential to raise awareness about the importance of physical activity** (around 63% agreed completely), than to actually motivate the home care service users to be more active (around 43% agreed completely). Furthermore, in both cases, CiM-Assistants tended to be less optimistic about CARIMO's impact than informal carers. For an indirect comparison, a large majority of service users reported that CARIMO could motivate them to do exercises (89% in the second survey) and to be physically active (73% in the second survey) (Trukeschitz and Blüher 2018b).

The majority of CiM-Assistants and informal carers **agreed that care recipients enjoyed trying out CARIMO**, and that **CARIMO was rather easy to learn** for the clients. However, especially CiM-Assistants tended to not "completely", but only "somewhat", agree with this.

The **CARIMO-Team identified several issues with CARIMO features** and using the **devices**. Over 20% of CiM-Assistants and more than 10% of informal carers reported that they found CARIMO rather difficult to use for the clients. Almost 80% of CiM-Assistants, informal carers and volunteers observed that older people or relatives using CARIMO still had issues with the fitness bracelet. More than one quarter of respondents saw difficulties with the activity overview and the activities and notes feature, and around 20% noted that there was some difficulty with the most popular CARIMO feature, the exercise videos. Moreover, almost half of the respondents perceived issues for the service users with the touch screen of the tablet, and saw that their clients and relatives struggled with registering exercises, activities, and logging GPS with the fitness bracelet. A frequent point of irritation seemed to be a perceived inaccuracy of the bracelet's step count, as well as issues with the transfer of the steps from the fitness bracelet to the activity overview on the tablet.

How did CiM-Assistants and informal carers support older people using CARIMO, and how did the carers perceive this effort?

CiM-Assistants were tasked with visiting the CARIMO test users, introducing them to CARIMO and answering any questions. In Austria, CiM-Assistants followed a 6-week training program, teaching CARIMO to the clients in a step-by-step process. Informal carers provided support individually, when needed.

Around half of the CiM-Assistants enjoyed teaching CARIMO to their home care service users. However, some of them reported **issues that made the initial training phase more difficult** than expected; some did not feel adequately prepared for teaching CARIMO, especially the fitness bracelet, to their care recipients. Half of the CiM-Assistants reported that they had only little or not enough time to become familiar with the fitness bracelet. Especially the CiM-Assistants in Italy, who did not receive a fundamental introduction to CARIMO, had some difficulty – they felt significantly less prepared for teaching how to use the CARIMO tablet than their Austrian colleagues. Generally, CiM-Assistants tended to have more issues with teaching the fitness bracelet than with teaching the tablet. Particularly the fitness bracelet was a challenge for the service users as well as the CARIMO-Team.

How did the members of the CARIMO care network perceive the user experience and usability of CARIMO as a tool for coordination and organization of care work?

The **CARIMO web portal** for the care network **did not reach its intended purpose**. The results of our evaluation suggest that the CARIMO-Team did not perceive enough of a benefit from using the web portal to sustain a longer period of use: in fact, around 45% of the CARIMO-Team (similar shares in all groups) had not used the web portal before participating in the

survey. The most commonly cited reason for non-use of the portal was that they did not really need it, followed by not being sure what the purpose of the web portal was.

Thus, overall, the **web portal did not play an important role** for the CARIMO-Team in their participation in the CiM-Project. Most of the respondents who did use some of the CARIMO communication and coordination features **preferred the service users' CARIMO tablets for entering appointments, activities and notes**. Furthermore, there was some feedback from the comments that some carers were not able to log on to the web app from their home computers or mobile devices.

Nonetheless, from the respondents who were familiar with it, the **CARIMO web portal** received **positive ratings in terms of its attractiveness**. In all aspects, volunteers gave the most positive assessment, followed by CiM-Assistants, and informal carers, who were pronouncedly more skeptical. Comparing the items we used to determine the web portal's attractiveness, respondents found it **most lacking with regard to aesthetic appeal**, and were **most attracted to the portal because of its practicality and clarity**. Here, it was important to note that informal carers somewhat deviated from the other groups apart from their generally lower ratings, in that they found the web portal least attractive in terms of ease of use and usefulness.

CiM-Assistants seemed more skeptical than informal carers and volunteers, which might be due to the fact that they had a more balanced perspective, whereas informal carers and volunteers appeared to be involved with more enthusiastic or digitally adept older people. Although the differences between the groups were often not statistically significant due to the small sample sizes, it does not mean that there were no differences. Possible differences may not only be a result from different perceptions but also from different roles of the participants. Care workers were required to deal with CARIMO without the necessary capacities or in some cases, training. In addition, there was frustration about CARIMO not working entirely as expected or not fully working in Italy (system bugs, incomplete updates, and failure of the proper implementation of some of the contents – e.g. exercise descriptions being shown in German language instead of Italian). On the other hand, volunteers and informal carers had made the conscious decision to participate in the project and likely had greater confidence in the app overall.

There were **some limitations to this survey**, which may affect the validity and generalizability of the results. Because only a small number of informal carers and volunteers could be recruited for the trial group of the CiM-Project, the potential sample size for this survey was reduced. Furthermore, not all participants of the CARIMO-Team took the usability questionnaire for carers, leading to weakened statistical power in any significant or non-significant results. There was also some "overlap" between the different roles, which implied that some respondents were asked to evaluate CARIMO from the two different perspectives of their roles. Some of the respondents participated in the CiM-project as informal carers and as CiM-Assistants, and others were service users in the test group, who also worked as volunteers. Looking at the descriptive output of the responses of these cases, we determined that they were able to take on different perspectives and included them in the analysis; however, this is still likely a limitation to our results.

Overall, the **assessments of the members of the CARIMO-Team** supported the general impression that **CARIMO's fitness features seemed to work very well for older people**. Care workers, rating CARIMO for the group of clients they support, were, however, less enthusiastic than informal carers and volunteers who assessed CARIMO for a specific older

person. The features of the **CARIMO system that aim to facilitate and promote collaboration were less well received**. Implementation issues during the project, particularly not involving enough informal carers who remotely care for their relatives, and a lower-than-expected engagement of the social care organizations' management in co-creating a collaborative tool, slowed down the innovative change in the trial phase. However, it has to be noted that the collaboration of groups (informal carers, care workers and volunteers) that have not been in such an intense exchange before was one of the most (non-technical) challenges the CARIMO system faced. Nonetheless, the experiences and first steps taken in this project may help to implement such platforms in the future and to support social care organizations in catching up with ICT-based tools for supporting their customers - clients as well as the relatives who are taking care of them.

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