Acronym:	vINCI
Name:	Clinically-validated INtegrated Support for Assistive Care and Lifestyle Improvement: the Human Link
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D3.5 Compliance with User Requirements

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Partners involved (leader in bold): ICI, MPU, UNRF, CMD, SAL, OPL, **CTR**

Project Co-Funded by:

Project Partners:

[1] L = legal agreement, O = other, P = plan, PR = prototype, R = report, U = user scenario

[2] PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services)

Partner list:

No.	Partner name	Short name	Org. type	Country
1	National Institute for Research and Development in Informatics	ICI	R&D	Romania
2	Marche Polytechnic University	MPU	R&D	Italy
3	University of Nicosia Research Foundation	UNRF	R&D	Cyprus
4	National Institute of Telecommunications	NIT	R&D	Poland
5	Connected Medical Devices	CMD	SME	Romania
6	Automa Srl	AUT	SME	Italy
7	Optima Molliter (former Salvatelli Srl)	SAL	SME	Italy
8	National Institute of Gerontology and Geriatrics "Ana Aslan"	NIGG	R&D	Romania
9	Comtrade (former Comtrade Digital Services)	CTR	Large enterprise	Slovenia
10	National College of Ireland – Cloud Competency Center	NCI	R&D	Ireland

Revision History

Rev.	Date	Partner	Description	Name
1	26.06.2019	ICI	Created the template, added the sections and draft content	Lidia Bajenaru
2	09.09.2021	ICI	Added content	Lidia Bajenaru
3	12.10.2021	ICI	Added content	Lidia Bajenaru Mihaela Tomescu
4	20.11.2021	ICI	Added content	Lidia Bajenaru Ion Alexandru Marinescu
5	30.11.2021	ICI	Final check and editing	Lidia Bajenaru Ciprian Dobre

Table of Contents

1. Introduction

This document presents the requirements of the participants in the project for the design of vINCI application interfaces and the compliance with these requirements of vINCI technology.

This activity provides an overview of the impact of the technologies developed within the vINCI project on a sample of users, by analysing the feedback received from them on the satisfaction resulting from the interaction with these technologies. The results of this analysis helped developers to improve the basic components of participatory interface according to users' observations and understand how the whole system is perceived from an external point of view.

Assistive environments are designed primarily to support the healthy and independent lives of the elderly. Older people are often perceived as resistant to technology; in reality, many of them are willing to accept new digital technologies in their lives and take advantage of what the technology has to offer. On the other hand, the "not worth it" impression is more likely to be triggered by unusable interfaces, which prevent older users from perceiving the technology as both usable and useful. This motivates the need to investigate the appropriate guidelines for the design of user-system interfaces in the field of intelligent support environments, for which older people are typical target users.

The vINCI project has developed an assistive monitoring technology for the elderly. The monitored person downloads a free application on his / her mobile phone. Using the application on his / her phone, or the web version of vINCI technology, create an account by increasing the growth having access to the application of personal data. From the mobile application, the person can periodically complete a series of medical questionnaires to which he would otherwise have had access only after complex medical consultations: a questionnaire to identify the perception of quality of life, a questionnaire to identify the perception of physical activity, another level for physical activity. The application also provides the scores obtained, even in time, for the respective questionnaires. From the dashboard (Web version), the family can track in real-time the monitored parameters of the person.

Development approach: User Centered Design (UCD)

In order to specify user' needs and requirements, vINCI project consortium has chosen to apply *User Centered Design (UCD)*, which means a development approach that focuses on the end users that are going to use the product or service created [Courage & Baxter, 2005]. The aim of UCD is that the product / service developed should suit the user, rather than making the user suit the product / service. This is accomplished by employing techniques, processes, and methods throughout the life cycle of the product / service, that maintain the focus on the user from the very beginning until

the end. There are three key principles of UCD regarding Courage & Baxter, 2005 that we apply throughout the project:

1. *An Early focus on Users and Tasks*

   The first principle focuses on the systematic and structured collection of users´ requirements. The first step is to gather these user requirements and to get understanding what the user really wants and needs. This information becomes invaluable when creating a superior product.

2. *Empirical Measurement of Product/Service Usage*

   The focus of this principle is of ease of learning and effective, error-free use. This can be assessed early in the life cycle via usability testing of prototypes / models. A usability test is administered in the last phase of the project. Different metrics predict the usability and are analysed in order to improve the product / service before the final version is developed.

3. *Iterative Design*

   The final principle recommends that requirements are collected and the product is designed, modified, and tested repeatedly. The development cycle is continuously iterated and fine-tuned with each cycle until it becomes right. It is impossible to get all the information the first time, no matter how expertly the usability activity is executed. This means that there are be many repetitions of the methodology throughout the projects life-time.

The general phases of User-Centred Design process [www.w3.org, accessed in 2020; www.usability.gov, accessed in 2020] are:

1. *Specify context of use*: Identify who the primary users of the product, why they want to use the product, what are their requirements and under what environment they use it.
2. *Specify Requirements*: Once the context is specified, it is the time to identify the granular requirements of the product. This is an important process which can further facilitate the designers to create storyboards, and set important goals to make the product successful.
3. *Create Design solutions and development*: Based on product goals and requirements start an iterative process of product design and development.
4. *Evaluate Product*: Product designers do usability testing to get users' feedback of the product. Product evaluation is a crucial step in product development which gives critical feedback of the product [Moen, R., 2019].

2. Design of user-centred participative interfaces

2.1 Specify context of use

In the following there are presented the primary users of the product, why they want to use the product, what are their requirements and under what environment they use it.

2.1.1 Target Group

The Target User Groups consists of two main categories. *The first category* includes *primary end-user older adults* aged 65+ without severe impairments who live alone or in a day care centre and who understand the advantages of non-intrusive remote monitoring through technology of various physical, mental and social parameters, for early detection of symptoms related to impairments associated with old age, and for triggering alerts related to possible incidents.

In order to increase motivation and positive interest of the end users, benefits brought by vINCI are presented. According to Garand et al. [Garand, L. et al., 2009], it is important to understand the fears of participants in the health pilot project, and "they are unwilling to accept that they (or their loved one) have or are at high risk for disease, and risk the reaction of others, they may be unwilling to even contemplate participation in a study focused on behavioural issues related to the disease". Such fears are addressed in the vINCI project, focusing on independence and improving the QoL conditions of older adults by integrating leading technologies.

The second category includes *caregivers and other stakeholders* such as medical doctors, physiotherapists etc. that are going to provide support for individualisation of medical QoL intervention.

The vINCI technology was tested and valided by 2 pilots:

- 1 from Romania, at the National Institute of Gerontology and Geriatrics "Ana Aslan";
- 1 from Cyprus, a day center from Nicosia.

The Pilot Study from NIGG was performed on 60 persons 65 years of **age and older, 30 for control group and 30 for test group**.

All consecutive patients 65 years of age and older admitted to NIGG - Geriatrics and Gerontology Inpatients Department on referral from general practitioners or other specialist for various chronic or subacute conditions were considered for inclusion in the Pilot Study and then evaluated against exclusion criteria. In the first 3 days of hospital admittance all patients were screened for study inclusion against inclusion and exclusion criteria and for computer digital skills until the sample target number is reached for each part of the Pilot Study.

All potential participants filled in a Digital Skills Questionnaire (DSQ) to evaluate their computer and technological literacy. Seniors who scored low on the DSQ were excluded from inclusion in the study group.

Prior to study initialization, all seniors signed the Informed Consent form. The persons who did not sign the Informed Consent were excluded.

Exclusion criteria were documented by medical examination, anamnesis and from patients' medical charts and documented medical history.

If person gave informed consent, person was included in study and continued with Compliance Form.

If person did not fully complete baseline questionnaires, person was excluded from study.

If person did not fully comply with vINCI instructions or did not appropriately use vINCI items, person was excluded from study.

Exclusion criteria were documented by medical examination, anamnesis and from patients' medical charts and documented medical history.

2.1.2 Digital skills data

Presence of digital skills for the elderly represents an inclusion criterion in study. Digital competence is the set of knowledge, skills, attitudes (thus including abilities, strategies, values and awareness) that are required when: using ICT and digital media to perform tasks, solve problems, communicate, manage information, collaborate, create and share content etc. All potential participants filled in a Digital Skills Questionnaire (DSQ) to evaluate their computer and technological literacy.

The Digital Skills Questionnaires is based on DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe [Ferrari, A. et al., 2013].

2.1.3 End-users

Groups of elderly and caregivers (both formal and informal), both from *Romania and Cyprus*, were closely involved throughout the entire duration of the project to contribute their needs and ideas that become the basis for the definition of the needs of this target group in terms of managing their daily activities at home / care centre, as well as their preferences, needs and requirements regarding the vINCI environment.

During the information gathering process two different groups, with different target group members have been involved:

- Group 1: Elderly Residents of NIGG (Romania);
- Group 2: Elderly evaluated by UNRF (Cyprus).

The first group includes 62 elderly (49 women and 13 men) from NIGG in range of age between 65 and 86, the second group includes 20 elderly (4 men and 16 women) from UNRF in range of age between 65 and 80 and the third group includes 62 formal and Informal caregivers from NIGG. More specifically 43 formal (including Doctor - 18, Nurse - 18, Physiotherapist - 2, Psychologist - 3, Social worker - 1, Caregiver - 0, Others - 1) and 19 informal caregivers (including 1st degree relatives - 16, other degrees of kinship - 2, Friend - 0, Neighbour - 0, Voluntary - 0, Others - 1).

2.1.4 User needs gathering methodology

In order to identify the user needs, a lot of information should be taken into account. The user requirement collection started from the existing knowledge provided by vINCI platform developers as well as designated pilots for clinical validations (Romania and Cyprus). All this information supported the project objectives and was the starting point to fulfil the end user needs.

In the **context of designing the vINCI platform**, *questionnaires* are the chosen method of data gathering that support the process of identifying the requirements and needs of end users. Questionnaires are an instrument designed to gather quantitative and qualitative data about participant's usage of assistive technologies and their preferences concerning the vINCI environment. This method uses specific questions to collect opinions of targeted group that can easily be analysed. The questionnaires (for the elderly and their informal / formal caregivers) are developed based on partners' experience (ICI, NIGG, UNRF), the objectives of the vINCI project, and also, the results extracted from the thorough review of the relevant literature.

The requirements, needs and wishes of end users, represent the backbone of the design and development of the vINCI platform. In this sense, a bottom-up approach is implemented, with end-users being involved from the very beginning of the design process. They were involved in three distinct phases throughout the whole project implementation. In the first phase, needs collection, the end users were involved in a study whose results allowing the identification of their needs, which later was transformed into requirements and ideas regarding the functionalities of the vINCI platform, as well as the guidelines regarding the appearance of the user interfaces. In the next phases, users were invited to evaluate the first implementation and final version regarding the usability and acceptance of the technologies available within the vINCI platform.

For the first phase two questionnaires are developed, together with the input of user-related partners, ICI (Romania), NIGG (Romania) and UNRF (Cyprus) and additionally the other partners. During this second phase, the first implementations, based on the data collected in the first phase (needs collection), were evaluated with low-fi prototypes with the participation of target user groups and necessary amendments were carried out, depending on the results. In the final phase, the interaction of users

with the final prototype was evaluated and the usability and acceptance of the technology was studied. Users' opinions on aspects that may be improved were gathered.

The methods for identifying the end user needs and establishing requirements in vINCI, were defined. As follows, the main tool used to efficiently collect the data that were used in establishing user requirements is presented. For the first round of identifying the end-user needs and analysing the requirements, in addition to the detailed study of the literature, two questionnaires were developed.

The first questionnaire (see Annex 1) is addressed to older people and aims at how they perceive new assistive technologies in the context of the daily activities, needs and expectations with regards to their interaction with the vINCI platform.

The second questionnaire (see Annex 1) was provided to the formal and informal caregivers of the elders in order to get their point of view of what the system should provide for improving elderly care and their perception of certain requirements regarding a continuous, intelligent, non-invasive monitoring environment of the physical, mental and social state of the elderly. Formal (i.e., Physiotherapist) and informal (i.e., Family members of the elderly) caregivers, were also involved in the data analysis with vINCI designer and developers for gathering and identification a more realistic and effective requirements that assist in improving the independence, active ageing and efficiency of care monitoring for the older person.

Each questionnaire is divided into two parts. The first part of the questionnaire (part A1), regarding some demographic data, daily activity and interest in new technologies requires as input the level of familiarity with various technology terms related to health (geo-location, digital communication, use of Internet etc.). The answer is in the form of multiple choices and corresponds to an aspect that can be found in the vINCI platform. The second part of the questionnaire (part A2) gives to developers a much more detailed picture of users' preferences and needs regarding the vINCI environment. They collected information about the level of acceptance of some proposed technical solutions, appearance, functionalities and interaction.

The partners responsible for the end user studies (NIGG and UNRF) conduct the questionnaires that are implemented on two different types of target group, patients (elderly) and staff who provide care for the elderly (formal or informal), with their own characteristics and needs.

The main advantage of the questionnaires is that the users themselves (elderly and caregivers), even if they are not familiar with the concept of assistive technologies for health, have the opportunity to get informed regarding the advantages of using technology for elderly care and answer at different types of questions that meet their needs regarding an active aging.

By performing a scientific **literature study, there were discovered the link between the use of ICT-based services and technology and how these can have positive impacts on different dimensions of health and quality of life of older adults and how those can be used as facilitators for operational optimization of care services**. Moreover, it investigated meanings for promoting active ageing, person centred and event-driven applications supported by an ICT solution (and more specifically a personalized assistance services for patients in an IoT-based ecosystem), in a manner that reflects the elderly patient's lifestyle, needs, usual habits, and preferences, cultural and social orientations for senior adults.

Adaptive technologies are among the types of environmental modifications that may be used in response to declining physical or cognitive abilities, but there has been a mismatch between the changing capabilities of older persons and societal opportunity structures. The gerontological social and technological research has been slowly following the technological change. Age is negatively associated with technology use, with older persons tending to be late adopters of new technology.

This is a diversity in relation to elderly and ICT. On one side, it's the magical benefits or / and opportunities allowing elderly to remain longer at their own homes. On the other hand, it's the lack of needs in everyday life, anxiety from coming into contact with it, lack of experience and knowledge of ICT, perception of low self-efficacy in conducting the system, too old to learn and little confidence in the system.

2.2 Specify Requirements

The results of the literature study showed a potential success of an ICT-driven support in for elderly daily life in order to feel supported in their independence.

Regarding the analysis and determination of the end user needs and requirements from the vINCI system, two questionnaires, divided in two parts, were developed (in line with the objectives of vINCI project) as follows:

- Part A – Demographic, Daily Activity, Interest in New Technologies;
- Part B – User preferences, Needs and Requirements regarding the vINCI environment (acceptance, appearance, functionality and interaction).

The first questionnaire targets the elderly population, while the second one targets the caregivers (both formal and informal).

Starting from the demographic distribution, the designers of the vINCI platform could contribute to reducing reluctance in adopting emerging technologies between men and women, by creating an appropriate training framework that contributes not only to the presentation of the product's functions, but also to the improvement of all users' digital skills. Also, the vINCI platform must prove the usefulness and reliability of its functions at the level of the caregivers, the medical personnel or even the family, whose opinions can contribute to the widespread adoption of the proposed

technologies among elderly patients. Since most study participants are married, there is a high likelihood that the vINCI platform can be used by the consort partner as well.

The average age and high level of user education are an advantage in understanding the platform's functions faster, but, at the same time, it forces designers to offer user-centred quality interfaces, based on reliability and ease of use, thus contributing substantially to an independent and active aging of the elderly.

Part A - Demographic, Daily activity, Interest in new technologies

Table 2.1 indicates a majority of older people who find it **comfortable to communicate through the Internet with carers, family members, doctors** etc. Thus, 29% in Romania and 25% in Cyprus of the answers simply agree with the A10 statement, while 24.19% for Romania and 50% for Cyprus completely agree with this statement. Figure 2.1 shows the comfort felt by older people when communicating over the Internet for each pilot.

Table 2.1 Comfort felt by older people when communicating over the Internet

A10: "I feel comfortable communicating with caregivers/medical staff/family or other people via the Internet"									
1		**2**		**3**		**4**		**5**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
12 (19.35%)	1 (8.33%)	9 (14.52%)	0 (0%)	8 (12.90%)	2 (16.67%)	18 (29.03%)	3 (25%)	15 (24.19%)	5 (50 %)
13 (17.56%)		9 (12.16%)		10 (13.51%)		21 (28.37%)		20 (27.02%)	

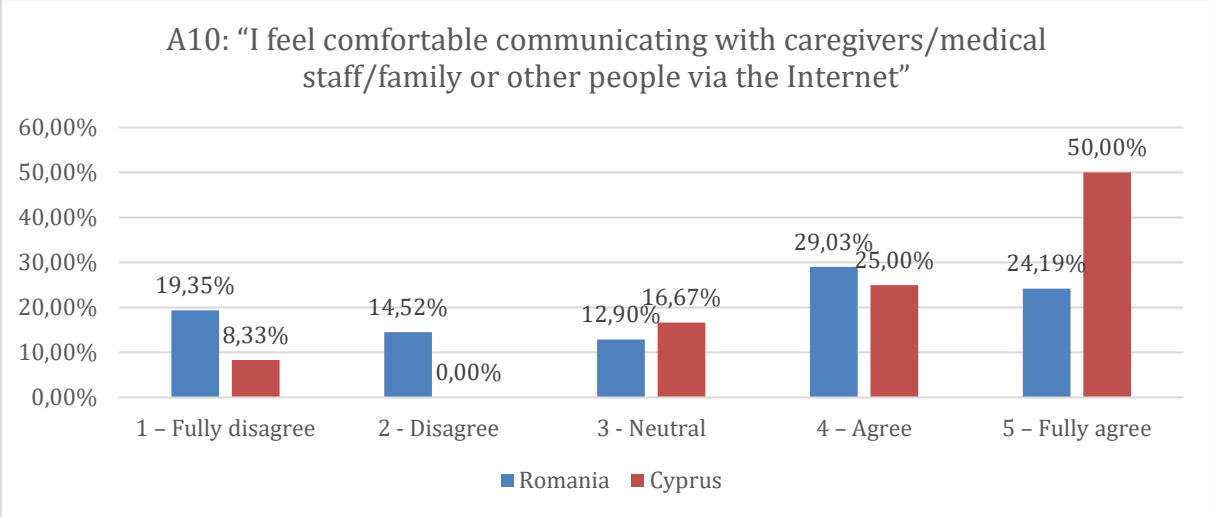

Figure 2.1 Comfort felt by older people when communicating over the Internet

Older people experience a higher degree of safety when interacting more often with carers, family members etc. There are many ways to interact, directly, online, through intermediaries, etc. Direct audio / video communication via Internet, especially with medical or care staff, has until recently been a difficult option to implement, especially in the case of older people. The emergence of intelligent mobile devices has made it possible to popularize the communication through specific application via Internet,

their model being successfully implemented at the level of the doctor / caregiver-patient interaction. The advantages are multiple: low cost, more availability of the doctor / caregiver, home consultations, patient observation in the natural environment etc. Table 2.2 shows the availability of the majority of the elderly in the two pilots, to interact online with the medical staff. Thus, 32.26% of the respondents agree and 24.19% totally agree with this facility, while for Cyprus there is a 33.33% for those who agree and 33.33% for those who have expressed their total agreement.

For the successful adoption of the vINCI platform, developers must provide tools, protocols and technical support to perform the audio / video / data communication between patients and doctors / caregivers in good and intuitive conditions. Figure 2.2 shows the results about online interaction with medical staff for each pilot.

Table 2.2 Results about online interaction with medical staff

A11: "I would prefer to go online to interact more often with medical staff"									
1		**2**		**3**		**4**		**5**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
12 (19.35%)	1 (8.33%)	6 (9.68%)	1 (8.33%)	9 (14.52%)	2 (16.67%)	20 (32.26%)	4 (33.33%)	15 (24.19%)	4 (33.33%)
13 (17.56%)		7 (9.45%)		11 (14.86%)		24 (32.43%)		19 (25.67%)	

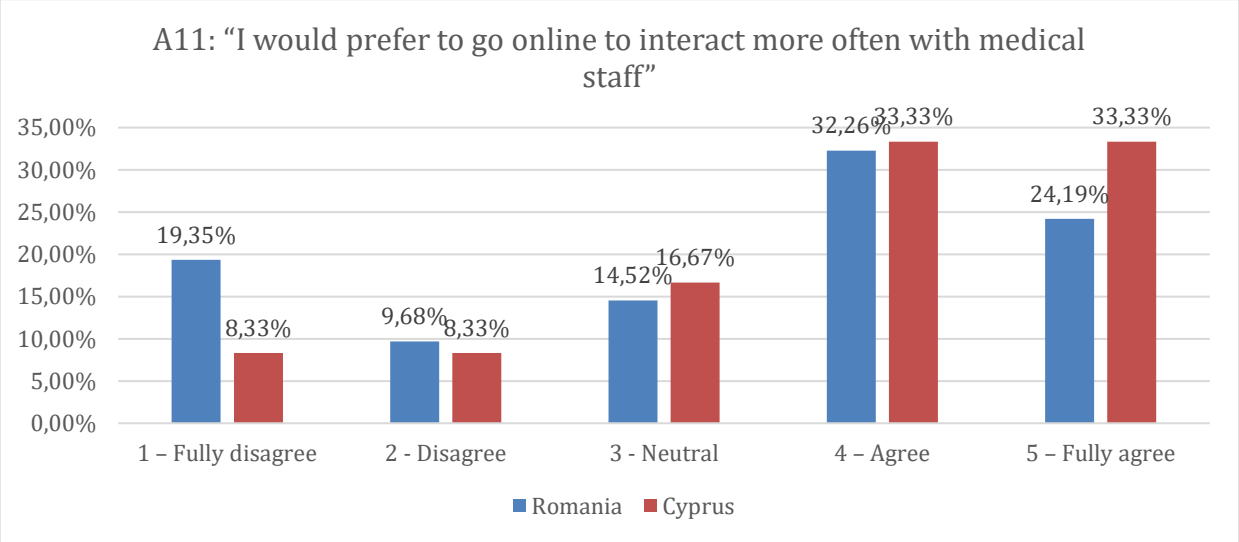

Figure 2.2 Results about online interaction with medical staff

Online interaction with the medical staff involves the provision of medical advice and personalized interventions in the patient's natural environment. The results presented in Tables 2.2 and 2.3 indicate a clear option of the elderly to interact online with the medical staff and obtain personalized information at home. Thus, 40.32% of the respondents in Romania and 58.33% in Cyprus want a platform through which they can communicate online with the medical staff and through which they can receive personalized advices on improving health, physical condition or social interaction. Figure 2.3 shows the acceptance to receive medical personalized advices through the Internet for each pilot.

Table 2.3 Acceptance to receive medical personalized advices through the Internet

A12: "I would like to receive medical personalized and professional advice through the Internet"									
1		**2**		**3**		**4**		**5**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
6 (9.68%)	0 (0%)	4 (6.45%)	0 (0%)	8 (12.90%)	1 (8.33%)	19 (30.65%)	4 (33.33%)	25 (40.32%)	7 (58.33%)
6 (8.10%)		4 (5.40%)		9 (12.16%)		23 (31.08%)		32 (43.24%)	

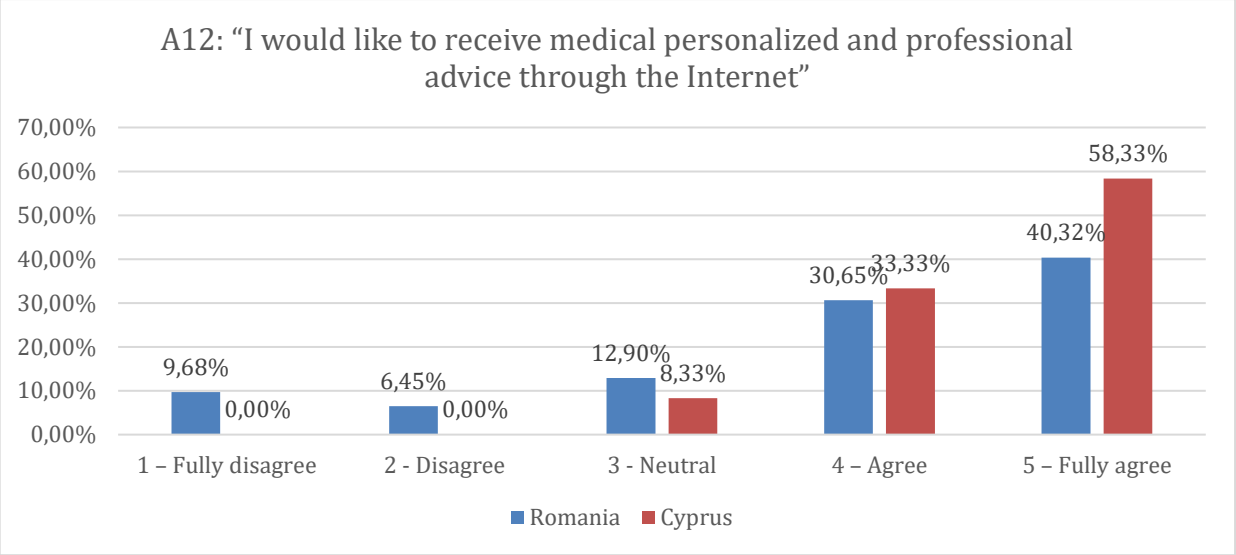

Figure 2.3 Acceptance to receive medical personalized advices through the Internet

PART B - User preferences, Needs and Requirements regarding the vINCI environment

The section "User preferences, Needs and Requirements regarding the vINCI environment" provides the results of the second part of the patient (elderly) requirements questionnaires. In this section there are gathered preferences, needs and requirements of the participants regarding vINCI environment.

Users' technological preferences

In this category there are collected **answers about the users 'preferences regarding a series of functionalities based on intelligent technologies, specific to health monitoring or medical assistance systems.** A high degree of utility from the user perspective led to the formalization of user requirements, that were the basis for designing the vINCI platform.

Monitoring the health parameters through intelligent technologies (wearable sensors, IoT, etc.) is an important step in the early detection of health problems. Thus, the health parameters are automatically monitored at home without influencing the patient's daily activities. A major advantage of remote health monitoring is the increased comfort for the patient and a reduction of medical service needs.

The participants in the two pilot studies had the opportunity to express their degree of satisfaction regarding the possibility of a system to carry out a continuous

monitoring of the health status through the technologies. This function was considered particularly useful by 40.32% of the study participants in Romania and by 50% of the participants in Cyprus. The complete results obtained in the two pilot studies are shown in Table 2.4. Figure 2.4 shows the user satisfaction in using the health monitoring feature through intelligent technologies for each pilot.

Table 2.4 User satisfaction in using the health monitoring feature through intelligent technologies

B1: "Continuous health monitoring through smart technologies"									
1		**2**		**3**		**4**		**5**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
5	0	1	0	2	2	29	4	25	6
8.06%	0%	1.61%	0%	3.23%	16.67%	46.77%	33.33%	40.32%	50%
5 (6.75%)		1 (1.35%)		4 (5.40%)		33 (44.59%)		31 (41.89%)	

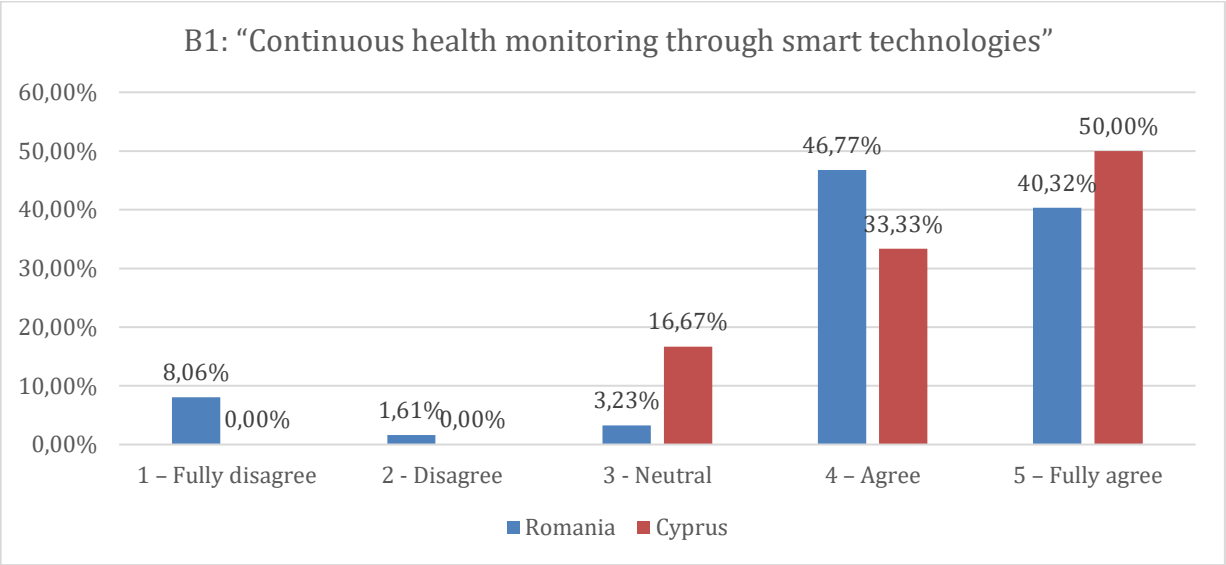

Figure 2.4 User satisfaction in using the health monitoring feature through intelligent technologies

2.3 Creation of participative interfaces, starting also from the feedback obtained from the studies

2.3.1 Basic components of participatory interfaces

The information that guided the development of vINCI interface (Dashboard - UI) is presented as follows. The Homepage of the Dashboard is presented in Figure 2.5.

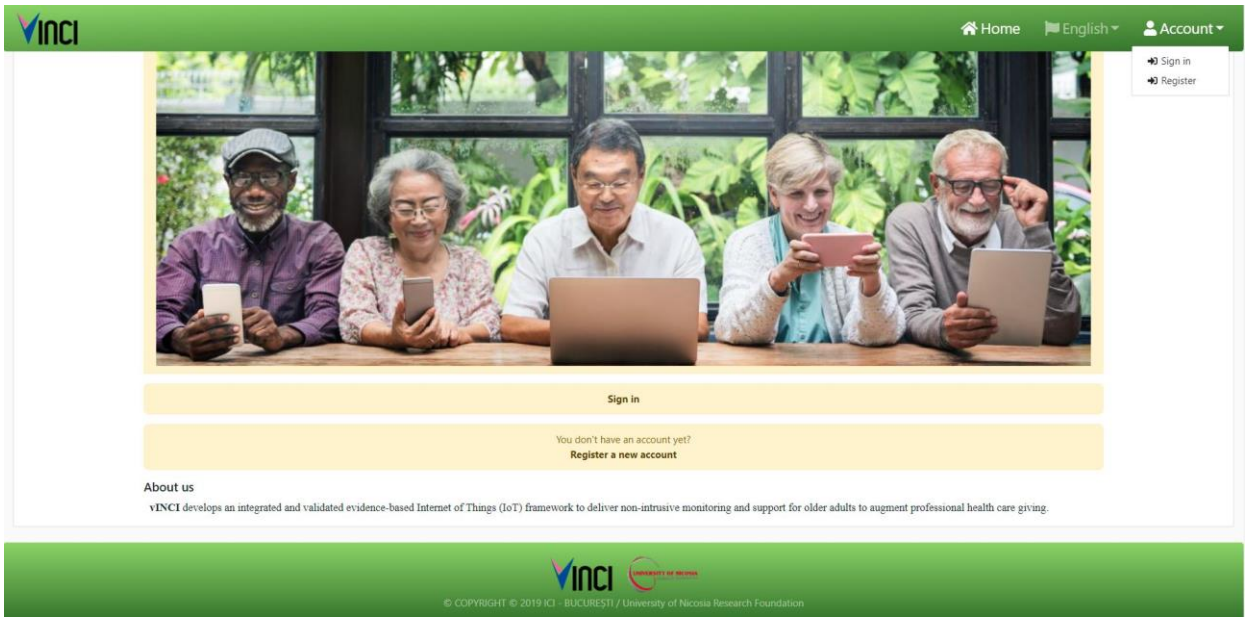

Figure 2.5 Homepage

The vINCI UI can be separated into 2 domains: public and private.

Public domain

Public domain refers to any pages that are accessible without requiring any login. Such pages are: login screen and register screen.

1. Login screen

This includes a form with fields for username and password and buttons for login, register and recover password. The form has validation for empty username and password fields. If login is unsuccessful, the user is presented with a corresponding error message. Upon successful login, the user is redirected to its homepage. The Sign In Page is presented in Figure 2.6.

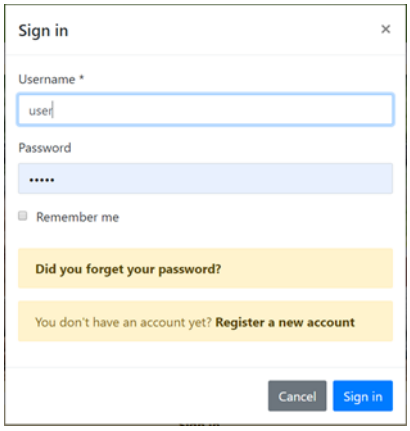

Figure 2.6 Sign In Page

2. Register screen

This includes a form with fields for first name, last name, email, password and password confirmation. The form has validation for required fields, valid email, valid

password and password matching. Upon registering the user is sent an email with a confirmation link and is redirected to the login page with a message to check his email.

The email link takes the user to the login page and automatically sends a message to the server to confirm the account. The user is presented with a confirmation message, as well. The Register Page is presented in Figure 2.7.

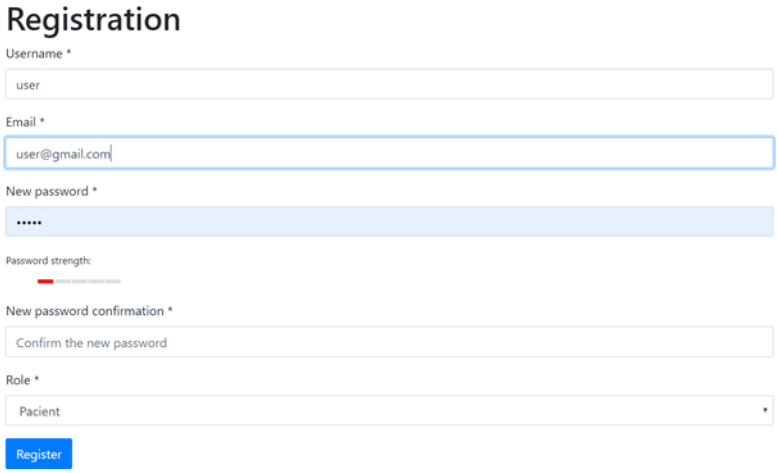

Figure 2.7 Register Page

3. Recover password

From the login screen, the user can fill in just the username and request a password recovery. He is sent an email with a reset password link. The link takes the user to a password reset page with a form with 2 fields: password and password confirmation. The form has validation, similar to the registration form. Once the password is reset, the user is taken to the login screen and shown a confirmation message.

Private domain

These are pages that require a login. The pages can be different according to the user type / role.

The available user roles are:

- Patient;
- Family;
- Organization;
- System administrator.

1. Patient

The main page is a dashboard that includes all the user main information: devices status, notification / alerts / events (basic and aggregated). By basic we mean per device and by aggregated we mean information generated by aggregating data from multiple devices (e.g., is the patient lazier than normal - info from watch, insole and maybe indoor cameras).

The devices page has as main content a table for all the user's devices. Each row includes the device id, UUID, name, description, alerts and maybe last sent data. Each

row can be clicked and the device edited or removed. The table has sort by name and UUID and search filtering for name, UUID and description. Also, there exists an add button to add new devices. This presents the user with a pop-up form where he can define the device name, description, UUID. The form has validation and the user is presented with error/success messages.

The account page includes info about the user: first name, last name, address, phone. This is editable. The form has validation and the user is presented with error / success messages. It also includes a user UUID that the user can share with anybody that has a Family account. Using this UUID, a Family user can add the user to his account to monitor it. Figure 2.8 presents the User Details Page resulted after editing information about the user in the account page.

Figure 2.8 User Details Page

2. Family

This is can monitor multiple Patient users.

The main page is a dashboard that presents info about all the associated users. This can be a grid of user 'cards', where each card includes: user name, user status (status of different evaluations can be represented with icons or smileys), user alerts / notifications / events.

The user page is a user dashboard with more details. This can be the same dashboard as the Patient user sees.

The account page includes info about the user: first name, last name, address, phone. This is editable. The form has validation and the user is presented with error / success messages.

The family does not manage devices.

3. Organization

This can be an institution / asylum that can monitor its patients.

The main page is a dashboard that presents the latest alerts / notification / events.

The user page has as main content a list of the organization's users. Each row includes the user id, UUID, name, description, number of devices (upon hover or click, a list of the user's devices is shown). Each row can be clicked and the user edited or removed. The table has sort by name and UUID and search filtering for name, UUID and description. There also exists a link / button on each row to open the user's dashboard and the list of devices.

Also, there exists an add button to add new users. This presents the user with a pop-up form where he can define the user's name, description. The form has validation and the user is presented with error / success messages. The form gives a 'generate user account' checkbox for the 2 cases:

- Patient that is not interested to have an account and no family that wants to monitor him – in this case the email address is optional;
- Patient wants to have an account and / or the family wants to monitor him - in this case the email address is required and the user is activated only after he confirms with a link sent on his email.

The devices page has as main content a table for all the users' devices. Each row includes the device id, UUID, name, user name, description, alerts and maybe last sent data. Each row can be clicked and the device edited or removed. The table has sort by name, UUID, user name and search filtering for name, UUID, user name and description.

Also, there exists an add button to add new devices. This presents the user with a pop-up form where he can define the device name, description, UUID and choose the associated user. The form has validation and the user is presented with error / success messages.

The user dashboard is the same as the dashboard of a Patient.

The account page includes info about the organization: name, address, phone. This is editable. The form has validation and the user is presented with error / success messages.

4. System administrator

This user only has management capabilities. He shouldn't have and doesn't need to have access to dashboards with device data, aggregated data etc.

The organizations page has as main content a table for all the organizations. Each row includes the organization id, name, description, number of users and number of devices. Each row can be clicked and the device edited or removed. The table has sort by name and search filtering for name.

The table has links / buttons to show the list of users and devices of the selected organization.

Also, there exists an add button to add new organizations. This presents the user with a pop-up form where he can define the organization name, description and email. The form has validation and the user is presented with error / success messages.

Upon adding a new organization, an email is sent to that organization to confirm its account.

The user page has as main content a list of all the users. Each row includes the user id, UUID, name, description, number of devices (upon hover or click, a list of the user's devices is shown), organization name. Each row can be clicked and the user edited or removed. The table has sort by name, UUID and organization name and search filtering for name, UUID, organization name and description. There also exists a link/button on each row to open the list of devices.

Also, there exists an add button to add new users. This presents the admin with a pop-up form where he can define the user's name, description, email (optional) and choose the associated organization. The form has validation and the admin is presented with error / success messages.

The devices page has as main content a table for all the users' devices. Each row includes the device id, UUID, name, user name, organization name, description, alerts and maybe last sent data. Each row can be clicked and the device edited or removed. The table has sort by name, UUID, user name, organization name and search filtering for name, UUID, user name, organization name and description.

Also, there exists an add button to add new devices. This presents the admin with a pop-up form where he can define the device name, description, UUID and choose the associated user. The form has validation and the admin is presented with error / success messages.

2.3.2 User satisfaction in the use of vINCI components and technologies

In the following, there are presented and analysed the results regarding the degree of user satisfaction in the use of vINCI components and technologies. This result is part of a larger study conducted in the Romanian and Cyprus pilot, who tested a series of components and technologies resulting from the project and whose results are going to be presented in subsequent studies. The users' satisfaction survey results corroborated with the results of another study on the evaluation of the usability of the vINCI mobile app by a group of experts, allowed developers to improve the interfaces and functions of the entire vINCI system, to finally deliver a product mapped to users' needs, market requirements and the results proposed in the project financing application. Consequently, this activity is structured in two main parts:

- Part 1: Analysis of the results obtained following the study on the degree of users' satisfaction who tested in a controlled framework the components and technologies developed within the vINCI project;

- Part 2: Formative evaluation of the usability of the vINCI system based on testing by a group of experts.

The final conclusion of this activity is a consolidation of the results of the two studies conducted over the pilot in the project, thus providing in an extremely clear way the necessary directions to improve the participatory interfaces and functions of the vINCI system.

Procedure

Measuring user satisfaction is of great importance to any future improvements of the vINCI technologies. The process of measuring user satisfaction is performed in three stages. **In the first stage**, the users from the target group have access to the services and technologies developed within the vINCI project. The testing of these technologies and services is carried out under medical supervision, within the Institute of Geriatrics and Gerontology "Ana Aslan" (NIGG) for Romania and UNRF for Cyprus. Users, independently or with NIGG / UNRF support, mainly use the vINCI mobile application together with intelligent devices for monitoring bio-medical parameters. Here we refer especially to the smart insoles and to the monitoring technologies based on smart watches developed both within the project (CMD Smart watch) and taken over from other companies (FITBIT). The obtained results are corroborated with the results obtained from completing the questionnaires regarding the quality of life or measuring the level of physical activity, thus obtaining a score that indicates the evolution of the monitored parameters.

During **the second phase**, users are invited to complete a user satisfaction survey that provides valuable insight into the real experience of users interacting with the vINCI services and technologies. In **the final phase**, the survey responses are evaluated and the degree of acceptance of the technology is studied. Users ’opinions on aspects that may be improved are gathered.

In section above, the methods for measuring user satisfaction in using vINCI technologies are defined. This section describes the main tool used to efficiently collect data from users. For this study, a questionnaire was developed.

This questionnaire is needed to understand if and how a user could be satisfied with the vINCI technologies or service they are using. Versions of the questionnaires in English, Romanian, Italian and Greek were developed, these being available in electronic and printable version. As follows, only the answers received within the **Romanian pilot**, coordinated by the NIGG partner, and the **Cyprus pilot**, coordinated by UNRF partner are analysed and presented.

The satisfaction questionnaire (see Annex 2 -English version and Annex 3 - romanina version) is divided into two parts. The first part of the questionnaire (part I) refers to some demographic data and the frequency of using vINCI mobile application. The second part of the questionnaire (part II) gives to developers a much more detailed

picture of users' experience regarding the vINCI environment. The information collected allowed developers to improve the prototype of the vINCI system, so that the final version of the system can obtain a maximum degree of satisfaction from users when using it intensively. In Romania, the **NIGG partner** is responsible for the implementation of this questionnaire and the collection of results, and in Cyprus, the **UNRF partner**.

vINCI Satisfaction Questionnaire Results Analysis

In order to measure the degree of user satisfaction regarding the use of vINCI technology and services, one questionnaire, divided into two parts, was developed (in line with the objectives of vINCI project) as follows:

- Part I – Demographic, Frequency of using the vINCI application;
- Part II – Interaction with all vINCI devices.

Part I - Demographic, Frequency of using the vINCI application

This section provides the results of the first part of the satisfaction questionnaires. The next sub-sections provide and analyse the results collected about demographic and frequency of using the vINCI application.

Demographic data

This study provides researchers with demographic data that help them better understand the impact of vINCI technology on both age and gender. Table 2.5 provides demographic information about the elderly from Romanian and Cyprus pilots, participants in the satisfaction measuring surveys.

Table 2.5 Elderly Users participated in satisfaction measuring surveys

Demographic data						
Elderly population	**Romania**		**Cyprus**		**Total Elderly**	
Number of participants	60		20		80	
Gender	M: 23 (38.3%)	F: 37 (61.7%)	M: 9 (45%)	F: 11 (55%)	M: 32 (40%)	F: 48 (60%)
Average age	71,48		73.65		72.56	
Level of education	Higher: 18 (30%) Secondary: 37 (61.7%) Others: 5 (8.3 %)		Higher: 7 (35%) Secondary:7 (35%) Others: 6 (30 %)		Higher: 25 (31.25%) Secondary: 44 (55%) Others: 11 (13.75 %)	
Range of Age	65-88					

As shown in the above table, in the two pilots, the majority of the study participants are women, 60% and the average age is 72.56. The level of education is high (per total participants), 86.25% of the respondents having higher and middle education (31.25% higher education, 55% secondary education). The distribution of the level of education by gender (Figure 2.9), underlines a higher level of education among the female population (in both pilots), which can be a positive factor in increasing the degree of

adoption of new technologies and therefore, the use in daily life of the vINCI application.

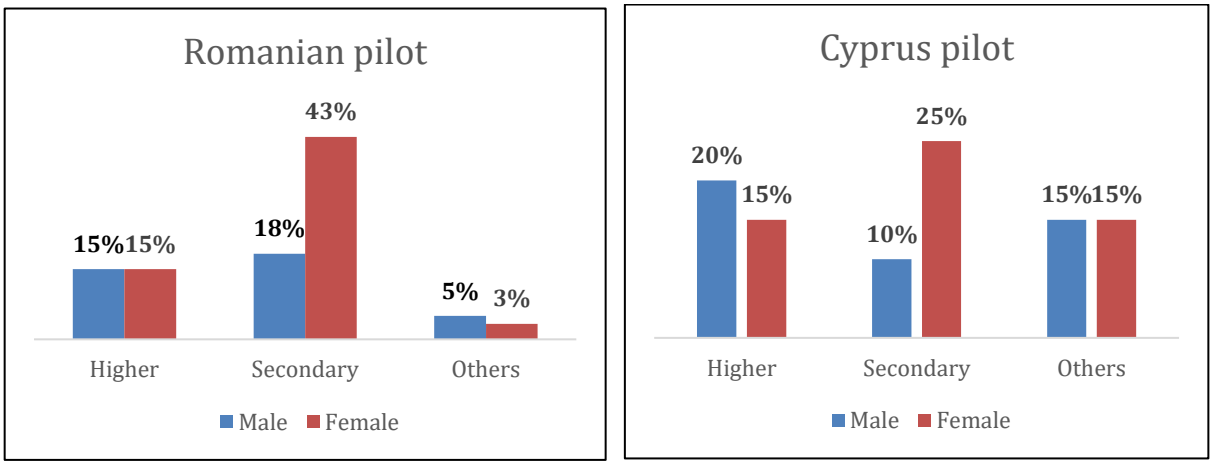

Figure 2.9 Distribution of education level by gender in Romania and Cyprus pilots

Next, we there are analyzed the users' answers regarding the frequency of use of the vINCI application, as well as the distribution of the answers according to gender. Participants have the opportunity to indicate on a scale from 1 to 5, how often they use the vINCI application. The proposed scale measure has the following significance:

- 1 - means daily: study participants use Vinci app daily. The impact of these users is high;
- 2 - weekly: study participants use the vINCI application once or several times a week;
- 3 - monthly: study participants use the vINCI application once or several times a month;
- 4 – several times a year: study participants use the vINCI application once or several times a year.
- 5 - never: Users do not use the vINCI application.

Table 2.6 Frequency of use of the vINCI application

I-1: "Frequency of use vINCI app"									
1 - Daily		**2 - Weekly**		**3 - Monthly**		**4 – Several times a year**		**5 - Never**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
40	20	10	0	9	0	1	0	0	0
66,67%	100%	16.67%	0%	15%	0%	1.67%	0%	0%	91.67%
60 (75%)		10 (12.5%)		9 (11.25%)		1 (1.25%)		0 (0%)	

We can observe from Table 2.6 an intensive use of the vINCI application, the number of those who use this application daily being almost 75% at the level of the two pilots and 100% within the Cyprus pilot. These results reinforce the scientific validity of the entire questionnaire and provide a pertinent view of the functions offered by the vINCI application and its impact on users. The distribution of the answers offered for the two pilots is represented graphically in Figure 2.10.

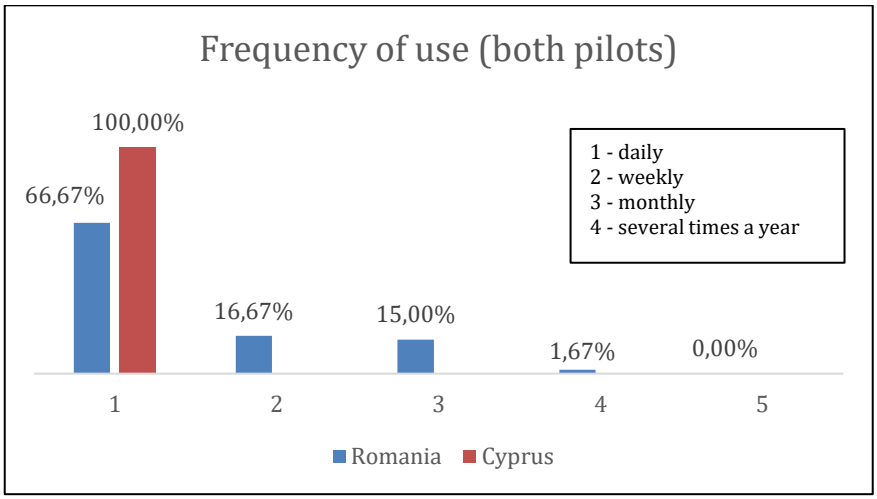

Figure 2.10 Frequency of use of the vINCI application in Romania and Cyprus pilots

At the gender distribution made in Table 2.7, close values can be observed at the level of daily use, both for male and female users, the balance being more pronounced towards female users when we refer to the other frequency ranges in use.

Table 2.7 Frequency of use of the vINCI application by gender in Romania and Cyprus pilots

	Romania				Cyprus			
	M		F		M		F	
1	18	**30%**	22	**36.6%**	9	**45%**	11	**55%**
2	2	**3%**	8	**13.33%**	0	**0%**	0	**0%**
3	2	**3%**	7	**11.66%**	0	**0%**	0	**0%**
4	1	**1.6%**	0	**0%**	0	**0%**	0	**0%**
5	0	**0%**	0	**0%**	0	**0%**	0	**0%**

In the second part of the questionnaire, there were formulated 19 statements covering all areas of intervention of the vINCI application, users being invited to express their agreement or disagreement with them.

The participants in this study had the possibility to indicate on a scale from 1 to 5 if they agree or disagree with a number of statements regarding the interaction with the vINCI application. The proposed scale measure has the following significance:

- 1 - fully disagree: users categorically reject the statement without the possibility of changing the adopted position;
- 2 - disagree: users reject the statement, but do not exclude a future reconsideration of the options if something is changing according to the users' expectations;
- 3 - neutral: the impact is minimal on users;
- 4 - agree: users agree with this statement, but expect some aspects of the interaction with the vINCI application to be improved.
- 5 – fully agree: Users fully agree with the statement without any comments.

Interaction with all vINCI devices

II-1 It is easy to learn how to work with the vINCI application

Learnability is one of the five quality components of usability (the others being efficiency, memorability, errors, and satisfaction). Testing learnability is especially valuable for complex applications and systems that users access frequently, though knowing how quickly users can acclimate to your interface is valuable for even objectively simple systems. In this study, users of both pilots found it easy to learn how to work with the vINCI application (63.33% of users in Romania and 85% in Cyprus agree with statement II-1). However, there is a cumulative percentage of 12.5% of users who are neutral and disagree with the ease of learning how to interact with the vINCI application. In this case, additional studies are needed to identify the causes and improve the interfaces or how to interact with them. Figure 2.11 shows the distribution of answers for each pilot.

Table 2.8 Easy to learn how to work with the vINCI application

II-1: "It is easy to learn how to work with the vINCI application"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	2	0	6	2	38	17	14	1
0.00%	0.00%	3.33%	0.00%	10.00%	10.00%	63.33%	85.00%	23.33%	5.00%
0(0%)		2(2.5%)		8(10%)		56 (74%)		15 (18.75%)	

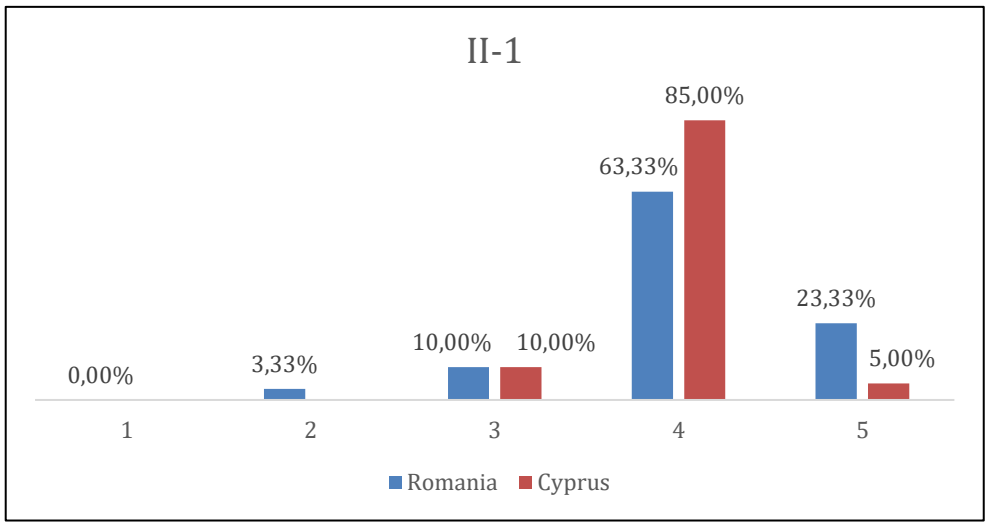

Figure 2.11 Graphical representation of the results for statement II-1

II-2 The vINCI application is easy to use

The vast majority of users consider the vINCI application to be easy to use. 86.25% of the cumulative answers on the two pilots agree and totally agree with the statement II-2. Only 5% of users find certain aspects of the application difficult to use, which overall confirms the efforts of developers to make a useful and easy to use application. Figure 2.12 shows the distribution of answers for each pilot.

Table 2.9 Answers to the statement "The vINCI application is easy to use"

II-2: "The vINCI application is easy to use"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	3	1	6	1	35	17	16	1
0.00%	0.00%	5.00%	5.00%	10.00%	5.00%	58.33%	85.00%	26.67%	5.00%
0		4		7		52		17	
0.00%		5.00%		8.75%		65.00%		21.25%	

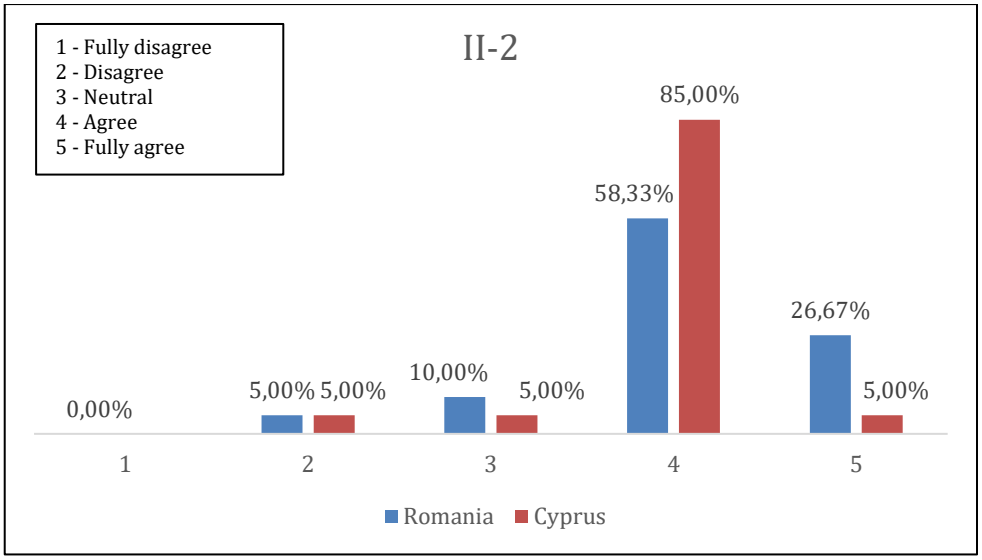

Figure 2.12 Graphical representation of the results for statement II-2

II-3 Using the vINCI app, I am better informed about my health

The statement II-3 is based on one of the major objectives of the entire vINCI project, which aims to provide real-time information about the user's health through innovative technologies (smart devices, mobile application, etc.). According to the study, this goal has been partially achieved. The answers indicate that users agree with statement II-3 in the Romanian pilot (56.67% agree and 20% fully agree) and not at all in the Cyprus pilot. Coupled with a high percentage of neutral opinions (95% Cyprus), the result for all two pilots remains modest, requiring further development efforts. Figure 2.13 shows the distribution of answers for each pilot.

Table 2.10 Answers to the statement "Using the vINCI app, I am better informed about my health"

II-3: "Using the vINCI app, I am better informed about my health"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
1	0	0	1	13	19	34	0	12	0
1.67%	0.00%	0.00%	5.00%	21.67%	95.00%	56.67%	0.00%	20.00%	0.00%
1		1		32		34		12	
1.25%		1.25%		40.00%		42.50%		15.00%	

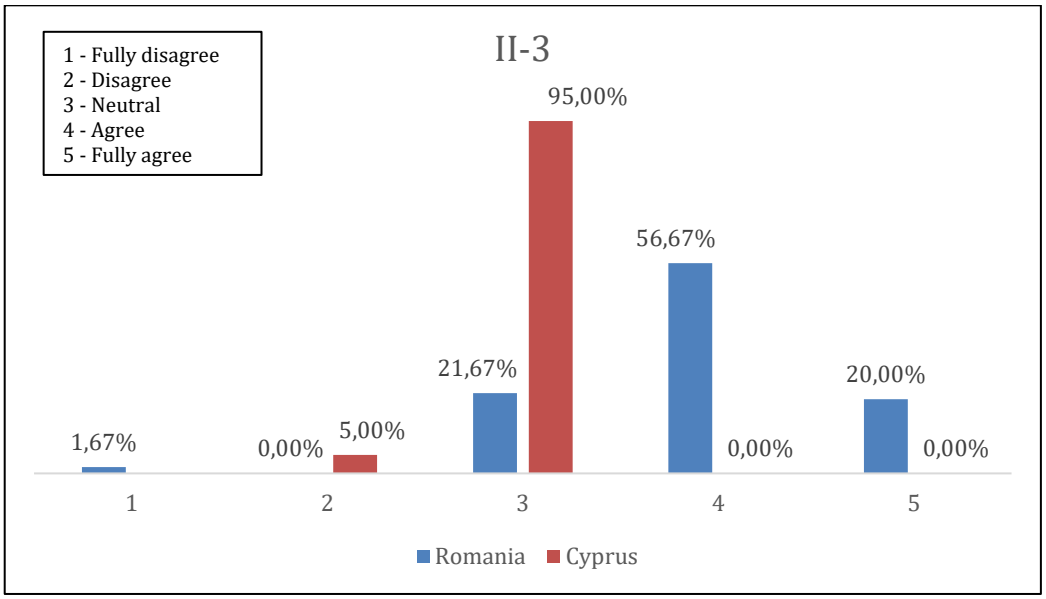

Figure 2.13 Graphical representation of the results for statement II-3

II-4 My security level has improved using the vINCI application

The degree of security perceived by users after using the vINCI application and related technologies, is another important objective that is to be achieved in the vINCI project. In this study, statement II-4 was designed precisely to measure the extent to which this goal was achieved. The answers indicate that users agree with statement II-4 in the Romanian pilot (58.33% agree and 1.67% fully agree) and not at all in the Cyprus pilot. Coupled with a high percentage of neutral opinions (95% Cyprus), the results indicate that further efforts are needed to improve the functionality of the vINCI application. Figure 2.14 shows the distribution of answers for each pilot.

Table 2.11 Answers to the statement "My security level has improved using the vINCI application"

II-4: "My security level has improved using the vINCI application"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	5	1	19	19	35	0	1	0
0.00%	0.00%	8.33%	5.00%	31.67%	95.00%	58.33%	0.00%	1.67%	0.00%
0		6		38		35		1	
0.00%		7.50%		47.50%		43.75%		1.25%	

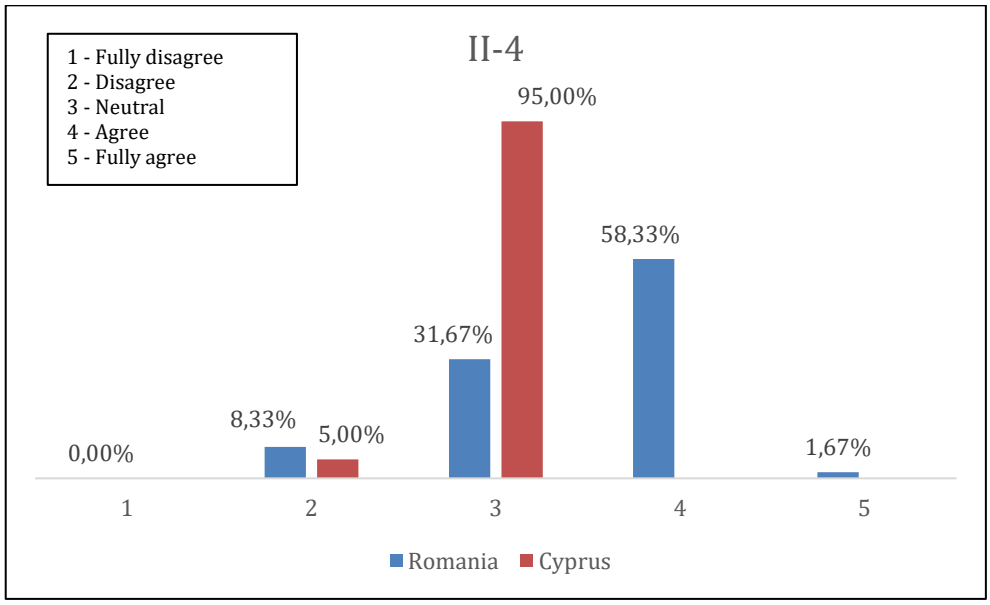

Figure 2.14 Graphical representation of the results for statement II-4

II-5 The vINCI application helps me to obtain relevant quality of life data

Measuring quality of life is an important parameter for estimating the outcomes of health care programs and interventions. Obtaining relevant data in this field is an important functionality of the vINCI application. Statement II-5 is agreed by over 58.75% of study participants, while 13.75% fully agree. However, there are notable differences between the answers provided by the Romanian pilot and the Cyprus pilot. These differences must be analyzed and reduced by identifying the reasons and taking appropriate measures to improve the application. Figure 2.15 shows the distribution of answers for each pilot.

Table 2.12 Answers to the statement "The vINCI application helps me to obtain relevant quality of life data"

II-5: "The vINCI application helps me to obtain relevant quality of life data"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
3	0	1	1	10	7	36	11	10	1
5.00%	0.00%	1.67%	5.00%	16.67%	35.00%	60.00%	55.00%	16.67%	5.00%
3		2		17		47		11	
3.75%		2.50%		21.25%		58.75%		13.75%	

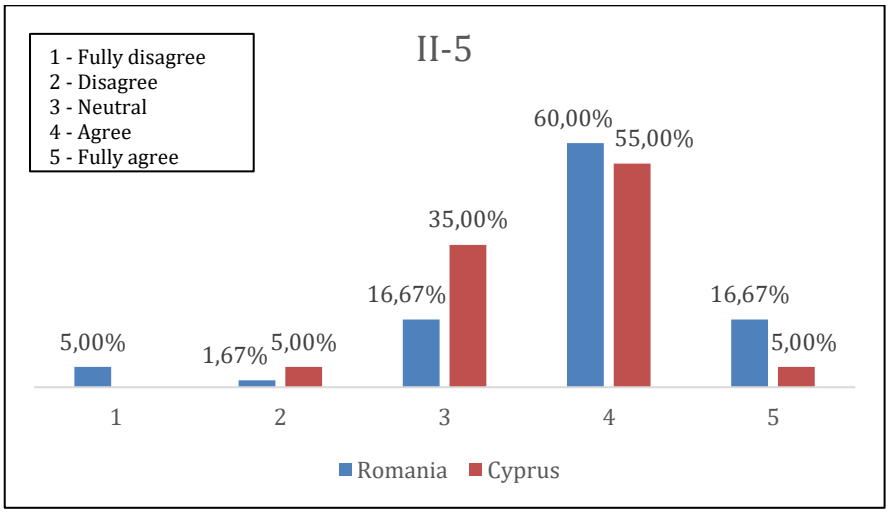

Figure 2.15 Graphical representation of the results for statement II-5

II-6 The vINCI application gives me the opportunity to more easily communicate data about my physical condition / quality of life

The vINCI application allows the collection and communication of data on user physical condition / quality of life. A majority percentage calculated at the level of the two pilots indicates that 57.50% of the participants in the study agree and 10% fully agree with statement II-6. Figure 2.16 shows the distribution of answers for each pilot.

Table 2.13 Answers to the statement "The vINCI application gives me the opportunity to more easily communicate data about my physical condition / quality of life"

II-6: "The vINCI application gives me the opportunity to more easily communicate data about my physical condition / quality of life"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
2	1	0	2	8	13	42	4	8	0
3.33%	5.00%	0.00%	10.00%	13.33%	65.00%	70.00%	20.00%	13.33%	0.00%
3		2		21		46		8	
3.75%		2.50%		26.25%		57.5%		10.00%	

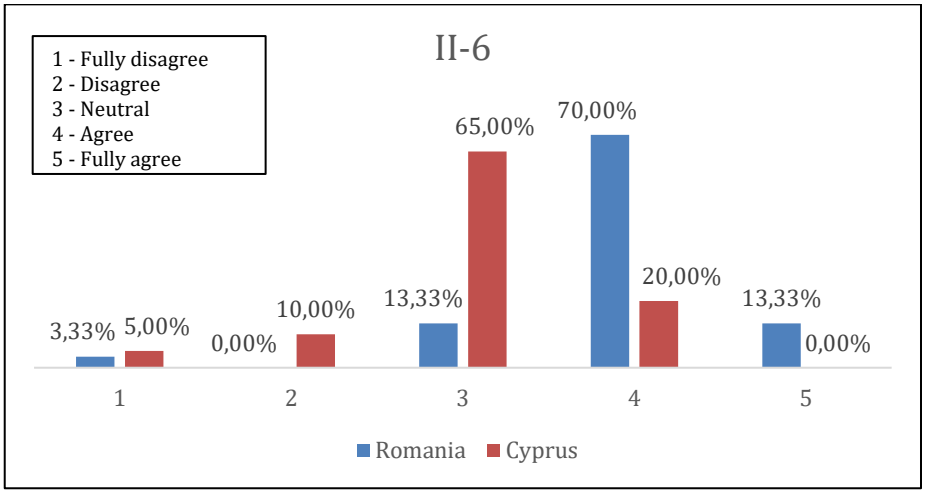

Figure 2.16 Graphical representation of the results for statement II-6

II-7: "The system interface is pleasant and intuitive"

According to the degree of acceptance of statement II-7, the vast majority of users consider the interface of the vINCI application pleasant and intuitive. Statement II-7 was agreed by 73.75% of study participants, 13.75% fully agreeing with it. Figure 2.17 shows the distribution of answers for each pilot.

Table 2.14 Answers to the statement " The system interface is pleasant and intuitive "

II-7: "The system interface is pleasant and intuitive"									
1 – Fully disagree		2 - Disagree		3 - Neutral		4 – Agree		5 – Fully agree	
Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus
2	0	0	1	7	0	41	18	10	1
3.33%	0.00%	0.00%	5.00%	11.67%	0.00%	68.33%	90.00%	16.67%	5.00%
2		1		7		59		11	
2.50%		1.25%		8.75%		73.75%		13.75%	

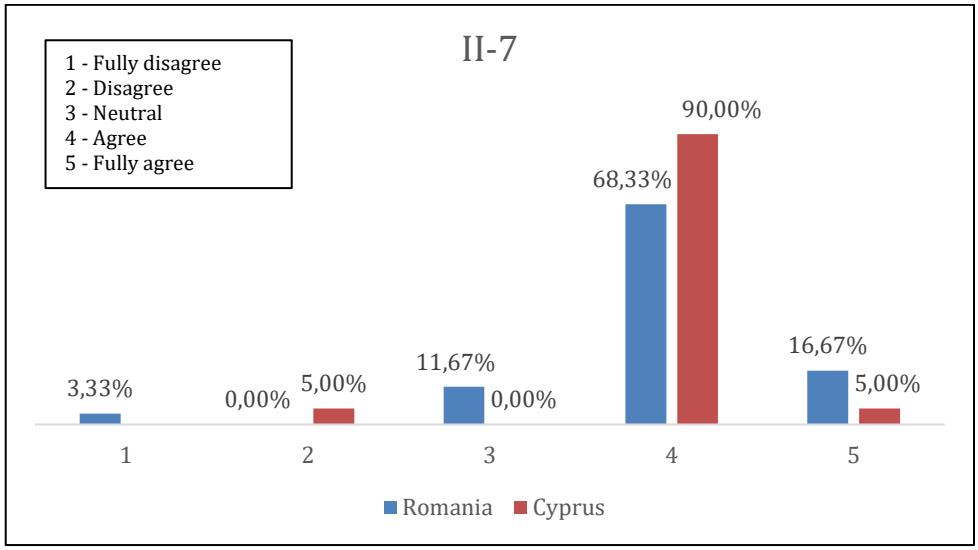

Figure 2.17 Graphical representation of the results for statement II-7

II-8: "The results provided by the application are easy to access and understand"

The information provided in the vINCI application is easy to access and understand. This statement was accepted by 70% of the participants in the study, 6.25% being totally in agreement with it. Figure 2.18 shows the distribution of answers for each pilot.

Table 2.15 Answers to the statement "The results provided by the application are easy to access and understand"

II-8: "The results provided by the application are easy to access and understand"									
1 – Fully disagree		2 - Disagree		3 - Neutral		4 – Agree		5 – Fully agree	
Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus
0	0	2	0	15	2	39	17	4	1
0.00%	0.00%	3.33%	0.00%	25.00%	10.00%	65.00%	85.00%	6.67%	5.00%
0		2		17		56		5	
0.00%		2.50%		21.25%		70.00%		6.25%	

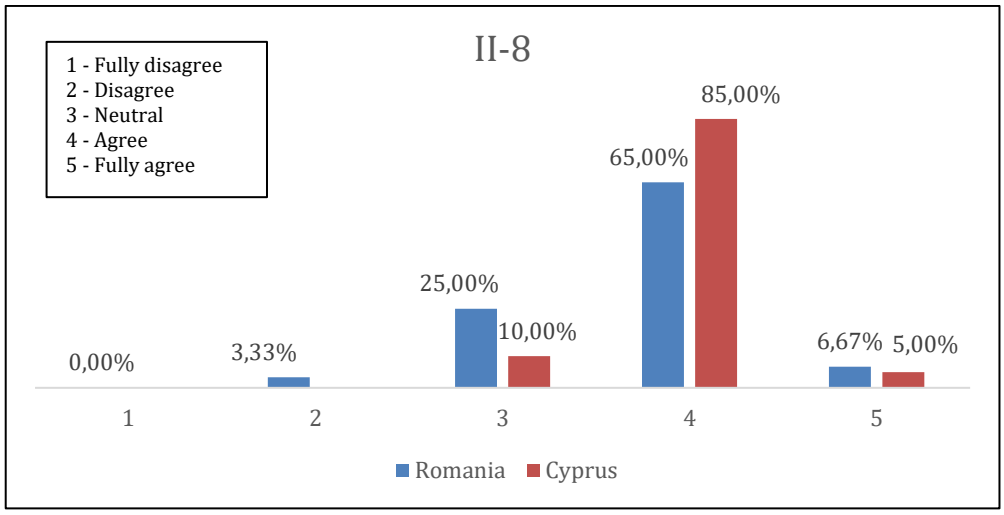

Figure 2.18 Graphical representation of the results presented for statement II-8

II-9: "I think I could improve my health using the vINCI app"

Another important objective of the vINCI project regarding the improvement of users' health by using the technologies developed within the vINCI project, was validated in the study by over 78% of participants, most agreeing with statement II-9 at the level of both pilots. Figure 2.19 shows the distribution of answers for each pilot.

Table 2.16 Answers to the statement „I think I could improve my health using the vINCI app"

II-9: "I think I could improve my health using the vINCI app"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
2	0	1	0	12	2	38	17	7	1
3.33%	0.00%	1.67%	0.00%	20.00%	10.00%	63.33%	85.00%	11.67%	5.00%
2		1		14		55		8	
2.50%		1.25%		17.50%		68.75%		10.00%	

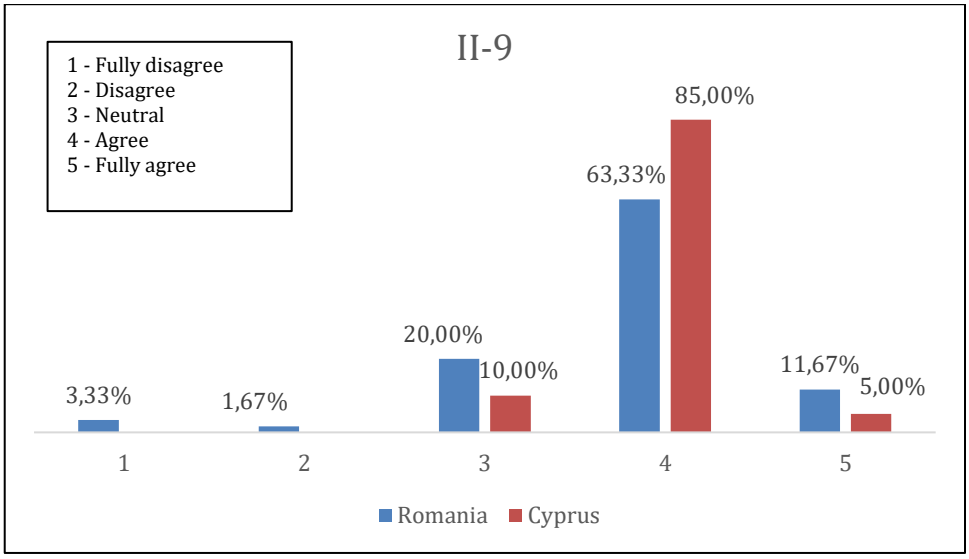

Figure 2.19 Graphical representation of the results for statement II-9

II-10: "The information provided by the vINCI application is complete and useful"

At the level of integrity and correctness of the information provided through the vINCI application, we have a percentage of 70% of the study participants who agree with statement II-10. However, 25% of participants preferred to express a neutral opinion, hence the need to identify the motivation behind these answers. Figure 2.20 shows the distribution of answers for each pilot.

Table 2.17 Answers to the statement "The information provided by the vINCI application is complete and useful"

II-10: "The information provided by the vINCI application is complete and useful"									
1 – Fully disagree		2 - Disagree		3 - Neutral		4 – Agree		5 – Fully agree	
Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus
0	0	1	0	16	4	42	14	1	2
0.00%	0.00%	1.67%	0.00%	26.67%	20.00%	70.00%	70.00%	1.67%	10.00%
0		1		20		56		3	
0.00%		1.25%		25.00%		70.00%		3.75%	

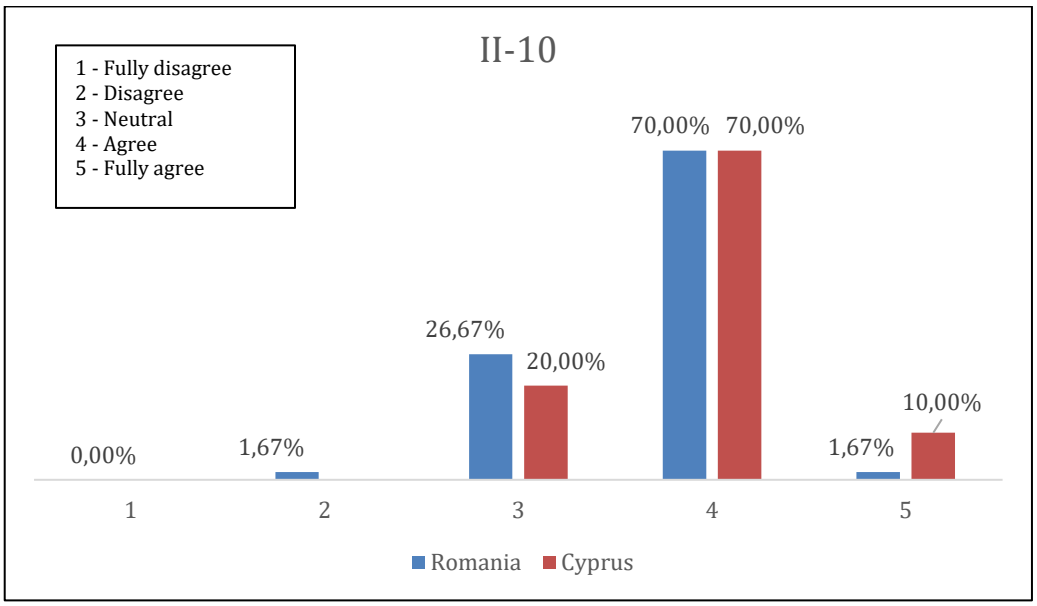

Figure 2.20 Graphical representation of the results for statement II-10

II-11: "The daily monitoring performed through the vINCI application does not interfere with my personal data"

The protection of personal data and respect for privacy are fundamental European rights that are stipulated in the European directives that are fully integrated into the national legislation of each Member State of the European Union. Within the vINCI project, the aim was to create products addressed to the global market that comply with these provisions. The participants in the study overwhelmingly confirmed over 90% that the functionalities of the vINCI application, especially those for monitoring bio-medical parameters respect the protection of personal data. Figure 2.21 shows the distribution of answers for each pilot.

Table 2.18 Answers to the statement "The daily monitoring performed through the vINCI application does not interfere with my personal data "

II-11: "The daily monitoring performed through the vINCI application does not interfere with my personal data"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	1	0	3	2	39	16	17	2
0.00%	0.00%	1.67%	0.00%	5.00%	10.00%	65.00%	80.00%	28.33%	10.00%
0		1		5		55		19	
0.00%		1.25%		6.25%		68.75%		23.75%	

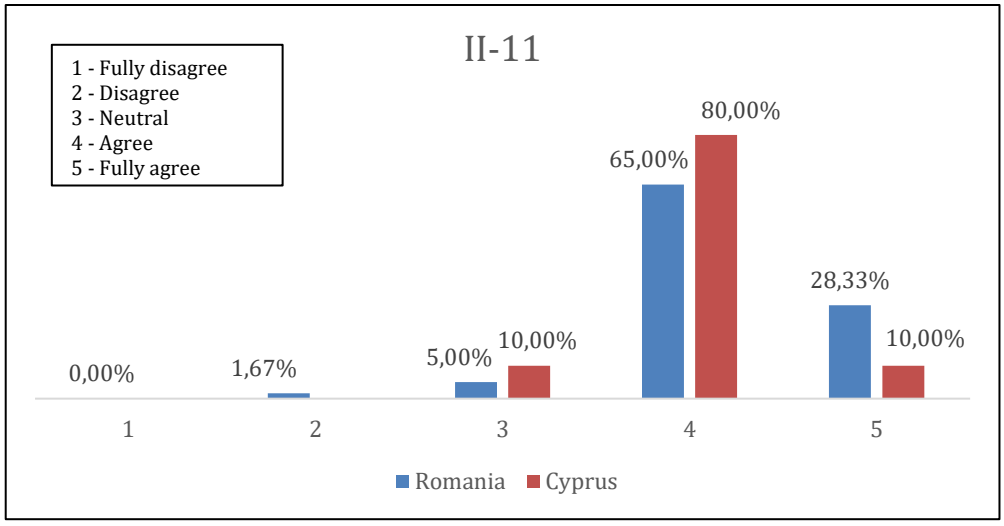

Figure 2.21 Graphical representation of the results for statement II-11

II-12: "The vINCI application has improved the quality of medical services received"

The impact of the vINCI application on the quality of medical services received by users is a defining element when designing the vINCI application. Currently, almost 60% of the study participants positively appreciate this impact, 31% having a neutral opinion. Under these conditions, it is necessary to improve the services provided within the vINCI application in order to maximize the impact on the quality of medical services received by users. Figure 2.22 shows the distribution of answers for each pilot.

Table 2.19 Answers to the statement "The vINCI application has improved the quality of medical services received"

II-12: "The vINCI application has improved the quality of medical services received"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
2	1	2	2	10	15	37	2	9	0
3.33%	5.00%	3.33%	10.00%	16.67%	75.00%	61.67%	10.00%	15.00%	0.00%
3		4		25		39		9	
3.75%		5.00%		31.25%		48.75%		11.25%	

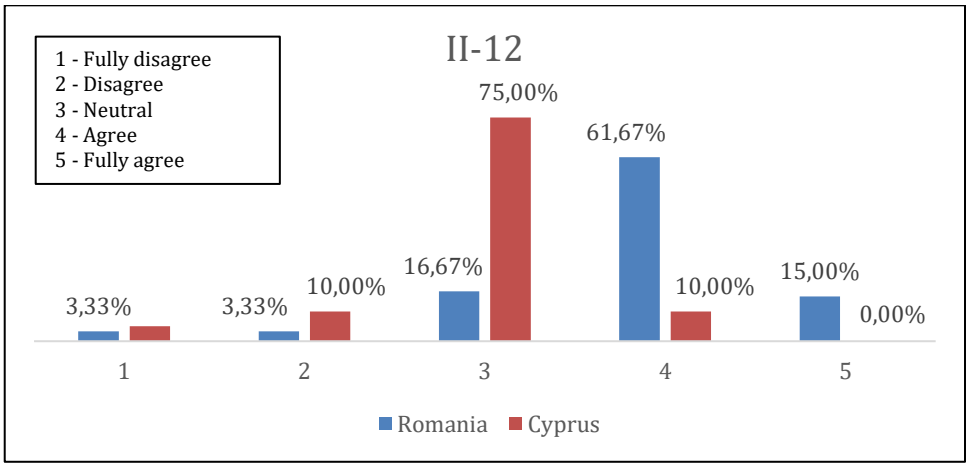

Figure 2.22 Graphical representation of the results for statement II-12

II-13: "The interaction with the vINCI application is clear and easy to understand"

According to ISO 9241-11: 2018 [ISO, 2018], the clarity and simplicity of interactions within an application helps make the messages clearer and meaningful to users. Over 87% of users consider the interaction with the vINCI application clear and easy to understand. Figure 2.23 shows the distribution of answers for each pilot.

Table 2.20 Answers to the statement "The interaction with the vINCI application is clear and easy to understand"

II-13: "The interaction with the vINCI application is clear and easy to understand"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	1	0	7	2	39	15	13	3
0.00%	0.00%	1.67%	0.00%	11.67%	10.00%	65.00%	75.00%	21.67%	15.00%
0		1		9		54		16	
0.00%		1.25%		11.25%		67.50%		20.00%	

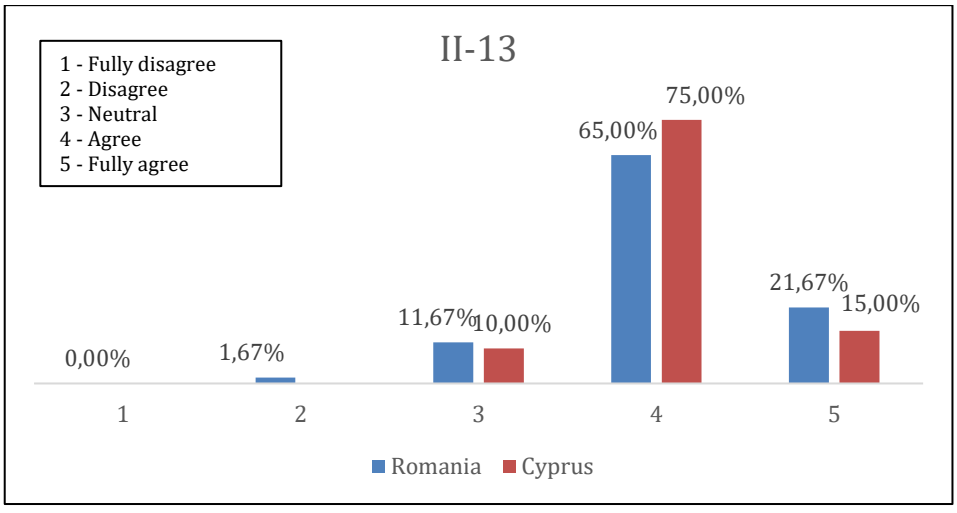

Figure 2.23 Graphical representation of the results for statement II-13

II-14: "The organization of the information on the screen of the devices running the vINCI application is clear and intuitive"

From the point of view of organizing the information within the vINCI application, over 83% of the participants in the study agreed and appreciated the way this information is organized and presented through the application interfaces. Figure 2.24 shows the distribution of answers for each pilot.

Table 2.21 Answers to the statement "The organization of the information on the screen of the devices running the vINCI application is clear and intuitive"

II-14: "The organization of the information on the screen of the devices running the vINCI application is clear and intuitive"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	0	0	11	2	42	16	7	2
0.00%	0.00%	0.00%	0.00%	18.33%	10.00%	70.00%	80.00%	11.67%	10.00%
0		0		13		58		9	
0.00%		0.00%		16.25%		72.50%		11.25%	

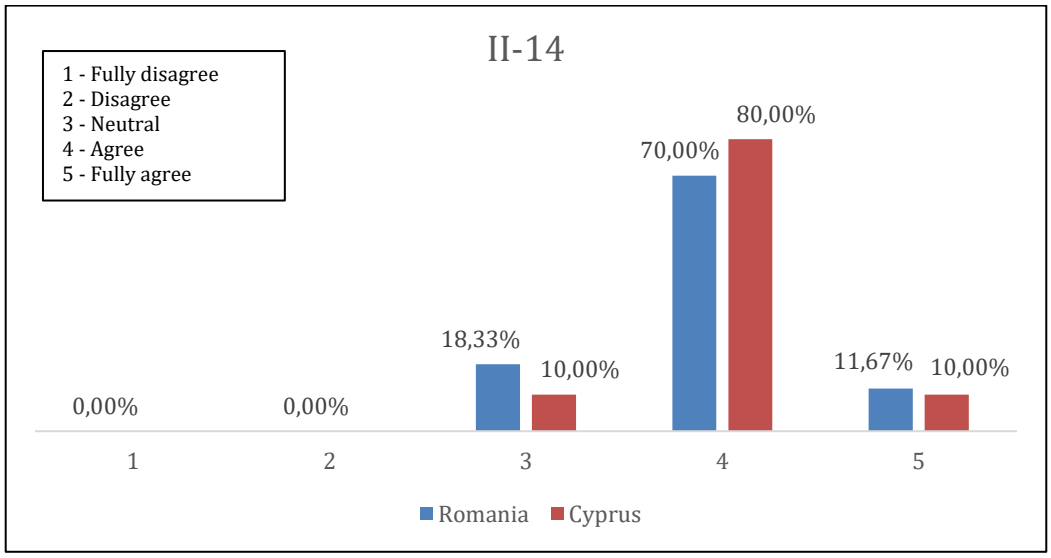

Figure 2.24 Graphical representation of the results for statement II-14

II-15: "The vINCI application is very useful for me in my daily life"

An important percentage of over 70% of the study participants consider the vINCI application very useful in their daily life. This percentage confirms the usefulness of the application and especially the fact that the vINCI project, through the proposed technologies, added value to the comfort, safety of the user in the daily activities carried out. In order to increase this weight, however, it is necessary a continuous improvement of the functionalities and the addition of new ones so that the vINCI application represents a product with a high degree of utility. Figure 2.25 shows the distribution of answers for each pilot.

Table 2.22 Answers to the statement "The vINCI application is very useful for me in my daily life"

II-15: "The vINCI application is very useful for me in my daily life"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
2	0	3	0	16	2	31	15	8	3
3.33%	0.00%	5.00%	0.00%	26.67%	10.00%	51.67%	75.00%	13.33%	15.00%
2		3		18		46		11	
2.50%		3.75%		22.50%		57.50%		13.75%	

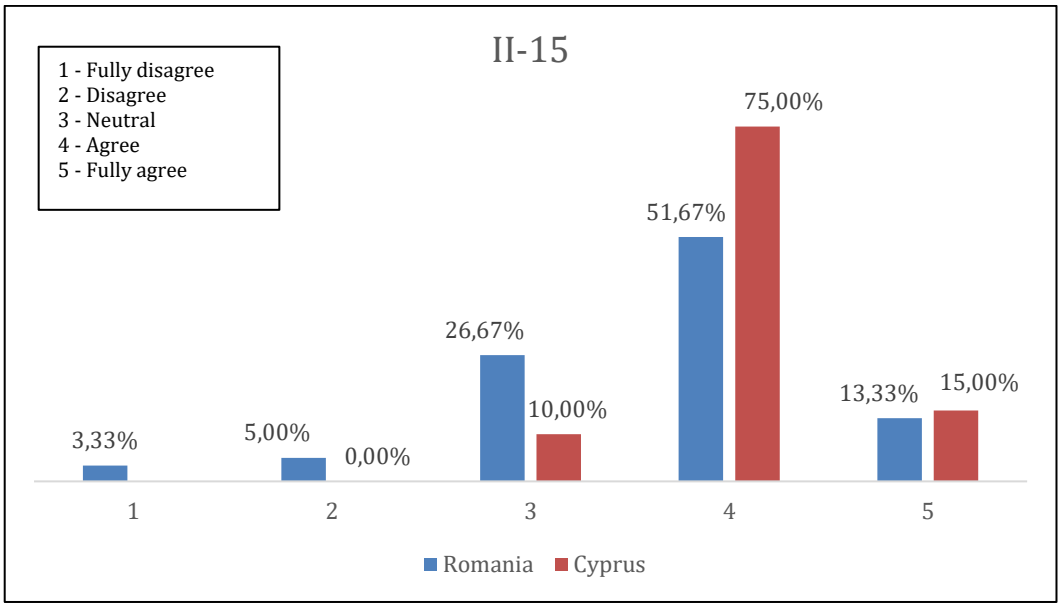

Figure 2.25 Graphical representation of the results for statement II-15

II-16: "Using the vINCI application is very exciting"

For almost 72% of the study participants, the vINCI application is considered interesting, which corroborated with the previous statement (II-15) results in an increased potential for popularization among users. Figure 2.26 shows the distribution of answers for each pilot.

Table 2.23 Answers to the statement "Using the vINCI application is very exciting"

II-16: "Using the vINCI application is very exciting"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	4	1	16	1	34	17	6	1
0.00%	0.00%	6.67%	5.00%	26.67%	5.00%	56.67%	85.00%	10.00%	5.00%
0		5		17		51		7	
0.00%		6.25%		21.25%		63.75%		8.75%	

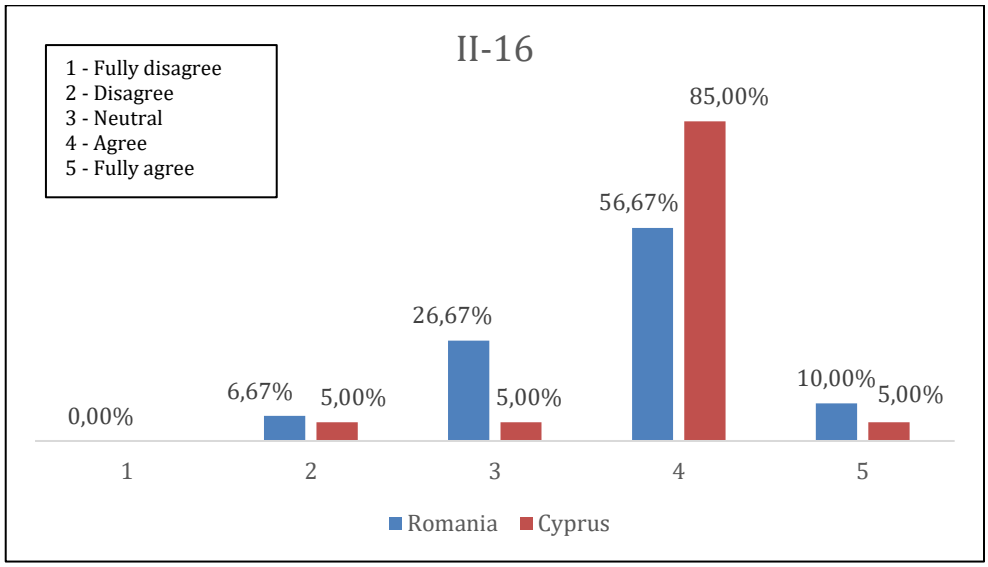

Figure 2.26 Graphical representation of the results for statement II-16

II-17: "I like to interact with the vINCI application interface"

The vINCI application also marks a success in terms of interface design, over 80% of users being happy to interact with the application's interfaces. Figure 2.27 shows the distribution of answers for each pilot.

Table 2.24 Answers to the statement "I like to interact with the vINCI application interface"

II-17: "I like to interact with the vINCI application interface"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	4	0	9	2	42	17	5	1
0.00%	0.00%	6.67%	0.00%	15.00%	10.00%	70.00%	85.00%	8.33%	5.00%
0		4		11		59		6	
0.00%		5.00%		13.75%		73.75%		7.50%	

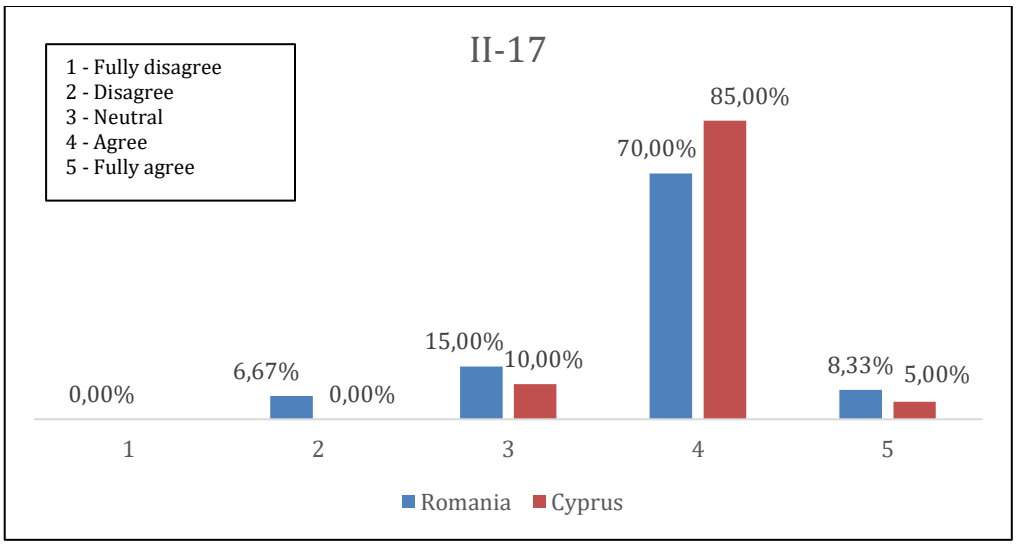

Figure 2.27 Graphical representation of the results for statement II-17

II-18: "I use the vINCI application with confidence"

User trust in an application is an important part of the user experience. Understanding how confident users are that they completed a task is one of many ways of diagnosing interaction problems and providing a benchmark for comparisons between tasks or versions. Over 83% of users agree and fully agree with the statement II-18, which represents a high degree of confidence in the vINCI application. Figure 2.28 shows the distribution of answers for each pilot.

Table 2.25 Answers to the statement "I use the vINCI application with confidence"

II-18: "I use the vINCI application with confidence"									
1 – Fully disagree		2 - Disagree		3 - Neutral		4 – Agree		5 – Fully agree	
Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus	Romania	Cyprus
0	0	3	0	8	2	42	16	7	2
0.00%	0.00%	5.00%	0.00%	13.33%	10.00%	70.00%	80.00%	11.67%	10.00%
0		3		10		58		9	
0.00%		3.75%		12.50%		72.50%		11.25%	

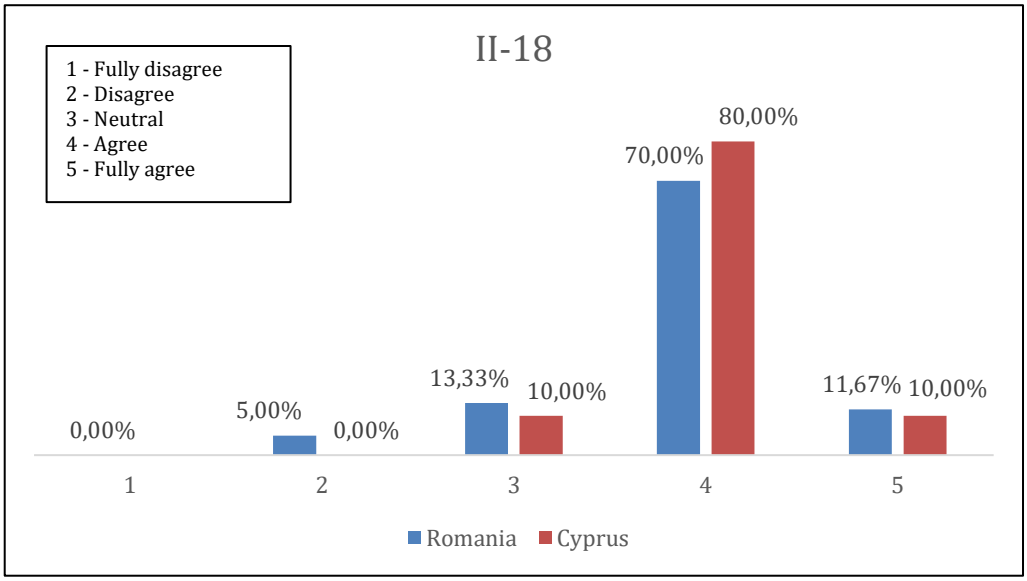

Figure 2.28 Graphical representation of the results for statement II-18

II-19: "Overall, I am satisfied with how to use the vINCI application"

Statement II-9 represents the conclusion of this study, through which the participants give a global note to the vINCI application. According to the answers received, over 85% of the participants positively appreciate the vINCI application as a whole, which confirms the fact that the vINCI project represents a successful project through the technologies developed and delivered, bringing a real benefit to the users. Figure 2.29 shows the distribution of answers for each pilot.

Table 2.26 Answers to the statement "Overall, I am satisfied with how to use the vINCI application"

II-19: "Overall, I am satisfied with how to use the vINCI application"									
1 – Fully disagree		**2 - Disagree**		**3 - Neutral**		**4 – Agree**		**5 – Fully agree**	
Romania	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**	**Romania**	**Cyprus**
0	0	2	1	7	1	44	15	7	3
0.00%	0.00%	3.33%	5.00%	11.67%	5.00%	73.33%	75.00%	11.67%	15.00%
0		3		8		59		10	
0.00%		3.75%		10.00%		73.75%		12.50%	

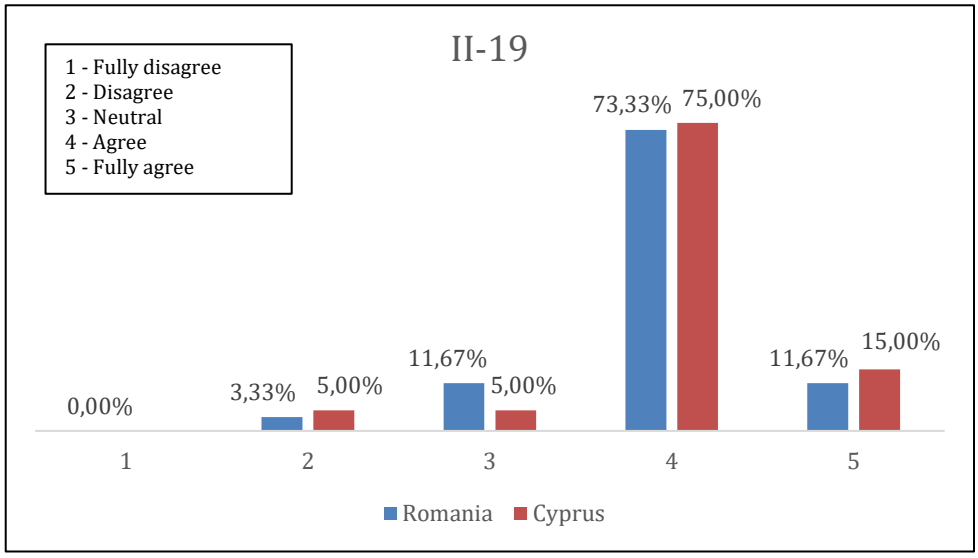

Figure 2.29 Graphical representation of the results for statement II-19

Conclusion

In this study, the degree of user satisfaction in using the technologies developed within the vINCI project was evaluated. The vINCI mobile application and the associated intelligent devices were tested, through which the real-time monitoring of the various bio-medical parameters is performed. Overall, the interaction with the vINCI application was satisfactory from the users' point of view (over 85%), achieving the objectives of the application (and of the vINCI project in general) being confirmed mainly by the answers received to the following statements:

- II-3 "Using the vINCI app, I am better informed about my health": over 53% of participants agree or fully agree with this statement;
- II-4 "My security level has improved using the vINCI application": over 44% of participants agree or fully agree with this statement;
- II-5 "The vINCI application helps me to obtain relevant quality of life data": over 58% of study participants agree, while 13.75% fully agree with this statement;
- II-9: "I think I could improve my health using the vINCI app": over 68% of study participants agree, while 10% fully agree with this statement;

- II-11: “The daily monitoring performed through the vINCI application does not interfere with my personal data”: over 68% of study participants agree, while 23.75% fully agree with this statement;
- II-12: “The vINCI application has improved the quality of medical services received: over 48% of the study participants agree, while 11.25% fully agree with this statement”;
- II-15: “The vINCI application is very useful for me in my daily life: over 57% of study participants agree, while 13.75% fully agree with this statement”.

Also, in terms of the answers provided, there are significant percentages of users who maintained a neutral opinion or who did not agree with the statements provided in the study. These answers require special attention and a complete response from the developers and designers of the vINCI application to increase the degree of satisfaction among users and thus improve their experience with the application. Particular attention should be paid to the answers to the following statements:

- II-3: “Using the vINCI app, I am better informed about my health”: 40% of participants said they were neutral, while 1.25% disagreed with this statement. Increasing the degree of informing users about their own health is an important objective of the vINCI project and one of the important factors in choosing e-Health applications and services;
- II-4: “My security level has improved using the vINCI application”: 47.50% of the participants declared themselves neutral, while 7.50% do not agree with this statement. These figures show that further efforts are needed to increase the level of personal security perceived by users when using the vINCI application and services;
- II-5 “The vINCI application helps me to obtain relevant quality of life data”: 21.25% of the participants declared themselves neutral, while 2.50% do not agree with this statement. Measuring quality of life is an important parameter for estimating the outcomes of health care programs and interventions. Obtaining relevant data in this field is an important functionality of the vINCI application;
- II-6 “The vINCI application gives me the opportunity to more easily communicate data about my physical condition / quality of life”: 26.25% of the participants declared themselves neutral, while 2.50% do not agree with this statement. Within these results, significant differences are observed between the two pilots;
- II-8: “The results provided by the application are easy to access and understand”: 21.25% of the participants declared themselves neutral, while 2.50% do not agree with this statement;

- II-10: “The information provided by the vINCI application is complete and useful”: 25.00% of the participants declared themselves neutral, while 1.25% do not agree with this statement;
- II-12: “The vINCI application has improved the quality of medical services received”: 31.25% of the participants declared themselves neutral, while 5% do not agree with this statement;
- II-15: “The vINCI application is very useful for me in my daily life”: 22.50% of the participants declared themselves neutral, while 3.75% do not agree with this statement.
- II-16: “Using the vINCI application is very exciting”: 21.25% of the participants declared themselves neutral, while 6.25% do not agree with this statement.

2.4 Formative evaluation of the usability of the vINCI system based on testing by a group of experts

This section is reserved for **usability testing of vINCI application**. In the process of designing software systems, the formative evaluation of usability is a particularly important step for the development of stable and quality applications. Usually, usability is defined as the particularity of the software product to be understood, learned, used and considered attractive by the user, when used under specified conditions [ISO, 2001].

Depending on the timing and purpose of the testing, usability evaluation can be formative or summative. Formative usability evaluation is carried out iteratively throughout the development cycle with the aim of identifying and eliminating usability problems as early as possible [Theofanos, M. et al, 2005]. The earlier these problems are identified, the less costly the solving effort. Usability problems are aspects of the user interface that create difficulties or dissatisfaction for the user, related to an important indicator of usability: ease of learning, ease of operation, error rate, subjective satisfaction [Nielsen, J., 1993].

2.4.1 Testing and evaluation of the vINCI mobile application

The application evaluated in this study is vINCI app. The vINCI mobile app consists of an Android tablet application so that it can be portable and accessible to anyone, no matter where they are. Figure 2.30 shows a screenshot with the vINCI application interface. Because the target group of users consists of the elderly, the application needs a simple and concise interface so that each feature can be easily found.

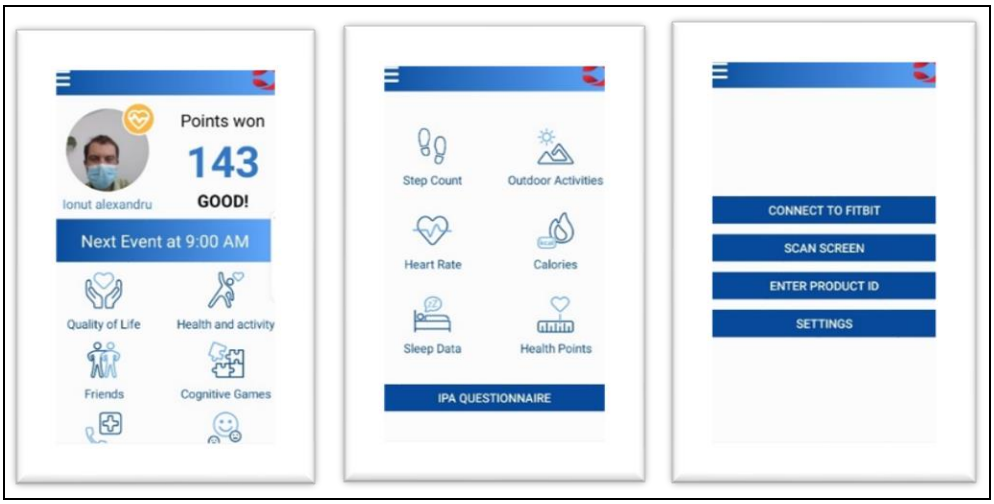

Figure 2.30 The interfaces of vINCI app

vINCI application connects multiple innovative user-oriented devices together: smart watches that identify the location, smart insoles that count the steps, cameras that record one's movements and tablets on which the users can answer surveys and questions about their mood and disposition. All the data are aggregated and analyzed inside a web platform which plans to create a much clearer overview of a patient's health, life and activity and also provide smart care for older people in clinics. The final goal is to use the data collected from devices, analyze it and use the results to improve the quality of life of the monitored patients and increase the active ageing rate.

The smartwatches, smart insoles and the cameras, along with the survey application installed on the patient's tablets, are the main sources of data that enter the platform. Every device has one or more dedicated microservices with which it communicates. This offers a very clear separation of the data that enters and flows through the application and also independence in development.

2.4.2 Test Objectives

The most important objectives of evaluating the usability of the vINCI application are:

- Identifying the usability problems of the vINCI application;
- Formulation of recommendations to remedy the identified usability problems and communicate them to the application development team;
- Eliminating usability problems as early as possible.

Methodology

The formative evaluation method of the vINCI application was the heuristic evaluation, based on the revised set of heuristics developed by Pribeanu [Pribeanu, C., 2017]. Usability problems can be identified both by usability inspection (expert evaluation) and by user testing (user-centered evaluation). Among the usability inspection methods, the most frequently used are: heuristic evaluation, cognitive inspection and recommendations-based evaluation.

HE (Heuristic Evaluation) is a usability engineering method, applied by a small number of evaluators that examines a user interface, examine compliance with a set of usability principles (heuristics) and produces a list of usability problems (UP) categorized by severity corresponding to the estimated impact on user performance or acceptance [Molich, R. et al., 1990].

Usability heuristics

The revised set of usability heuristics synthesized by [Pribeanu, C., 2017] is presented in Table 2.27 and includes 14 heuristics that are structured in four groups: user guidance, user effort, user control and freedom and user support.

Table 2.27 The usability heuristics [Pribeanu, C., 2017]

	User guidance
1	Prompting
2	Feedback
3	Information architecture
4	Grouping / distinction
	User effort
5	Consistency
6	Cognitive workload
7	Minimal actions
	User control and freedom
8	Explicit user actions
9	User control
10	Flexibility
	User support
11	Compatibility with the user
12	Task guidance and support
13	Error management
14	Help and documentation

User guidance is a general ergonomic criterion that concerns the resources to inform, orient, and guide the users throughout the interaction with the computer [Scapin et al., 1997]. Suitable user guidance has positive effects on the ease of use. The user guidance includes the following four heuristics: prompting, feedback, information architecture, and grouping / distinction.

The second group refers to the physical, perceptual, and cognitive effort needed to learn how to use the system and the effort needed to use it effectively. Reducing the user's effort has positive effects on the learnability and efficiency of use. This group includes three heuristics: consistency, cognitive workload, and minimal actions.

The third group concerns the means available to adapt and control the system as well as to use it in a flexible way. The control and freedom have positive effects on the efficiency of use. This group includes three heuristics: explicit user actions, user control, and flexibility.

The last group concerns the support for using the system, including specific accessibility requirements for the users with special needs. Four heuristics have been included in this group: compatibility with the user, task guidance and support, error management, help and documentation [Pribeanu, C., 2017].

Participants

The evaluation of the usability of the vINCI application was performed in August 2021 by a team of 4 evaluators who tested the application based on the 6 tasks with the application. The evaluators were selected so as to have a high degree of experience in the field of mobile applications and in the field of usability evaluation.

Each evaluator prepared an individual evaluation report in which he mentioned: the tasks and the duration of the evaluation / task, the number of problems identified per task, total and degrees of severity and the list with detailed descriptions of usability problems for each task.

Tasks

The next step is to specify the tasks with which the vINCI application was tested and the target components. In the case of complex systems, it is necessary to identify representative tasks that allow the testing of as many facilities as possible within a reasonable time.

Table 2.28 Tasks for testing the vINCI application

Nr.crt	Tasks
(T1)	vINCI app Installation
(T2)	Creating a user account in the application
	Registration,
	Authentication / logout
	Editing user profile
(T3)	Connect to a device
	Connecting to Insole
	Connecting to Fitbit
(T4)	Complete a questionnaire
	Complete IPAQ questionnaire
	Complete QoL questionnaire
(T5)	Using the *Physical Activity* component
(T6)	Using the *Today's feelings* component

Table 2.28 specifies the main tasks performed by evaluators in order to test as many functions of the vINCI application as possible.

Procedure

Heuristic evaluation involved two distinct stages: individual evaluation and collaborative consolidation of usability problems. The individual evaluation was performed by each evaluator for the assigned tasks. It is necessary for each task to be evaluated by at least 2 evaluators, in order to have acceptable evaluation effectiveness.

Individual evaluation

The individual evaluation was performed by each evaluator for the assigned tasks. First, each evaluator tested the vINCI mobile application, trying to fulfil the testing tasks. The evaluators used the heuristics mainly to document, analyze, and report the usability problems. In this respect, the method differs from a typical heuristic evaluation where heuristics are mainly used to identify usability problems.

Reporting individual usability issues was done according to a structured format that contains: problem identifier, title (brief description), difficulties encountered by the user, specific context (location of the problem in the interface, possible causes (what is wrong in the project) and remedial suggestions, heuristics used and severity (impact, on three levels: major, moderate and minor).

Consolidation of Usability Problems

Consolidation of usability problems is an integral part of the heuristic evaluation in which several evaluators are involved. The process of consolidating usability issues took place in two stages:

- filtering: removing duplicates from the problem lists identified by the evaluators resulting in a unique list of usability issues for each task.
- integration: combining usability problems on each task in order to produce a unique list of usability issues per application.

The lists of individual usability problems identified by each evaluator were consolidated for each task based on the “similar changes” criterion [Hertzum et al., 2003]. During consolidation phase, duplicates were removed and an agreement on severity was reached.

The result of the consolidation phase is a list of unique usability problems based on which following aspects were analyzed:

- Usability problems: cause and suggestions to fix them.
- The nature of usability problems as regarding the ergonomic criterion / guideline not respected.
- Indicators of usability metrics.

Results

Results of individual evaluation

Results of the individual evaluation are the sets of individual usability problems, identified by each evaluator. The number of individual usability problems detected by the four evaluators varied from 8 to 10 problems. On each task, the results of individual evaluation are as follows: T1: 6 problems, T2: 6 problems, T3: 4 problems, T4: 6 problems, T5: 7 problems and T6: 6 usability problems. Table 2.29 presents the problems identified by each evaluator.

Table 2.29 Usability problems identified by each evaluator

Task	Total UP			
	Ev. 1	Ev. 2	Ev. 3	Ev. 4
T1	2	1	1	2
T2	1	2	2	1
T3	1	1	1	1
T4	1	2	1	2
T5	2	2	2	1
T6	2	2	1	1
Total	9	10	8	8

We mention the fact that the usability problems identified by each evaluator went through the process of collaborative consolidation in which the duplicates of the problems have been eliminated, resulting in a unique list of usability problems.

Results of collaborative consolidation

Collaborative consolidation is an integral part of the heuristic evaluation in which several evaluators are involved. The process of consolidating usability problems takes place in two stages: filtering - removing duplicates from the lists of problems identified by and integration - combining usability problems on each task in order to produce a unique list of usability problems on the application.

Table 2.30 List of unique usability problems

Tasks	Total	Major	Moderate	Minor
T1	2	0	1	1
T2	4	0	2	2
T3	3	0	2	1
T4	5	0	4	1
T5	3	0	2	1
T6	2	0	1	1
Total	19	0	12	7

After the collaborative consolidation (removal of duplicates, discarding of false usability problems and agreement on severity) a list of 19 unique problems resulted, as shown in Table 2.30.

The individual lists of usability issues have been consolidated on the basis of the "similar changes" criterion as follows:

- At the first task, 2 usability problems were maintained, of which 1 moderate and 1 minor. 4 duplicates were removed and the severity was changed to 2 usability problems.
- At second task, 4 usability problems were maintained, of which 2 moderate and 2 minor. 2 duplicate was removed and severity was changed to 2 usability problems.
- At T3, 3 usability problems were maintained after consolidation. 1 duplicate was removed and the severity was changed to 1 usability problem.
- In the case of T4, 3 usability problems were noted. 2 duplicates were removed and the severity was changed to 3 usability problem.
- At T5 task, 5 usability problems were identified, out of which 4 moderate and 1 minor. There were no duplicates of the problems identified.
- At T6 task, 2 usability problems were identified, out of which 1 moderate and 1 minor. Four (4) duplicates were removed.

In the case of the first task, the main problem is the lack of a stable version assumed by the developer and published in an official app store. We recommend the dissemination of the application through an official application store, which contributes to high quality and safety standards. Also, the vINCI App is only compatible with devices running Android as operating system. The application should be compatible with other operating systems in the future.

In the case of creating of a new account, filling in the field associated with the date of birth requires sequential scrolling (at the month level). It is necessary to implement an easy way of selecting the date of birth (the function of selecting the date on the calendar has a frequency of scrolling at the level of the month - it is also necessary at the level of the year).

Another usability issue is that the terms and conditions of use of the application are not displayed or available online. The terms and conditions of use must be accepted by the user before initiating the registration procedure, but they cannot be consulted.

At level of connection to other devices, the most common problems identified were related to errors in identifying the smartwatch. Also, after registering the FITBIT device, only the current parameters are displayed and the user does not have access in this section to the measurement history. Other problems were related to the

difficult identification of commands that allow the connection of devices and tracking of data obtained.

In the case of completing a questionnaire, the lack of an archive to view the results of the questionnaires already completed and the fact that there is no link with the identification data associated with the application, are the main usability issues identified by the evaluators. Also, the user cannot view for comparison the results obtained from the previous completion of the questionnaires nor can he deduce whether his physical activity or quality of life has improved or deteriorated.

The absence of the "Help" menu or the context-sensitive help menu is another problem with the vINCI application. Thus, users do not have the opportunity to receive adequate assistance and guidance when they encounter difficulties in working with the platform.

Recommendations

Based on the results of the usability evaluation, a series of recommendations were formulated and communicated to the development team within the project. The most important recommendations are:

- Provide options for the automatic installation of the vINCI mobile application, including through the Google Play Store and other operating systems;
- In order to avoid filling in the personal data in different sections several times in the same session, it is recommended to fill in only once and share them between different functions / sections.
- We recommend consulting users on the terms and conditions of use of the application before initiating the registration procedure.
- It is recommended to create a history section in which users can view the answers / score to the completed questionnaires.
- It is necessary to develop the Help section within the platform so that users who encounter difficulties to benefit from assistance at any time of the interaction with the vINCI application.

Consolidate conclusions

Usability is a key factor in the quality of mobile apps, especially for its users. However, research on mobile apps usability is still fragmented and inconsistent. For this reason, an adapted set of usability heuristics is expected to help understand the user experience in mobile healthcare apps context.

The results of the usability evaluation highlighted several moderate and minor usability issues of the vINCI mobile application. From the point of view of the violated ergonomic criteria, most of the usability problems anticipated by the heuristic evaluation are due to the inadequate guidance of the user, followed by lack of

feedback and adequate assistance, flexibility and efficiency of use and compliance with standards and rules.

2.5 Results: Test and Validation

2.5.1 Presentation of the vINCI application

Starting screen

After installing the apk, the user can open the vINCI application by clicking on the icon corresponding to the application. When app start, splash screen is shown like on Figure 2.31.

Figure 2.31 Splash Screen of Vinci app

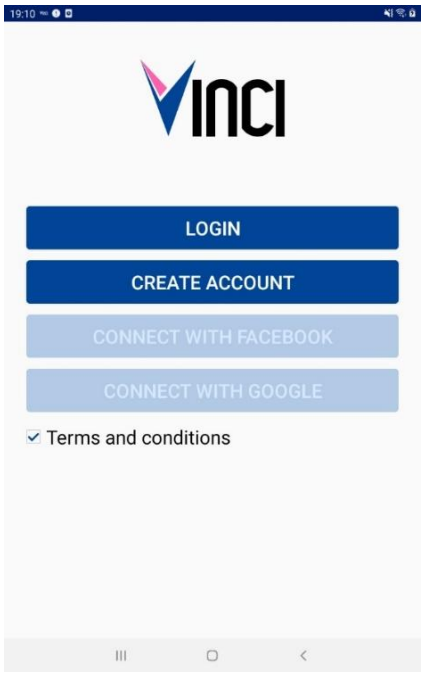

Figure 2.32 Starting Screen

After that, login and create account option screen is presented (Figure 2.32).

In this screen, the user is invited to create an account if he uses the vINCI application for the first time or to authenticate if he has already created an account.

If CREATE ACCOUNT command is clicked, the app redirects user to CREATE ACCOUNT screen as can be seen in Figure 2.33. Users are invited to enter their username, email, password and choose their role in the vINCI system, which can be patient or family. After filling in the fields, the user must click on the Create account button.

Figure 2.33 Create Account Screen

After successfully creating the account, the application redirects the user to the login screen. The same thing happens when the user clicks the Login button on the home screen. The login screen is shown in Figure 2.34. Users must fill in the field's *username* and *password*.

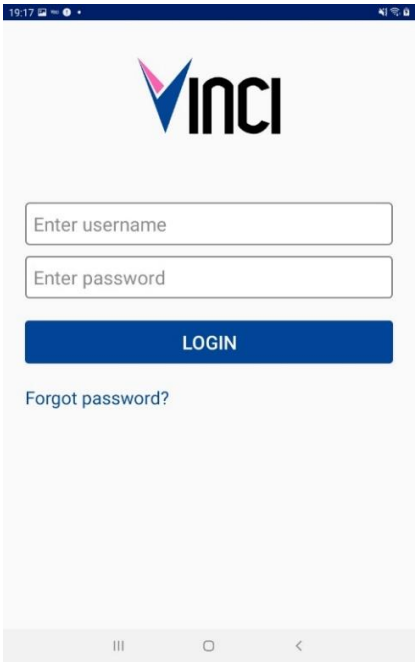

Figure 2.34 Login Screen

If the user has forgotten the password, by pressing the "*Forgot password*" button, the user is directed to the password *recovery* screen, as seen in Figure 2.35. To recover the password, the user must fill in the email address and press the "*Reset password*" button. After verification, the new password is sent to the specified email address.

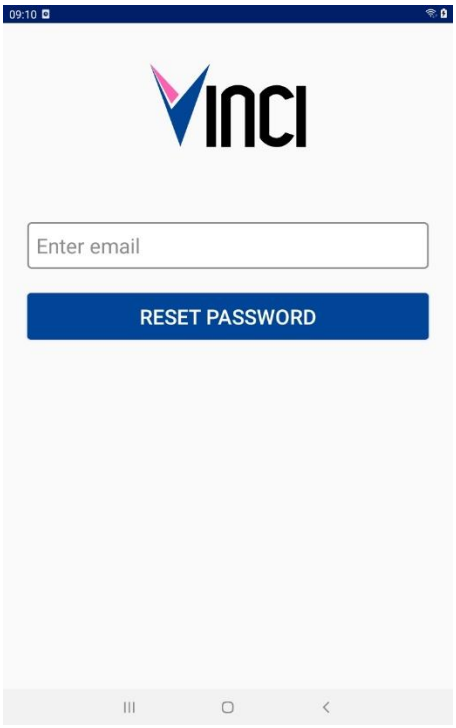

Figure 2.35 Reset password Screen

After successful login, user is redirected to main (home) screen of vINCI application (Figure 2.36).

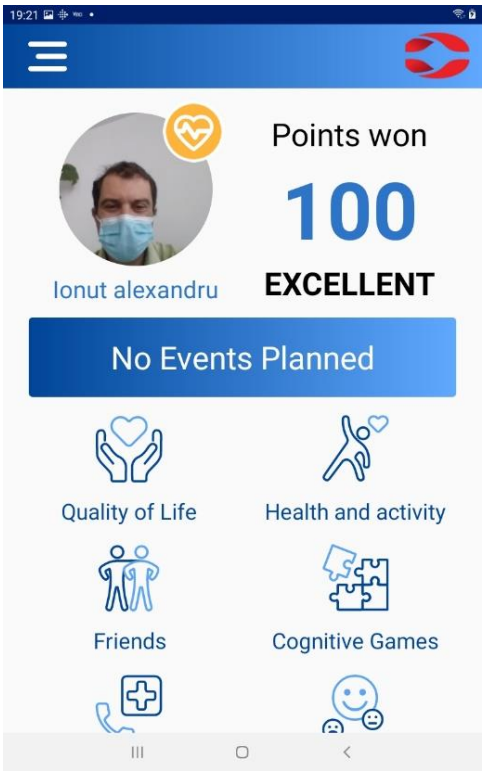

Figure 2.36 Main Screen

Main screen

The main screen from the above figure offers two sections from where commands can be initialized. The first section is represented by the application menu, and the second

by the commands displayed on the screen. A third section is intended to display information for users.

Main menu

The vINCI application gives users access to the main functions through the application menu. The main commands are: Home, Gallery, Profile, Questionnaire, Devices, Settings, Logout (Figure 2.37).

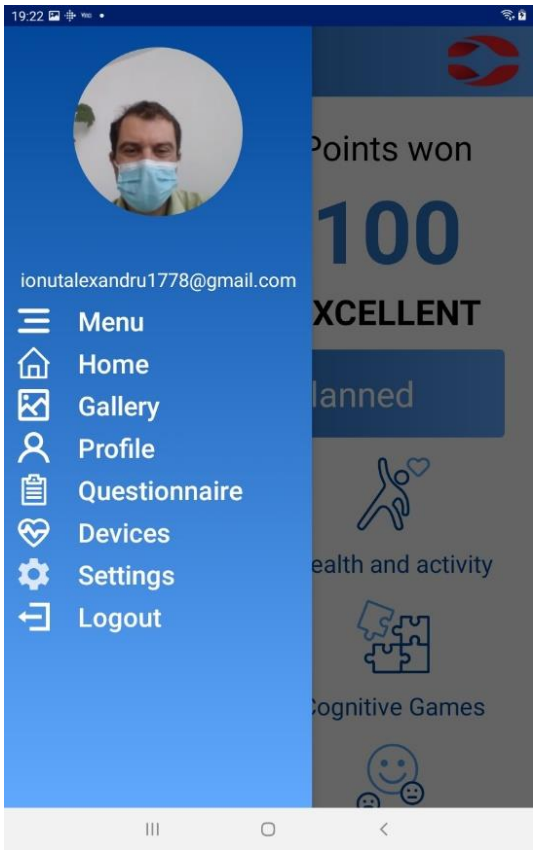

Figure 2.37 Application Menu

Profile

When the user accesses the vINCI application for the first time, he is invited to complete his profile. By pressing the Profile command in the menu, the user is directed to the screen as seen in Figure 2.38. The following commands are displayed on the screen:

- Edit Personal Data;
- Change Profile Picture;
- Change Emergency Number.

Figure 2.38 Profile Screen

By selecting the PERSONAL DATA EDIT command, the user can update his account information (Figure 2.39).

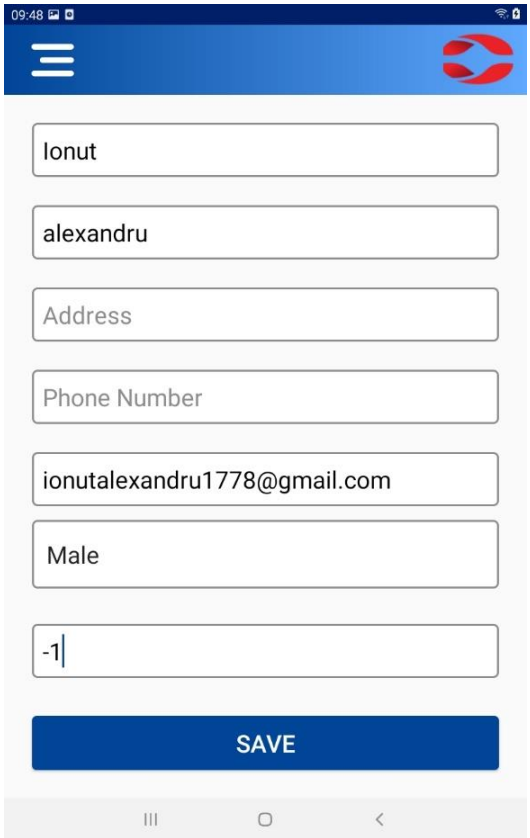

Figure 2.39 Profile Screen with account information

By selecting the CHANGE PROFILE PICTURE command, the user can update his profile picture (Figure 2.40). As you can see, the user has the following commands:

- TAKE PICTURE: the tablet or smartphone camera is activated and the user can take a selfie that is displayed as a profile picture;
- CHOOSE EXISTING: the user can choose a profile picture from those stored in the memory of the mobile device;
- SAVE PROFILE PICTURE: the user's photo can be saved in the Gallery section of the vINCI application;
- DELETE: the user can delete the selected profile picture.

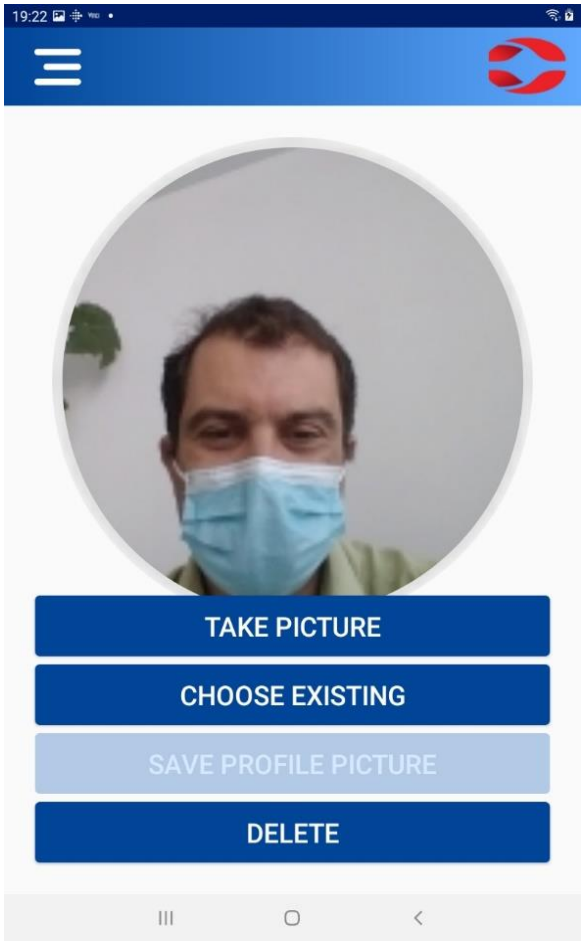

Figure 2.40 Change Profile Picture Screen

By selecting the CHANGE EMERGENCY NUMBER command, the user can define an emergency number that can be called when the situation requires it (Figure 2.41). The number can also be entered from the agenda of the mobile device.

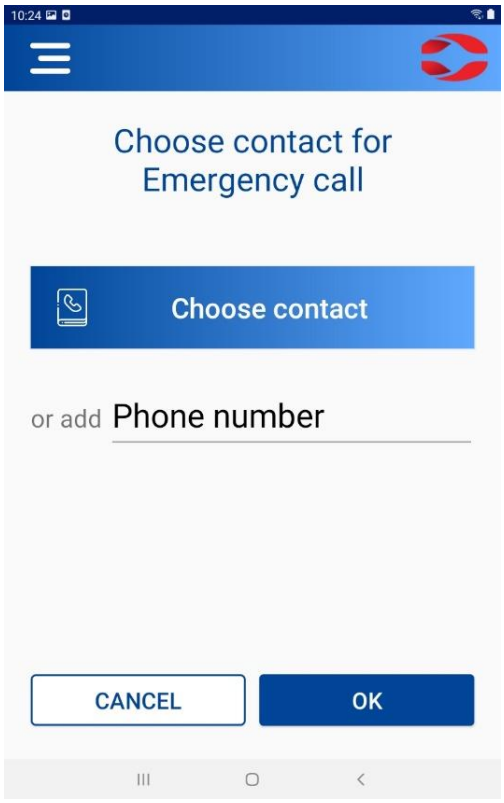

Figure 2.41 Set Emergency Number Screen

Gallery

The GALLERY command in the vINCI application menu allows users to store profile photos that can be associated with their account (Figure 2.42). Adding a new photo can be done directly with the camera of the mobile device or by selecting an existing photo, stored in the device's memory.

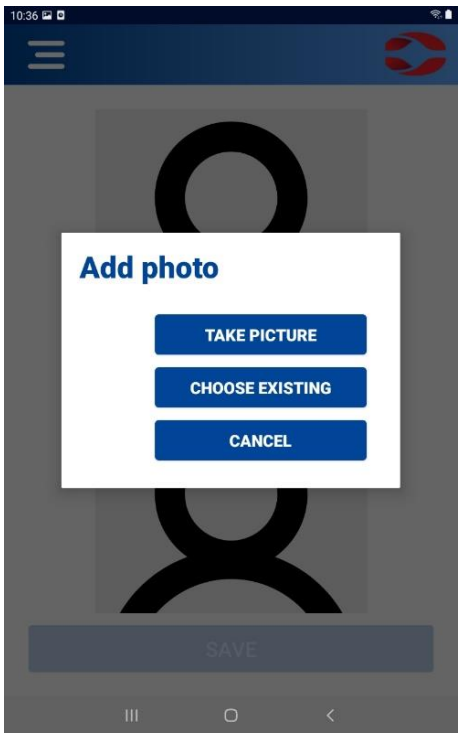

Figure 2.42 Gallery Screen

Questionnaire

By selecting the QUESTIONNAIRE command from the vINCI application menu, the user is invited to complete a set of questionnaires, the scores of which contribute to the health points calculation (Figure 2.43).

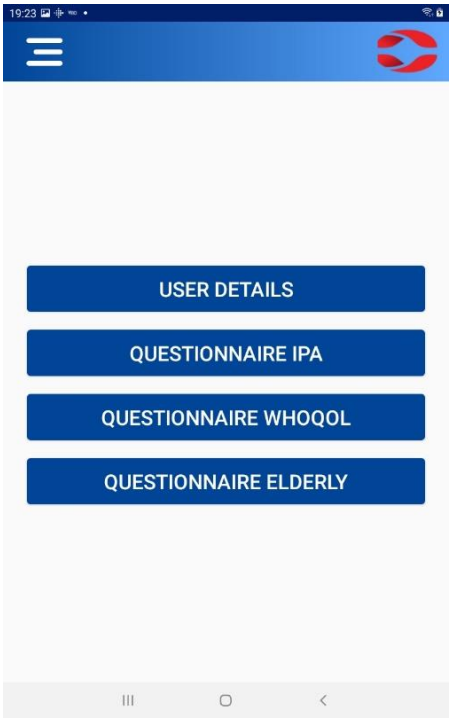

Figure 2.43 Questionnaire Screen

By clicking USER DETAILS command, user is redirected to user extra screen to set up additional information that is used in questionnaires (Figure 2.44).

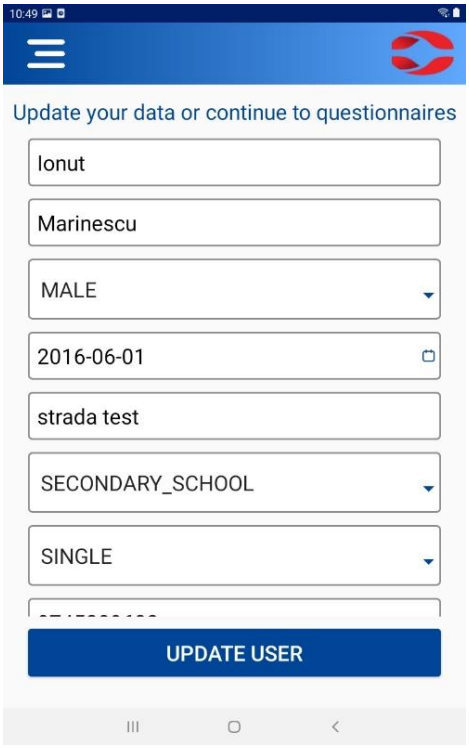

Figure 2.44 Questionnaire Screen with additional information

By clicking on the IPA QUESTIONNAIRE command, the user is redirected to fill IPA questionnaire (Figure 2.45). After displaying the score, the user must press the SAVE button, for the data to be saved in the survey microservice.

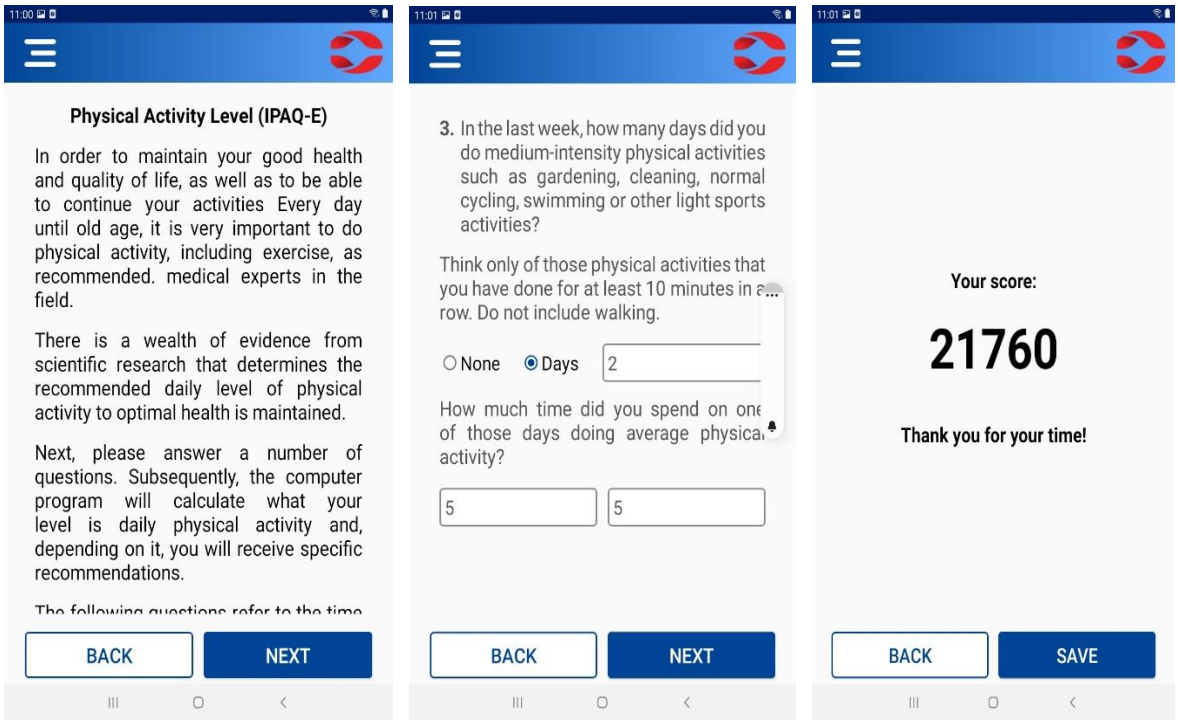

Figure 2.45 IPA Questionnaire Screen

By clicking on the WHOQOL QUESTIONNAIRE command, the user is redirected to fill WhoQoL questionnaire (Figure 2.46). After displaying the score, the user must press the SAVE button, for the data to be saved in the survey microservice.

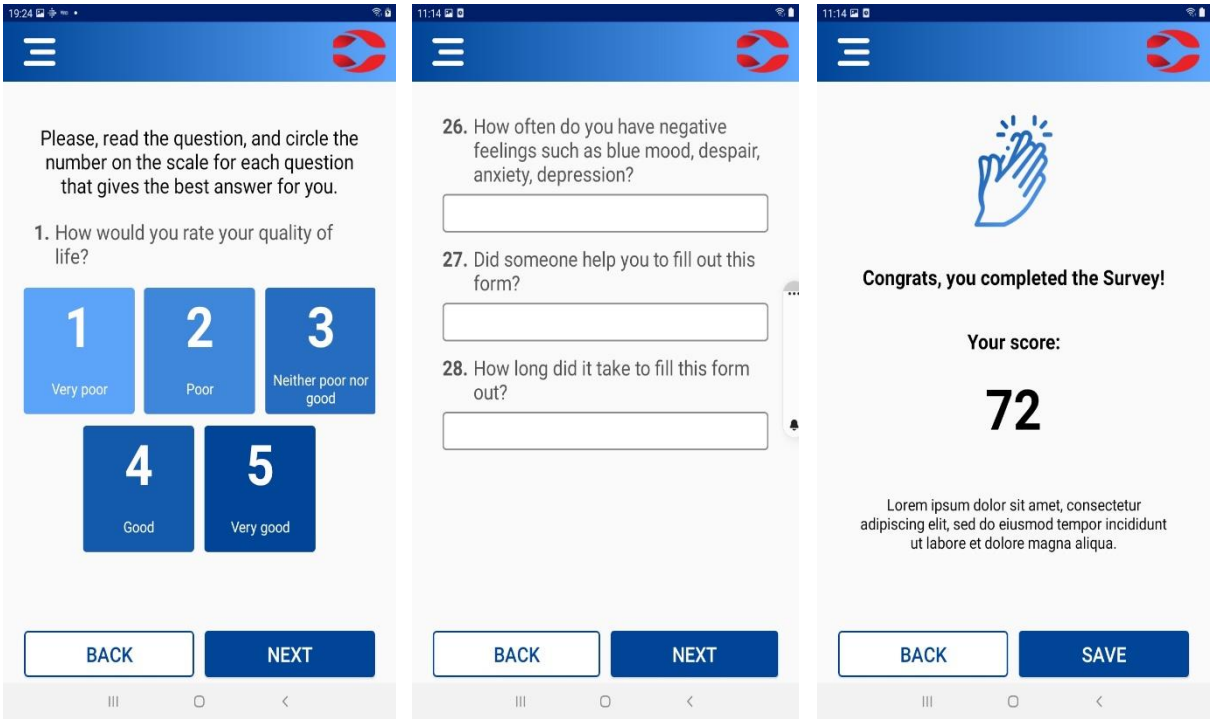

Figure 2.46 WHOQOL Questionnaire Screen

By clicking on the ELDERLY QUESTIONNAIRE command, the user is redirected to fill ELDERLY questionnaire (Figure 2.47). After displaying the score, the user must press the SAVE button, for the data to be saved in the survey microservice.

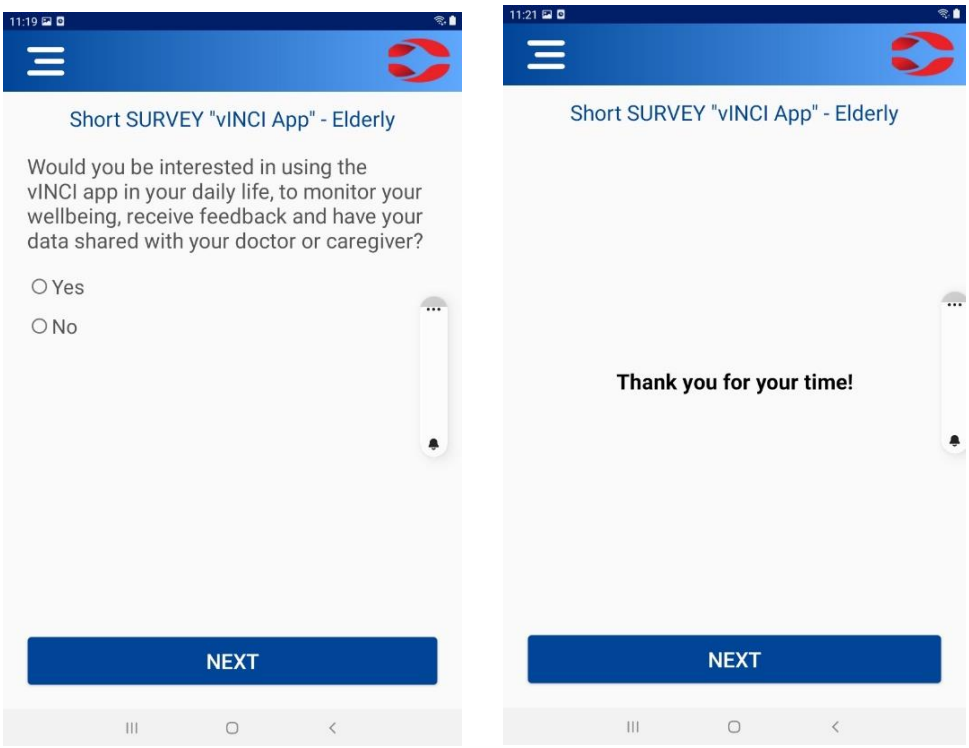

Figure 2.47 ELDERLY Questionnaire Screen

Devices

If DEVICES command is clicked from Vinci app menu, user is redirected to screen shown on Figure 2.48.

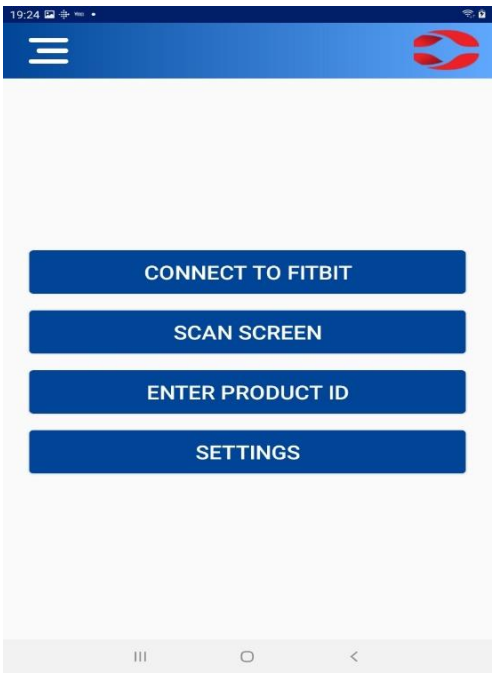

Figure 2.48 DEVICES Screen

From this screen, user can choose to connect to fitbit account and get access to data gathered from fitbit devices (Figure 2.49).

Figure 2.49 Connect to FitBit Screen

If scan screen is clicked user is redirected to screen where he can connect to smart devices (via Bluetooth connection), like insoles and start monitoring data (Figure 2.50).

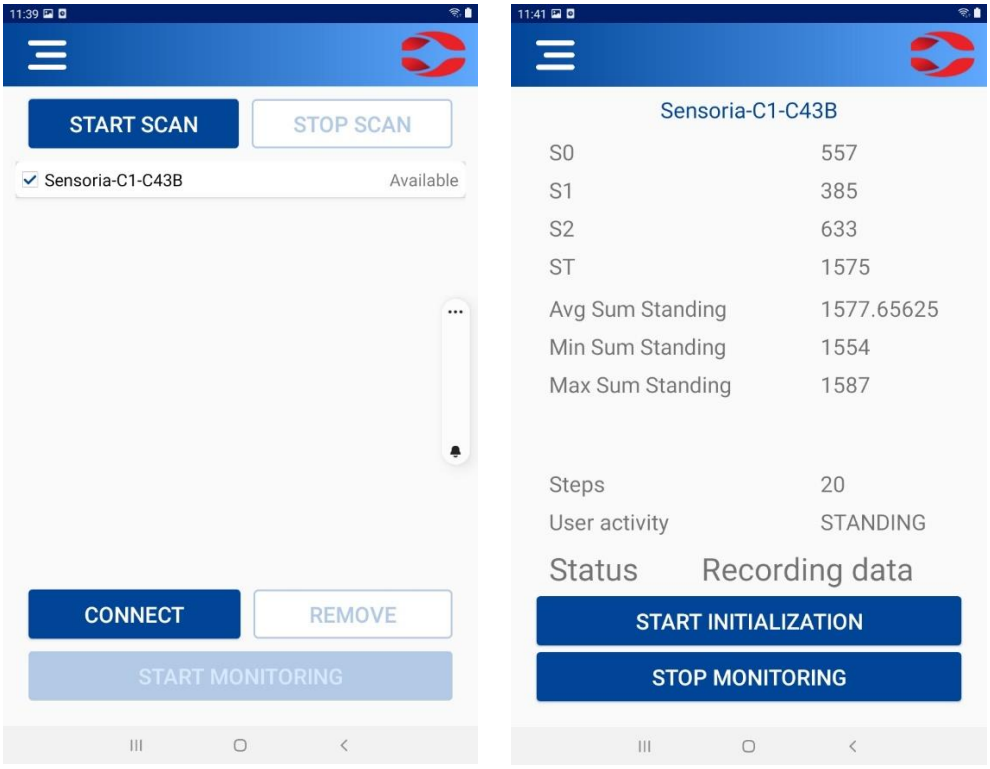

Figure 2.50 Connect to smart device Screen and Data view Screen

After connecting the device, it must be initialized via the “START INITIALIZATION” command. To turn off the device, the user can press “STOP MONITORING”.

Settings

If SETTINGS is clicked, user can check connection status of nearby devices (Figure 2.51).

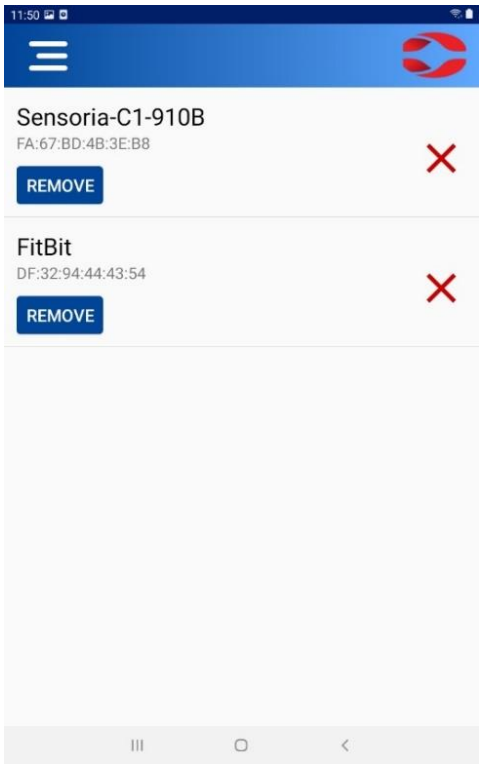

Figure 2.51 Connection settings Screen

Logout

The LOGOUT command allows the user to log out of the user account. Unsaved data are going to be lost.

Main screen commands

These commands represent categories of actions that can be performed by the user using the vINCI application. These are grouped in the form of the following types of actions:

- Planned Events;
- Quality of Life;
- Health and Activity;
- Friends;
- Cognitive Games;
- Emergency Call;
- Today’s feelings.

Planned Events

It provides a list of scheduled events that should be performed by the user in order to improve his health and quality of life. By clicking on the “Events Planned” command, the user has access to the list of scheduled events (Figure 2.52).

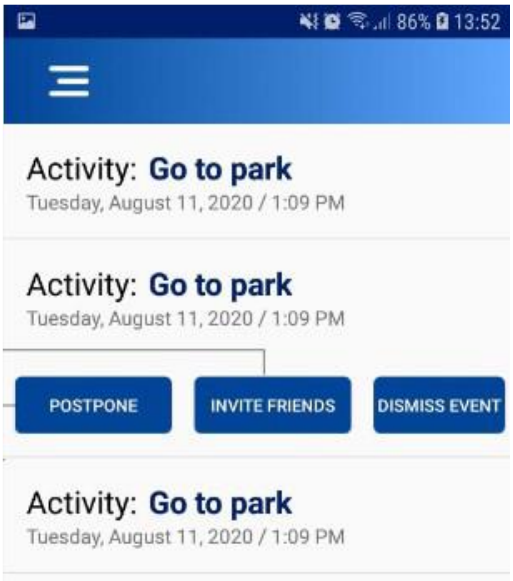

Figure 2.52 Event List Screen

Users can postpone or dismiss a particular activity (Figure 2.53).

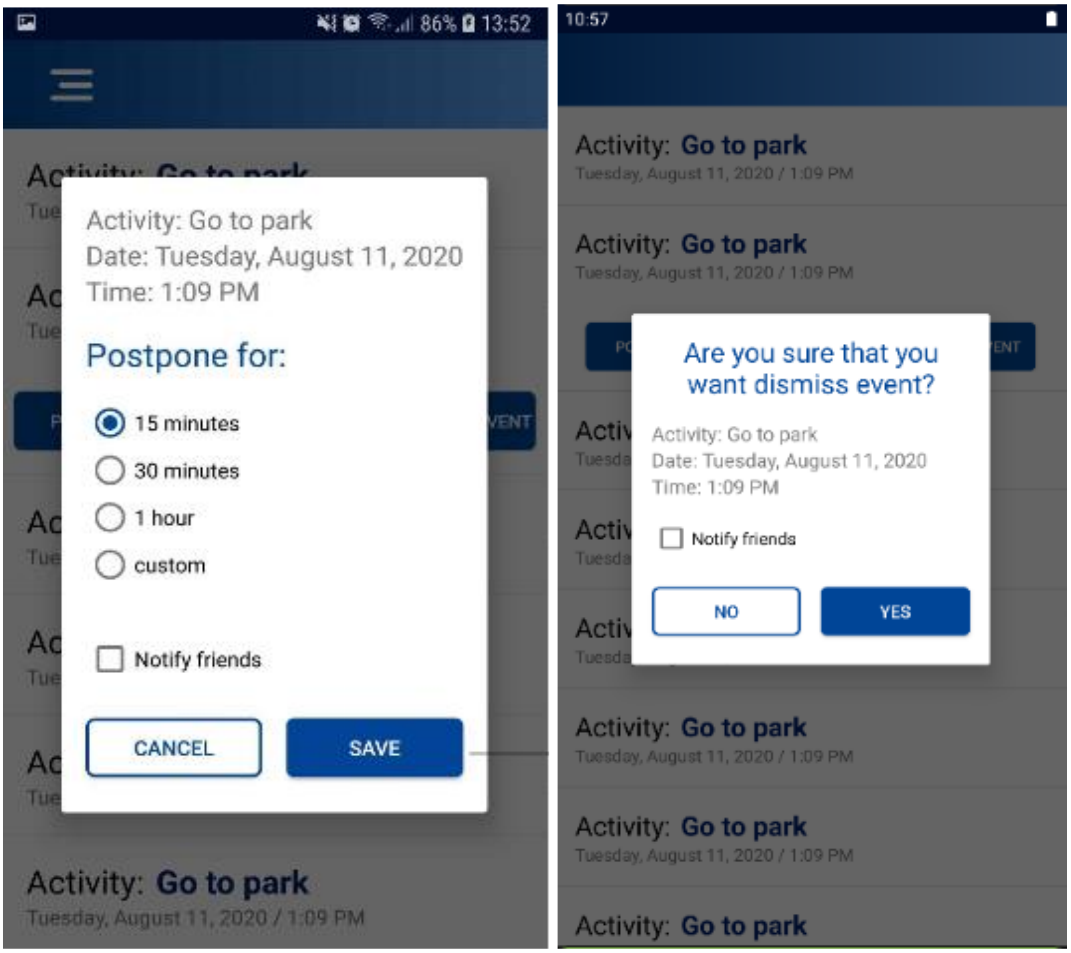

Figure 2.53 Postpone and Dismiss Event Screen

Quality of Life

By clicking on the “Quality of Life” command, the user accesses the WHOQOL questionnaire as presented above.

Health and Activity

By clicking on the “Health and Activity” command, the user is redirected to screen shown on (Figure 2.54).

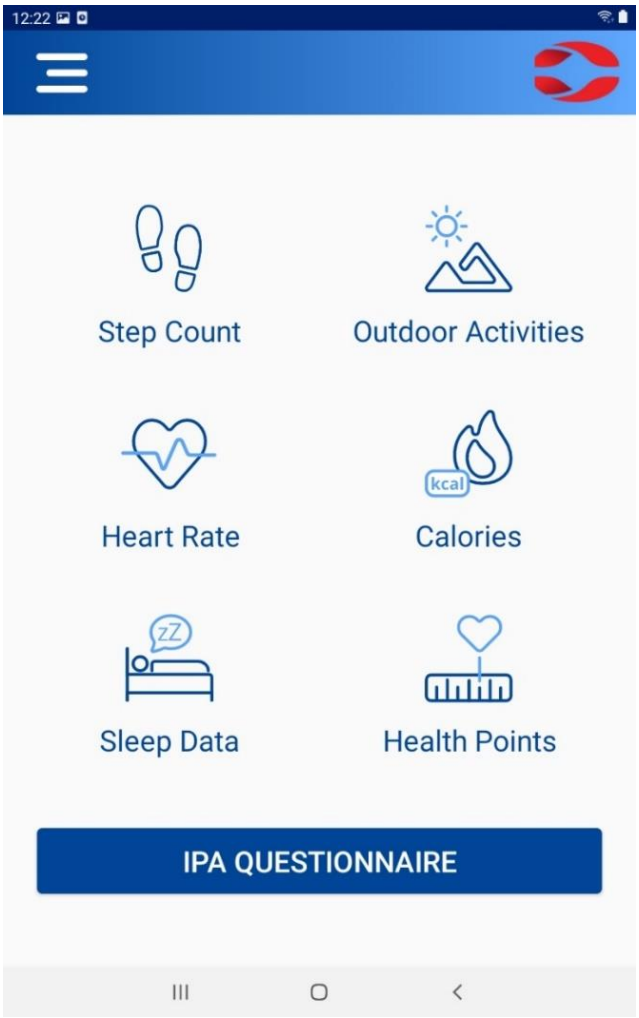

Figure 2.54 Postpone and Dismiss Event Screen

In this section, the user has access to a set of data from the monitoring of parameters from smart devices such as Fitbit. The main data sets refer to:

- Step Count;
- Outdoor Activities;
- Heart Rate;
- Calories;
- Sleep Data;
- Health points.

Step count

Step count on screen shows to the user a screen with all step count history data gathered from smart devices, Sensoria insole and fitbit (Figure 2.55).

Figure 2.55 Step count Screen

Outdoor Activities

By clicking on the *Outdoor Activities*, user is redirected to screen shown on Figure 2.56 where user can create new event and optionally invite friends to it.

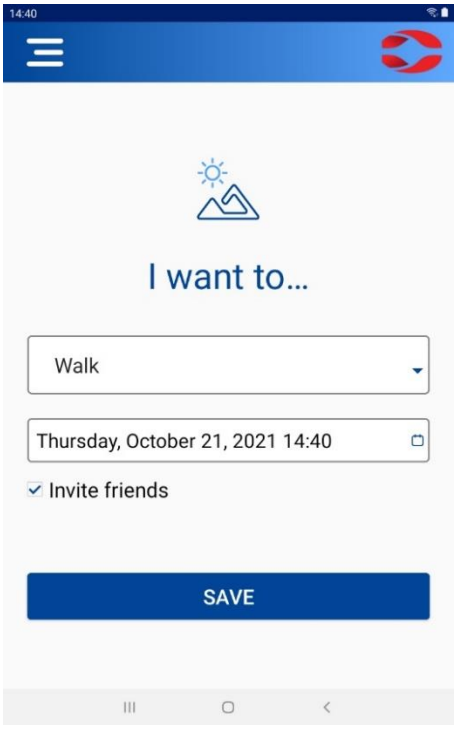

Figure 2.56 Outdoor Activity Screen

Heart Rate

By clicking on the *Heart Rate*, user is redirected to screen shown on Figure 2.57 where he has access to the heart rate data history, data that has been monitored via smart devices (e.g., fitbit). The pulse is the heart rate, or the number of times our hearts beats in one minute. The average and maximum values are displayed.

Figure 2.57 Heart Rate Screen

Calories

By clicking on the Calories, user is redirected to screen shown on Figure 2.58 where he has access to data on calories consumed during physical activity. The average values and the total calories consumed are displayed.

Figure 2.58 Calories Out Screen

Sleep data

By clicking on the Sleep Data, user is redirected to screen shown on Figure 2.59 where he has access to data about the quality of sleep. The actual number of minutes of sleep and the number of minutes of bedtime are displayed. Also, the average and maximum values per week are displayed.

Figure 2.59 Sleep Data Screen

Health points

For each action performed, the user receives a number of points that can serve as a benchmark for assessing health. After performing daily activities such as the number of steps or after completing the questionnaires provided through the vINCI application, the existing algorithm calculates a score that is displayed either as an average value or as a maximum value in a week. Also, the score can be broken down by activities (Figure 2.60).

Figure 2.60 Health points Screen

Friends

By clicking on the “Friends” command, the user is redirected to the screen shown on (Figure 2.61). In this section he has the possibility to add from the agenda of the mobile device, through the ADD button friends, with whom he wants to participate in the planned events.

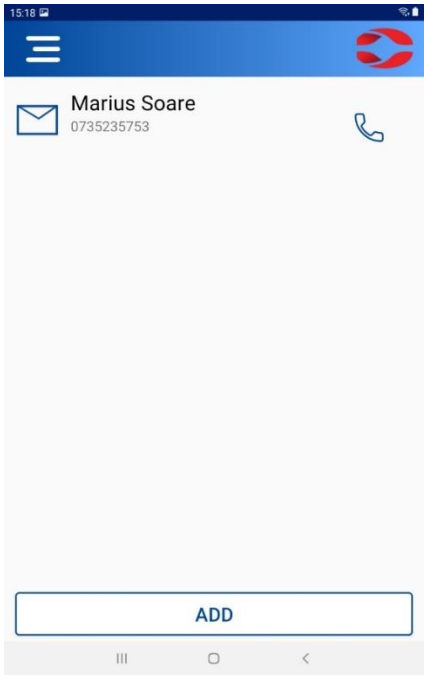

Figure 2.61 Friends Screen

Cognitive Games

By clicking on the *Cognitive Games* on main screen, the user is redirected to screen shown on Figure 2.62, where user can confirm cognitive games event and share it with friends.

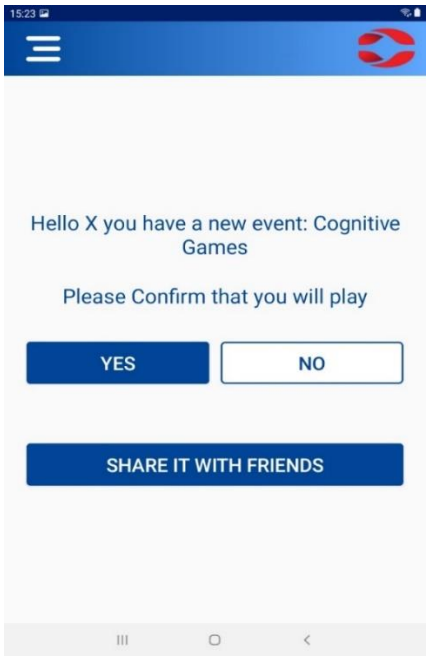

Figure 2.62 Cognitive Games Screen

Today’s feelings

Clicking on *Today’s feelings* on main screen opens the screen shown on Figure 2.63.

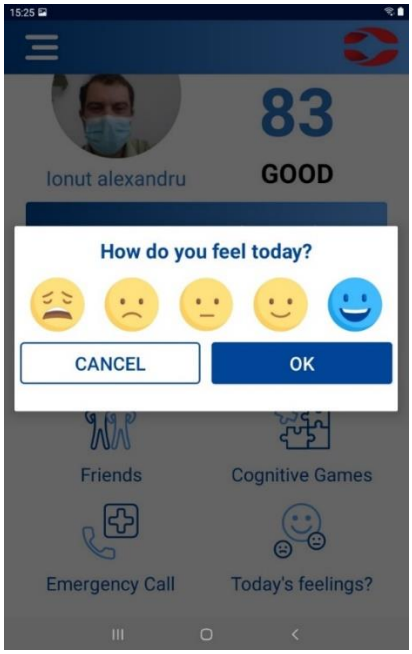

Figure 2.63 Today’s feelings Screen

Emergency Call

Clicking on *Emergency Call* is the same action that as the one described in the Figure 2.63.

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4. ANNEXES

4.1 Annex 1 User Needs Questionnaires - Romanian Language Forms

CHESTIONAR NEVOI UTILIZATOR – Pacient

Partea A – Date demografice, activitate zilnică, interes privind noile tehnologii

Date demografice, activitate zilnică, interes privind noile tehnologii		
A1	ID UTILIZATOR	
A2	Vârstă	
A3	Gen	☐ Bărbat ☐ Femeie
A4	Stare civilă	☐ Căsătorit(ă)/locuiesc cu partenerul/partenera ☐ Singur(ă) ☐ Văduv(ă) ☐ Divorțat(ă)
A5	Nivel de educație	☐ Primar ☐ Gimnaziu ☐ Liceu ☐ Studii superioare
A6	Cât de des interacționați cu persoanele din jur, altele decât cele aflate permanent cu dv. la domiciliu (rude/prieteni etc.)?	☐ Niciodată ☐ Anual ☐ Lunar ☐ Săptămânal ☐ Zilnic
A7	Care este cel mai utilizat mijloc de comunicare cu persoanele aflate la distanță (nu locuiesc cu dv.)?	☐ Telefon fix ☐ Telefon mobil clasic ☐ Dispozitive inteligente (e.g. smartphone, tabletă etc.) ☐ SMS ☐ Email ☐ Aplicații mobile (Skype, WhatsApp etc.) ☐ Rețele sociale (Facebook etc.) ☐ Altele .... ☐ Nici una din cele amintite anterior

Vă rugăm să indicați pe o scală de la 1 la 5, in care 1 reprezintă dezacord total, 2 - dezacord parțial, 3 - neutru, 4 - sunteți de acord si 5 - acord total, în ce măsură sunteți de acord cu următoarele afirmații:						
A8	Mă simt în siguranță atunci când interacționez mai des cu îngrijitorul / personalul medical / membrii familiei	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

A9	Nu mă deranjează ca informațiile referitoare la activitățile zilnice sau locație să fie cunoscute de aparținător / personal medical / familie / alte persoane implicate în îngrijirea mea	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A10	Mi se pare mai comod să comunic audio-video de la domiciliu, prin intermediul internetului, cu aparținătorul / personalul medical / familia / prieteni / alte persoane	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A11	Este de preferat să am acces permanent la datele mele medicale prin intermediul internetului.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A12	Este mult mai comod să primesc la domiciliu informații personalizate privind menținerea si îmbunătățirea stării mele de sănătate decât în instituțiile medicale.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

Partea B – Date privind preferințele, nevoile și cerințele participanților cu privire la mediul vINCI (acceptare, aspect, funcționalități și interacțiune)

Întrebări privind tehnologia vINCI						
Vă rugăm să indicați pe o scală de la 1 la 5 in care 1 înseamnă deloc util, 2 - foarte puțin util, 3- Indiferent, 4 - util, 5 foarte util, cat de folositor/util considerați un sistem informatic care poate să:						
B1	Monitorizeze continuu starea dv. de sănătate prin intermediul tehnologiilor inteligente (ex: senzori atașați de haine sau aflați în încăperea pacientului utilizați pentru detectarea nivelului de mobilitate (sedentarism), a implicării în activități fizice și sociale, de localizare și avertizare în caz de pericol, de detectare a căderilor etc.).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B2	Trimită alerte automate către familie, aparținător, etc în cazul în care aveți nevoie de ajutor sau în situații de urgență (ex.: cădere, probleme de mers sau postură etc.)	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B3	Monitorizeze activitățile pe care le desfășurați zilnic cu ajutorul unor dispozitive ce pot fi purtate permanent sau instalate la domiciliu, fără a vă afecta confortul personal.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B4	Colecteze următoarele categorii de informații personale: • Date demografie • Localizare și mișcare	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

	• Date utilizate în recunoașterea activităților • Date legate de sănătate (tensiune, puls etc.)	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐	☐ ☐ ☐
B5	Ofere informații personalizate despre: • Calitatea vieții • Situația curentă a activității fizice • Status psihosocial • Riscuri de sănătate • Evoluția sănătății	**1** ☐ ☐ ☐ ☐ ☐	**2** ☐ ☐ ☐ ☐ ☐	**3** ☐ ☐ ☐ ☐ ☐	**4** ☐ ☐ ☐ ☐ ☐	**5** ☐ ☐ ☐ ☐ ☐
B6	Ofere posibilitatea de a accesa online (pe internet) datele culese de senzorii de monitorizare ce vă sunt atribuiți.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B7	Ofere notificări periodice cu privire la modificările survenite în activitățile zilnice ce pot afecta starea de sănătate (de exemplu notificarea schimbărilor survenite în desfășurarea activităților fizice, în interacțiunile sociale, ce influențează starea de spirit etc).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B8	Sunteți familiarizat(ă) cu următoarele dispozitive de monitorizare? • Dispozitive mobile inteligente (Telefon/tabletă cu internet și aplicații de monitorizare sănătate) • Camera de adâncime • Dispozitive purtabile (ceas inteligent, încălțăminte inteligentă) • Senzori atașați pe corp • Altele	**Da** ☐ ☐ ☐ ☐ ☐	**Nu** ☐ ☐ ☐ ☐ ☐			
B9	Care din următoarele dispozitivele de monitorizare enumerate în partea dreaptă ați fi dispus/ă sa utilizați? • Dispozitive mobile intelegente (cu internet și aplicații - telefon/tabletă) • Dispozitive purtabile (ceas inteligent, Încălțăminte inteligentă) • Senzori atașați pe corp (senzori bio-metrici pentru măsurarea activității cardiace etc) • Altele	☐ ☐ ☐ ☐				

Vă rugăm să indicați pe o scală de la 1 la 5 in care

1 înseamnă deloc util, 2 - foarte puțin util, 3- indiferent, 4 - parțial util, 5 foarte util,
cat de folositoare/utile considerați următoarele funcții în cadrul unui sistem informatic ce sprijină îmbătrânirea activă și sănătoasă

B10	Detectarea timpurie a simptomelor unor afecțiuni asociate în general cu înaintarea în vârstă.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

B11	Control extins asupra dispozitivelor de monitorizare prin activarea / dezactivarea individuală a acestora în funcție de nevoi și respectul vieții private	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B12	Intervenție personalizată în cazul semnalării unor modificări ai parametrilor monitorizați	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B13	Anticipare a riscurilor de sănătate	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

CHESTIONAR NEVOI UTILIZATOR - Îngrijitor / Personal medical

Partea A – Date demografice, activitate zilnică, interes privind noile tehnologii

Date demografice, activitate zilnică, interes privind noile tehnologii		
A1	ID UTILIZATOR	
A2	Vârstă (Age)	
A3	Gen (Sex)	☐ Bărbat ☐ Femeie
A4	Tip de îngrijitor (Type of caregiver)	☐ Formal ☐ Informal
A5	Dacă sunteți îngrijitor formal, vă rugăm să vă indicați profesia (dacă bifați „Altele” vă rugăm să specificați):	☐ Doctor Specialitate:..... ☐ Asistent medical ☐ Fizioterapeut ☐ Medic geriatru ☐ Psiholog ☐ Infirmier ☐ Asistent social ☐ Îngrijitor profesionist ☐ Altele Vă rugăm specificați: .....
A6	Dacă sunteți o persoană ce asigură îngrijire fără calificare profesională, vă rugăm să indicați relația dvs. cu persoanele în vârstă (Dacă bifați „Altele” vă rugăm să specificați):	☐ Rude gradul I Vă rugăm specificați: ..... ☐ Alte grade de rudenie Vă rugăm specificați: ..... ☐ Prieten ☐ Vecin ☐ Voluntar ☐ Altele Vă rugăm specificați: .....
A7	Dacă sunteți o persoană care asigură îngrijire calificată, vă rugăm să specificați unde lucrați (Dacă bifați „Altele” vă rugăm să specificați):	☐ Clinică/Institut de gerontologie sau geriatrie ☐ Centru permanent de îngrijire a bătrânilor ☐ Centru de zi pentru îngrijirea bătrânilor ☐ Altele .....

Vă rugăm să indicați pe o scală de la 1 la 5, in care
1 reprezintă dezacord total, 2 - dezacord parțial, 3 - neutru, 4 - sunteți de acord si 5 - acord total, în ce măsură sunteți de acord cu următoarele afirmații:

A8	Mă simt epuizat după o zi de muncă datorită volumului mare de muncă / atenție depusă / acordată pentru îngrijirea persoanelor în vârstă.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A9	M-ar ajuta foarte mult ca unele sarcini specifice îngrijirii persoanelor în vârstă (de ex: monitorizare non-intruzivă, comunicare, etc.) să fie efectuate cu ajutorul noilor tehnologii inteligente (ex: senzori atașați de haine sau aflați în încăperea pacientului utilizați pentru detectarea nivelului de mobilitate (sedentarism), a implicării în activități fizice și sociale, de localizare și avertizare în caz de pericol, de detectare a căderilor etc.)	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A10	Este mult mai sigur și comod pentru pacient să fie monitorizat non-intruziv cu ajutorul tehnologiilor inteligente (ex: senzori atașați de haine sau aflați în încăperea pacientului utilizați pentru detectarea nivelului de mobilitate (sedentarism), a implicării în activități fizice și sociale, de localizare și avertizare în caz de pericol, de detectare a căderilor etc) la domiciliu acestuia și să poată primi alerte în caz de neîndeplinire a sarcinilor recomandate pentru păstrarea unei sănătăți optime odată cu înaintarea în vârstă.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A11	Este mai comod și eficient pentru îngrijitor și pacient ca ambii să comunice audio-video prin intermediul internetului, fără a fi necesară deplasarea frecventă a îngrijitorului la pacient și a pacientului într-un centru de îngrijire.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A12	Este de preferat să am acces permanent la datele medicale și/sau la cele care descriu activitățile zilnice ale persoanei în vârstă aflate în îngrijire.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

A13	O persoană în vârstă poate trece mult mai ușor către un stil de viață activ atunci când știe că în caz de pericol îngrijitorul calificat/necalificat va fi alertat.	**1** ☐	**2** ☒	**3** ☐	**4** ☐	**5** ☐
A14	Este mult mai comod să ofer intervenții personalizate în vederea menținerii și îmbunătățirii calității vieții persoanelor în vârstă, la domiciliul acestora, prin intermediul tehnologiilor inteligente.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A15	Tehnologiile inteligente mă ajută să am acces la date obiective (validate medical) ce pot contribui la îmbunătățirea evaluărilor și intervențiilor asupra sănătății persoanelor în vârstă monitorizate.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A16	Tehnologiile inteligente îmi oferă posibilitatea să mă ocup de îngrijirea mai multor persoane vârstnice în același interval de timp.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A17	Tehnologia contribuie la optimizarea resurselor alocate îngrijirii persoanelor în vârstă (ex: timp, financiare etc.).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A18	Tehnologia îmi permite să îmbunătățesc indicatorii de alienare socială a persoanelor în vârstă pe mai multe dimensiuni precum: izolare socială, lipsa activități fizice etc.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
A19	Tehnologia poate oferi persoanelor în vârstă următoarele avantaje: • Îngrijire pe termen lung • Sfaturi medicale personalizate • Îmbunătățirea prevenției • Susținerea îmbătrânirii active; • Evitarea spitalizării • Reducerea stresului asociat procesului de îngrijire	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

Partea B – Date privind preferințele, nevoile și cerințele îngrijitorilor cu privire la mediul vINCI (acceptare, aspect, funcționalități, și interacțiune)

Întrebări privind tehnologia vINCI						
Vă rugăm să indicați pe o scală de la 1 la 5 in care 1 înseamnă deloc util, 2 - foarte puțin util, 3- Indiferent, 4 - util, 5 foarte util, cat de folositor/util considerați un sistem informatic care poate să:						
B1	Monitorizeze continuu starea de sănătate a unei persoane în vârstă prin intermediul tehnologiilor inteligente (ex: senzori atașați de haine sau aflați în încăperea pacientului utilizați pentru detectarea nivelului de mobilitate (sedentarism), a implicării în activități fizice și sociale, de localizare și avertizare în caz de pericol, de detectare a căderilor etc.).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B2	Monitorizeze următoarele caracteristici: • observarea permanentă a pulsului unei persoane • activitatea în aer liber • numărul zilnic de pași • ritmul cardiac și tensiunea arterială.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B3	Observe postura și mobilitatea unei persoane în vârstă în timpul execuției unor activități fizice.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B4	Stimuleze efectuarea de activități fizice în interiorul sau exteriorul locuinței (de ex: în urma detecției unor perioade mai lungi de sedentarism sistemul trimite alerte prin care pacientul este invitat să execute o serie de exerciții fizice iar îngrijitorul primește un raport privind îndeplinirea/neîndeplinirea sarcinilor propuse).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B5	Furnizeze instrumente adecvate (ex: chestionare electronice) prin care pacientul (persoana în vârstă) este invitat să introducă periodic date prin care se poate măsura nivelul curent al calității vieții, al activităților fizice realizate, dispoziția în care se află etc.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B6	Monitorizeze timpul pe care pacientul îl petrece așezat fără a face alte mișcări sau activități.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B7	Ofere o interfață prietenoasă cu utilizatorul în care pot fi grupate și afișate selectiv toate datele primite de la un pacient (persoană în vârstă) prin intermediul dispozitivelor inteligente.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

B8	Permită validarea de către specialist a datelor obținute de la dispozitivele inteligente de monitorizare.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B9	Identifice în mod individual fiecare utilizator (pacient, îngrijitor) și ofere în mod securizat informații în funcție de credențialele furnizate de sistem (de ex: un pacient ar trebui să aibă acces la informații precum: evaluarea stării sale generale de sănătate, dacă este necesar să se adreseze unui doctor, dacă trebuie să facă mai multe exerciții fizice etc.).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B10	Trimită alerte automate către îngrijitor (medic, familie, aparținător, etc) în cazul în care pacientul are nevoie de ajutor sau in situații de urgenta (ex.: cădere, probleme de mers sau postură etc.)	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B11	Colecteze următoarele categorii de informații personale: • Date demografie • Localizare și mișcare • Date utilizate în recunoașterea activităților • Date legate de sănătate (tensiune, puls etc.)	**1** ☐ ☐ ☐ ☐	**2** ☐ ☐ ☐ ☐	**3** ☐ ☐ ☐ ☐	**4** ☐ ☐ ☐ ☐	**5** ☐ ☐ ☐ ☐
B12	Ofere informații personalizate despre: • Calitatea vieții • Situația curentă a activității fizice • Status psihosocial • Riscuri de sănătate • Evoluția sănătății	**1** ☐ ☐ ☐ ☐ ☐	**2** ☐ ☐ ☐ ☐ ☐	**3** ☐ ☐ ☐ ☐ ☐	**4** ☐ ☐ ☐ ☐ ☐	**5** ☐ ☐ ☐ ☐ ☐
B13	Ofere notificări periodice cu privire la modificările survenite în activitățile zilnice ce pot afecta starea de sănătate a pacientului (de exemplu notificarea schimbărilor survenite în desfășurarea activităților fizice, în interacțiunile sociale, ce influențează starea de spirit etc).	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B14	Sunteți familiarizat(ă) cu următoarele dispozitive de monitorizare? • Dispozitive mobile inteligente (Telefon/tabletă cu internet și aplicații de monitorizare sănătate) • Camera de adâncime • Dispozitive purtabile (ceas inteligent, încălțăminte inteligentă) • Senzori atașați pe corp • Altele	**Da** ☐ ☐ ☐ ☐ ☐	**Nu** ☐ ☐ ☐ ☐ ☐			

Vă rugăm să indicați pe o scală de la 1 la 5 in care **1 înseamnă deloc util, 2 - foarte puțin util, 3- indiferent, 4 - parțial util, 5 foarte util,** **cat de folositoare/utile considerați următoarele funcții în cadrul unui sistem informatic ce sprijină îmbătrânirea activă și sănătoasă**						
B15	Detectarea timpurie a simptomelor unor afecțiuni asociate în general cu înaintarea în vârsta.	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B16	Control extins asupra dispozitivelor de monitorizare prin activarea / dezactivarea individuală a acestora în funcție de nevoi și respectul vieții private	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B17	Intervenție personalizată în cazul semnalării unor modificări ai parametrilor monitorizați	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐
B18	Anticipare a riscurilor de sănătate	**1** ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☐

4.2 Annex 2 The English satisfaction questionnaire

The English satisfaction questionnaire is available at the web address: https://forms.gle/q5uHfVVPhheZUyTy5 and its content is presented as follows.

Clinically-validated INtegrated Support for Assistive Care and Lifestyle Improvement: the Human Link - vINCI

vINCI Pilot Study

Feedback questionnaire on the satisfaction of using the vINCI application

Introduction

This questionnaire is used to collect users' opinions on the use of the vINCI application.

Please complete this questionnaire at the end of the period of use of the vINCI application.

The questionnaire is anonymous, please fill it in as you see fit, following the experience you had.

Please answer the general questions in the first part of the questionnaire.

Age (years)		**Gender:**	Male/ Female	**Education:**	Secondary/ Higher/Other

I. How often do you use the vINCI application?

1	2	3	4	5
daily	weekly	monthly	Several times a year	never

II. Considering all vINCI devices, please answer the following statements:

Nr. crt.	**Questionnaire Item**	**Fully disagree**	**Disagree**	**Nor agree, nor disagree**	**Agree**	**Fully agree**
1.	It is easy to learn how to work with the vINCI application.					
2.	The vINCI application is easy to use.					
3.	Using the vINCI app, I am better informed about my health.					
4.	My security level has improved using the vINCI application.					

5.	The vINCI application helps me to obtain relevant quality of life data.					
6.	The vINCI application gives me the opportunity to more easily communicate data about my physical condition / quality of life.					
7.	The system interface is pleasant and intuitive.					
8.	The results provided by the application are easy to access and understand.					
9.	I think I could improve my health using the vINCI app.					
10	The information provided by the vINCI application is complete and useful.					
11	The daily monitoring performed through the vINCI application does not interfere with my personal data.					
12	The vINCI application has improved the quality of medical services received.					
13	The interaction with the vINCI application is clear and easy to understand.					
14	The organization of the information on the screen of the devices running the vINCI application is clear and intuitive.					
15	The vINCI application is very useful for me in my daily life.					
16	Using the vINCI application is very evINCIciting.					
17	I like to interact with the vINCI application interface.					
18	I use the vINCI application with confidence.					
19	Overall, I am satisfied with how to use the vINCI application.					

4.3 Annex 3 The Romanian satisfaction questionnaire

The Romanian satisfaction questionnaire is available at the web address https://forms.gle/K7LUGt1oduYKV9D38 and its content is presented as follows.

Clinically-validated INtegrated Support for Assistive Care and Lifestyle Improvement: the Human Link - vINCI

Studiu Pilot vINCI

Chestionar Feedback privind satisfacția utilizării aplicației vINCI

Introducere

Acest chestionar este utilizat în scopul colectării părerilor utilizatorilor cu privire la utilizarea aplicației vINCI.

Vă rugăm să completați acest chestionar la sfârșitul perioadei de utilizare a aplicației vINCI.

Chestionarul este anonim, vă rugăm să îl completați așa cum credeți de cuviință, în urma experienței pe care ați avut-o.

Vă rugăm să răspundeţi la întrebările generale din prima parte a chestionarului.

Vârstă (ani)		**Gen:**	Masculin/ Feminin	**Studii:**	Medii/ Superioare

I. Cât de des utilizați aplicația vINCI?

1	2	3	4	5
zilnic	săptămânal	lunar	de câteva ori pe an	niciodată

II. Luând în considerare toate dispozitivele vINCI, vă rugăm să răspundeți la următoarele afirmații:

Nr. crt.	Afirmație	Dezacord total	Dezacord	Neutru	De acord	Total de acord
1.	Este ușor de învățat modul de lucru cu aplicația vINCI.	O	O	O	O	O
2.	Aplicația vINCI este ușor de utilizat.	O	O	O	O	O
3.	Folosind aplicația vINCI, sunt mai bine informat privind starea mea de sănătate.	O	O	O	O	O
4.	Nivelul meu de siguranță s-a imbunătățit folosind aplicația vINCI.	O	O	O	O	O

5.	Aplicația vINCI ma ajută să obțin date relevante privind calitatea vieții.	O	O	O	O	O
6.	Aplicația vINCI îmi oferă posibilitatea să comunic mai usor date despre condiția mea fizică / calitatea vieții.	O	O	O	O	O
7.	Interfața sistemului este plăcută și intuitivă.	O	O	O	O	O
8.	Rezultatele oferite de aplicație sunt ușor de accesat și înțeles.	O	O	O	O	O
9.	Cred ca as putea să-mi imbunatatesc starea de sanatate folosind aplicația vINCI.	O	O	O	O	O
10	Informațiile furnizate de aplicația vINCI sunt complete și utile.	O	O	O	O	O
11	Monitorizarea zilnică realizată prin aplicația vINCI nu interferă cu datele mele personale.	O	O	O	O	O
12	Aplicația vINCI a îmbunătățit calitatea serviciilor medicale primite.	O	O	O	O	O
13	Interacțiunea cu aplicația vINCI este clară și ușor de înțeles.	O	O	O	O	O
14	Organizarea informațiilor pe ecranul dispozitivelor ce ruleaza aplicația vINCI este clară și intuitivă.	O	O	O	O	O
15	Aplicația vINCI îmi este foarte utilă în viața de zi cu zi.	O	O	O	O	O
16	Utilizarea aplicației vINCI este foarte antrenantă.	O	O	O	O	O
17	Imi place să interacționez cu interfața aplicației vINCI.	O	O	O	O	O
18	Folosesc cu încredere aplicația vINCI.	O	O	O	O	O
19	În general, sunt satisfăcut de modul de utilizare al aplicației vINCI.	O	O	O	O	O