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1. INTRODUCTION

This document describes the results obtained during the Virgilius scenario 1 test execution, held in the Perugia hospital (S.M. della Misericordia) in the period 24-26 September 2014.

1.1 PURPOSE AND SCOPE

Purpose of this document is to describe the environments and the process used to recruit the over 65 people that executed physically the test of the Virgilius system. The description of the different test scenarios executed will be reported. The process of collecting results is described (use of post-test questionnaire). Finally the analysis of the results is also presented and evaluated to address the future modifications of the system on the basis of the suggestions reported by the users.

2. PERUGIA HOSPITAL ENVIRONMENT DESCRIPTION

The test environment includes a part of the Perugia hospital named ACU (Ambulatory Care Unit) in which approximately 90 examination rooms, pertaining to 17 different medical branch, are distributed over four floors as shown in the next two figures:

Figure 1 – Perugia hospital ACU

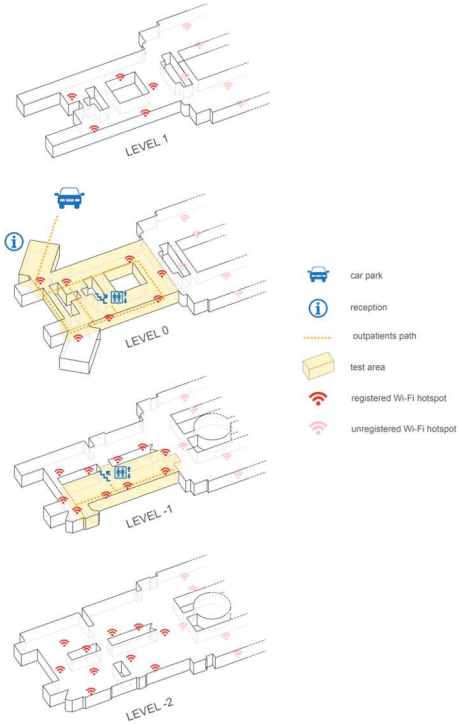

Figure 2 – Internal maps of the ACU

For test purposes, only two of these four floors are selected. In particular the 0 and -1 levels have been chosen (see next figure), considering that they includes the main entrance of the hospital and the ticket office.

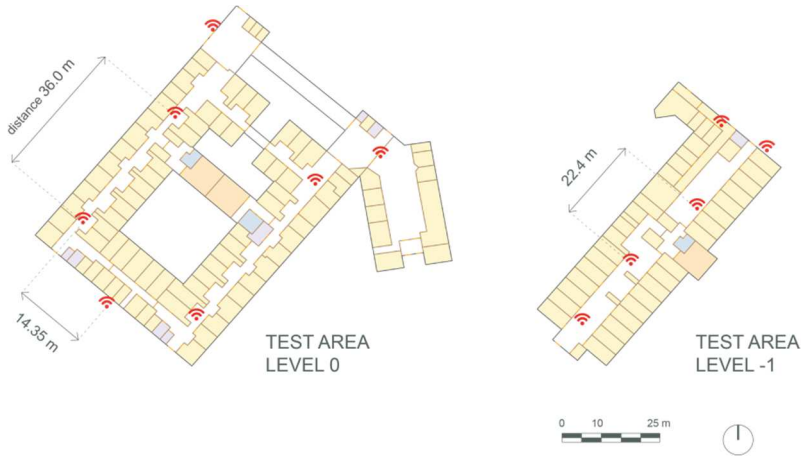

Figure 3 – Test area selected

The selected area was already cabled with a proprietary WI-FI network, currently used by the hospital for internal purposes. In the Figure 3 the WI-FI hotspots are reported in red colour.
After the first survey in the area, the Virgilius team verified that this network was not useful for internal positioning purposes, due to the poor distribution of the hotspots. The use of this technology should require the installation of others hotspots. This activity was considered too time consuming, taking into account the project schedule, then the team decided for the use of the Bluetooth technology for internal positioning in the test area. The installation of the Bluetooth beacon has been considered more easy and quick with respect to the WI-FI. To this purpose 100 Bluetooth beacons of the TOD's company were acquired and installed. The beacon support the Bluetooth 4.1 standard, as required by the Virgilius internal position technology.

In the next figure is reported the TOD's Bluetooth beacon and the related installation activities

Figure 4 – TOD's Bluetooth Beacon and installation activity

Finally, for the test six smartphones have been acquired. The chosen model is the Samsung Galaxy Note 3.

3. TEST CASE DESCRIPTION

The selection of the test case to be submitted to the users has been made on the basis of the following criteria:

- Simulate a usage condition as similar as possible to a real case
- Include in the test case all the Virgilius functions that were developed
- Reduce as much as possible the test time taking into account the age of the volunteers

Following these guide lines a test case divided in three main steps has been defined:

Step 1 – Outdoor-indoor navigation
The user arrives by car to the hospital, then parks his car in the hospital parking, stores the car position (personal POI creation) in the app and create a first trip from the car to an ambulatory chosen inside the internal cabled area.

Step 2 – Indoor-indoor navigation
The user arrives to the ambulatory selected as final destination of the Step 1 and simulates the need to reach another ambulatory inside the cabled area but in another floor. To do so, user creates a new trip with origin “current position” and final destination the chosen ambulatory.

Step 3 – Indoor-outdoor navigation
The user arrives to the final destination of Step 2 and creates a new trip to come back to its car in the parking.

During the execution of these three steps the user is invited to use the emergency functions of the Virgilius mobile app to verify:

- The activation of emergency page
- The automatic transmission of an SMS to the relative user associated
- The possibility to call emergency number
- The visualization on the home page of the mobile app of the personal medical data useful for the rescuers

After the completion of these three steps, each user is invited to re-enter in the hospital for the final phase of the test that consists in the usage of the Virgilius webapplication and then the compilation of the post test questionnaire.
The evaluation of the Virgilius web application includes the following test:

- Verification of the final user tracking function for the relative user associated and authorized
- Usage of the main functions dedicated to the final users:
    - Trip creation from the PC and verification of the automatic transmission of the trip to the mobile

- Personal data modification and automatic transmission to the mobile
- Relative authorization management

For sake of simplicity all the final users associated to the terminals available for the Perugia test, had the same relative user associated.
In the next figures some testers during the tests execution are shown.

Figure 5 – Users during the breefing pre test

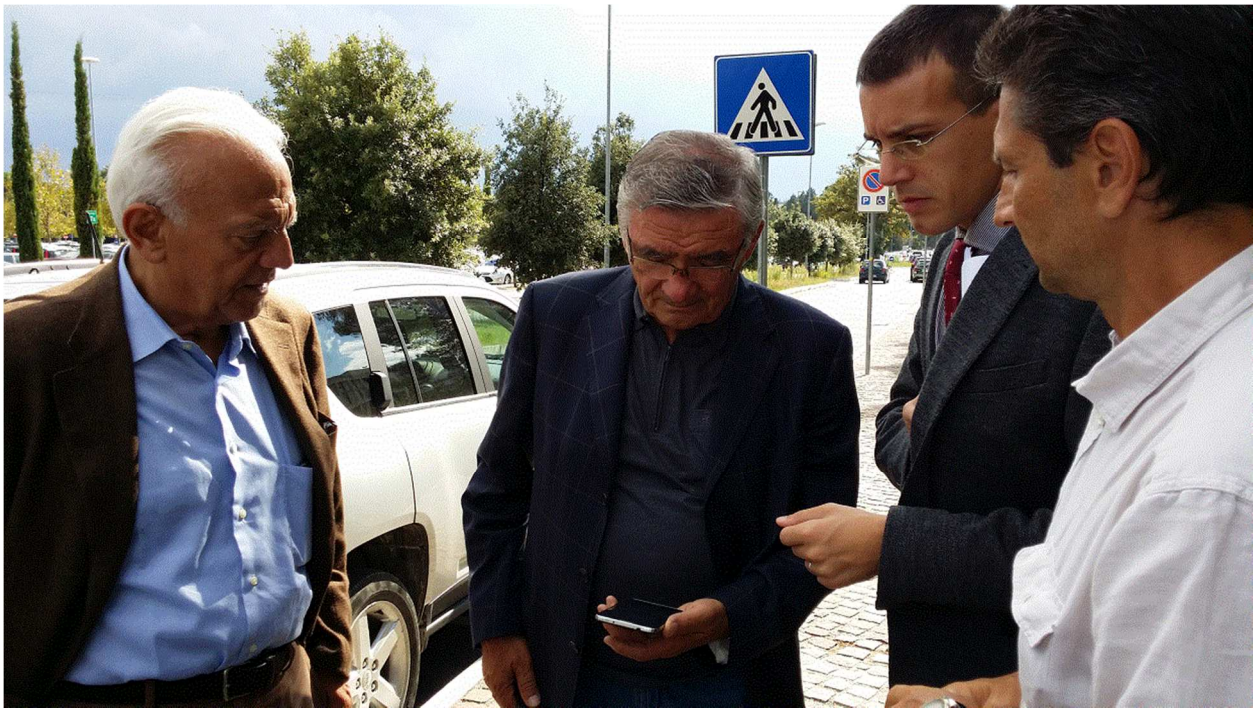

Figure 6 – Step 1 – User starts trip from parking

Figure 7 – Step 1: Users during outdoor navigation

Figure 8 – Step 1: Users enter in the hospital (ticket office) and start indoor navigation

Figure 9 – Step 2: Users create a new trip and navigate from an ambulatory to another

Figure 10 – Step 3: users exit from the hospital and comes back to the car

Figure 11 – Step 3: Users at the desktop for web application test

Figure 12 – Step 3: Users during the web application test

Figure 13 – Users during the post test questionnaire compilation

Figure 14 – Users during the post test questionnaire compilation

4. FINAL USER RECRUITMENT

The over 65 volunteers that participated to the final test have been recruited by the staff of the Perugia hospital supporting the Virgilius test activities. This group of testers has been selected starting from the group that in the last April was contacted for the first phase of the over 65 involvement in the project. As already reported in [1] these people have been contacted by means of the following organizations operating in Perugia:

- University of the Third Age of Perugia
- ADA Umbria (Association for the Rights of the Elderly)
- No-profit foundation “Fonte Nuovo”

As reported in details in [1], the number of people that filled the pre test questionnaire needed to evaluate the needs of the over 65 people, were 119.

From these 119 people, only 31 accepted to participate to the final test phase of the Virgilius system.

In the next figures are reported some meetings held in Perugia last April for the presentation of Virgilius project and for the submission of the pre test questionnaire (results of this questionnaire are reported in details in [1])

Figure 15 – Pre test meetings for over 65 involvement

Figure 16 - Pre test meetings for over 65 involvement

5. TEST RESULTS DESCRIPTION

As already described, at the end of the test, each user has been requested to fill a questionnaire for the evaluation of the system and to report suggestions and comments. Here below the English version of the questionnaire is reported:

1. *Age*
   a. *65 – 70*
   b. *71 – 75*
   c. *Over 75*
2. *Did you find easy the Virgilius usage?*
   a. *Yes*
   b. *No*
   c. *partially*
3. *Do you think that Virgilius can be useful?*
   a. *Yes*
   b. *No*
   c. *Only partly*
4. *Personally Do you use Virgilius system?*
   a. *Yes*
   b. *No*
5. *Do you change something in the following Virgilius characteristics?*

	SI	*NO*
Graphical design		
Buttons shape, dimension or position		
Colours choice		
Data insertion logic		

6. *Please, give an evaluation about the usefulness of the following Virgilius functions*

	USEFUL	*UNUSEFUL*	*INDIFFERENT*
Indoor navigation			
Emergency management			

Remote tracking for the parents/caregivers			
Medical data management			

7. *Please, give an evaluation about the "user friendly" degree of the following Virgilius functions*

	SIMPLE	*NORMAL*	*DIFFICULT*
Trip Creation and management			
Navigation			
Arrive to final destination			
Emergency signal activation			
Parents/caregivers authorizations management			

8. *In your opinion, what functions, currently not implemented, could be useful to include in the Virgilius system?*

……
……
……
……
……

9. *Suggestions/comments*

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……
……
……

The reduced number (31) of users that accepted to participate to the test, impeded the statistical processing of the results, then, the statistical correlation among the different variables presented in [1] for the pre-test questionnaire, in this case was impossible.

In the following only the collected results from the questionnaire will be described for each question.

Question 1: Age

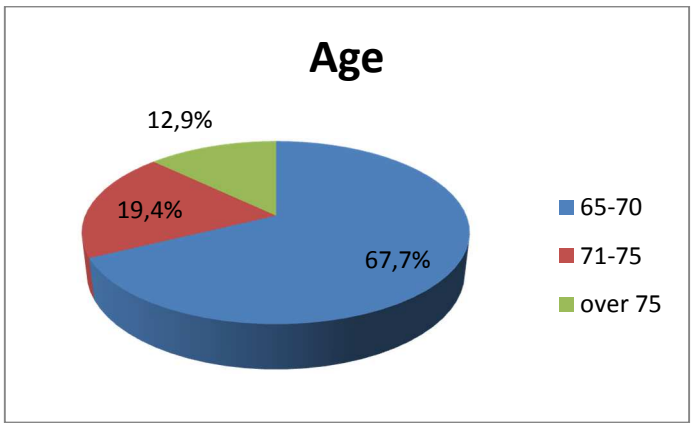

Figure 17 – Testers age distribution

Note that most of the participants were in the lowest age range. In general, it was found that people over 70 that previously participated to the recruitment and presentation meetings, in very few cases accepted to participate to the practical tests, confirming the difficult for elder people to independently move far from their familiar places.

Question 2: Did you find easy the Virgilius usage?

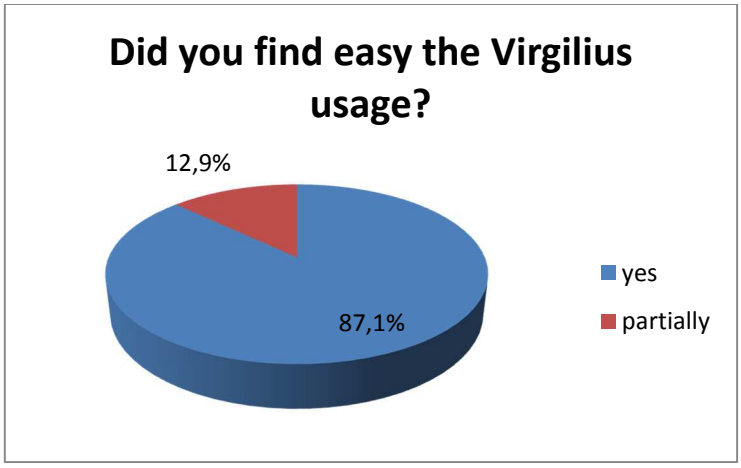

Figure 18 – Virgilius usability evaluation

To be noted that people that answered with “partially”, pertain surprisingly to the age range 65-70. It has been decided do not explicitly show this correlation due to its

inconsistency from statistical point of view. Then it should be considered only as a casualty in the group of people involved in the test

Question 3: Do you think that Virgilius can be useful?

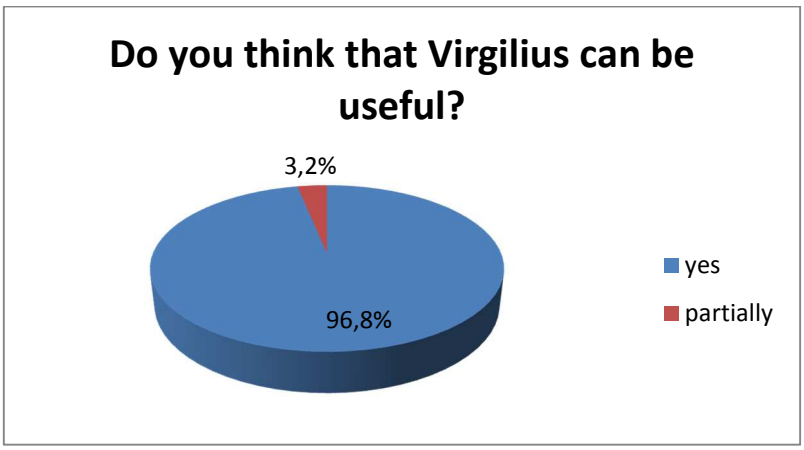

Figure 19 – Usefulness of Virgilius system

Question 4: Personally Do you use Virgilius system?

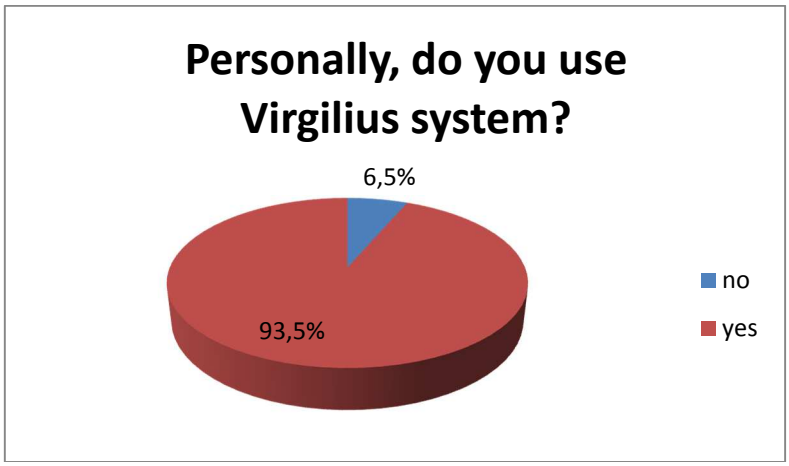

Figure 20 – Personal feeling with the Virgilius system

Question 5: Do you change something in the following Virgilius characteristics?

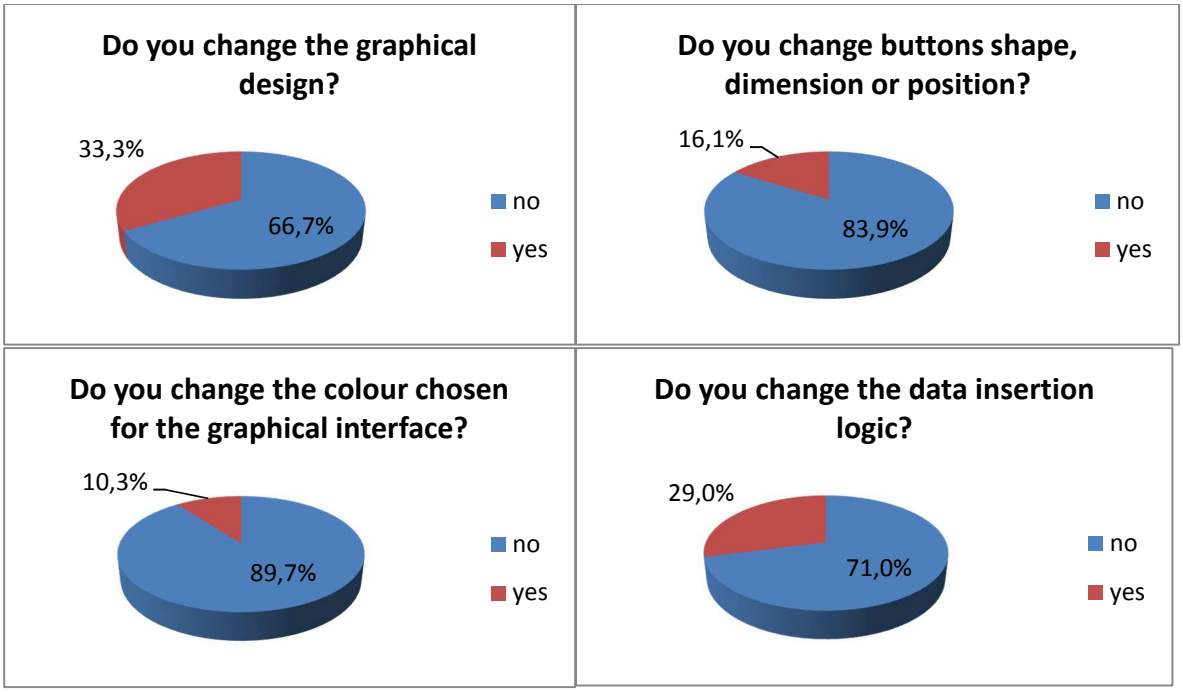

Figure 21 – Changing needs in main Virgilius functions

It is possible to make a consideration deduced from the live observation of the users reactions during the test: the significant percentage of testers that answered “yes” for changing in graphical interface and data insertion logic (around 30%) is not motivated by the graphical characteristics of the user interface, but mainly by the too high number of operations that they have to do for the trip creation and personal POI storage. This problem was addressed by the Virgilius team already before the test, but, at the current status of the development, was considered not easily solvable. It could be the main goal of future application developments, mainly orienting the system for an integration with external platforms, such as the booking and ticketing hospital platform that can avoid the manual insertion of the final destination in the trip creation.

Question 6: Please, give an evaluation about the usefulness of the following Virgilius functions

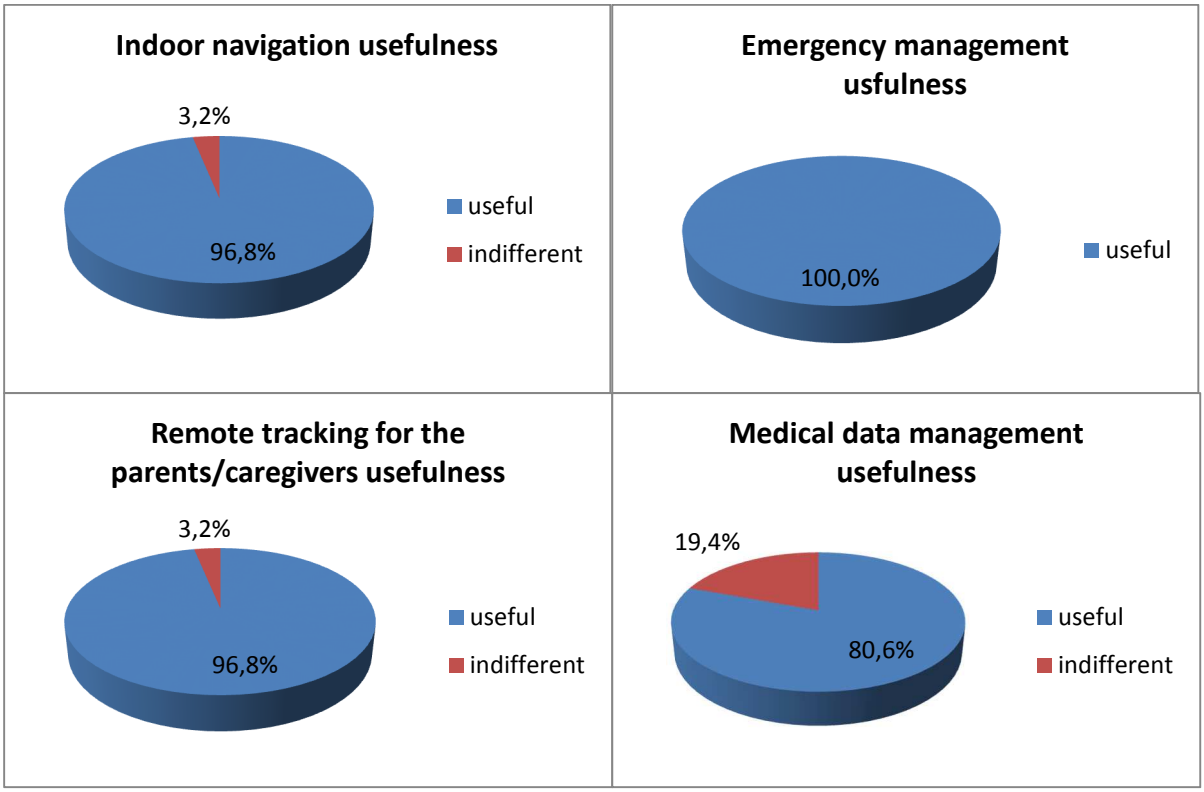

Figure 22 – Main Virgilius functions usefulness evaluation

Note that the totally of the testers evaluated as usefulness the presence of the emergency function. During the test, the testers paid particular attention to this function and they expressed also some suggestions for further development of it. They said that, the medical data automatic display in case of emergency function activation, is a very important feature and it has been appreciated as long as the privacy of sensible data is assured.

Question 7: Please, give an evaluation about the "user friendly" degree of the following Virgilius functions

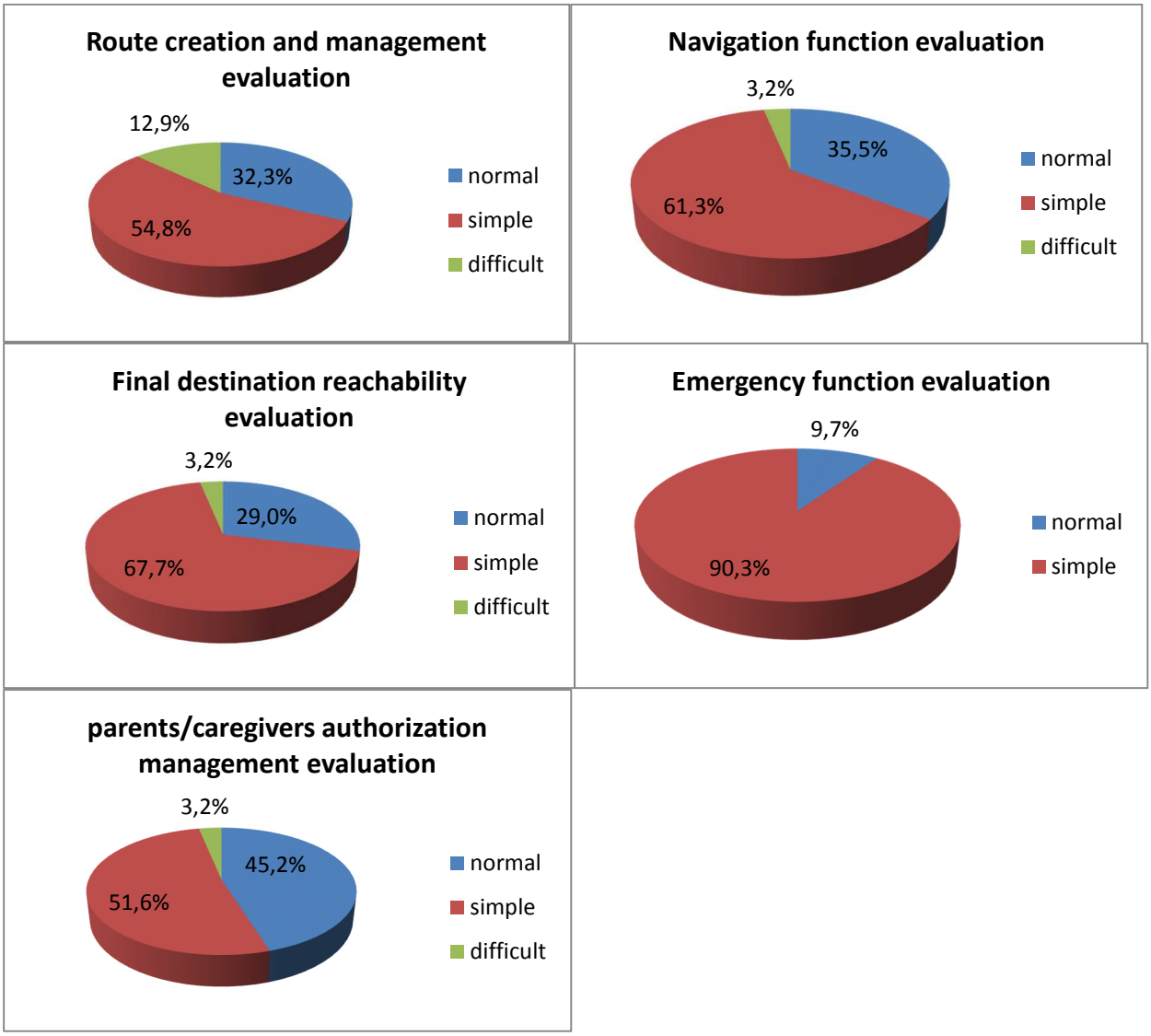

Figure 23 - Main Virgilius functions friendly degree evaluation

Note that, as already anticipated in the comments at question 5, the route creation and management is considered not so friendly by a significant percentage of testers (around 45%). This evaluation is mainly due to the high number of parameters to be inserted for the trip creation, especially for the choice of the internal final destination. This limitation can represent a topic for future modifications of the Virgilius system.

Question 8: In your opinion, what functions, currently not implemented, could be useful to include in the Virgilius system?

Here a list of the functions that the testers suggested in their questionnaire. Due to the open format of the answer, the suggestions have been reworded and grouped to better report the willing of the testers:

- Most of the tester said that they don't use the car but only public transportation, then they appreciate a possible integration of the Virgilius system with the public transportation network information (where available), for the outdoor navigation with the bus. For example, the user can plan the route from its home up to the hospital using the option "public transport". In this case the app shall select the bus line, indicating the closest bus stop and considering the timetable of the bus.
- Currently the emergency function automatically sends an SMS to the associated relative/caregiver and start a call to the emergency service (112). The current position of the user is available only to the relative/caregiver if it is enabled to display it. The request of the tester is that Emergency function can automatically send the user position also to the emergency authority, thus implying an integration of Virgilius system with the Emergency informatic platform.
- Due to the high number of parameters to be inserted for the trip creation including an internal destination, an integration with the hospital ticket office SW platform, that allows an automatic insertion of the internal destination is highly appreciated
- Navigation with vocal indication is considered useful by some testers

Question 9: Suggestions/comments

Here a list of suggestions/comments reported in the questionnaire by the testers. Due to the open format of the answer, the suggestions have been reworded and grouped to better report the willing of the testers:

- Internal maps should be more complete. The insertion of text indicating stairs, elevators, toilet, bar, restaurant, name of the different corridors is very useful for the orientation
- The possibility to create a route from the internal current position to toilet, ticket office, restaurant is mandatory for most people
- The route creation is often too difficult and not very intuitive (the button "create" is not clear, often users looking for a button "go ahead")
- The creation of personal POI and his usage is too difficult and not intuitive for all testers
- The word "POI" should be changed with something more clear
- The green arrow at the left bottom side of the interface should be more evident and more accurate. A lot of testers said that this arrow is more useful than the maps, so it should be highlighted.

- During the navigation the interface does not notice if the user is going in the opposite direction with respect to the right one
- The internal position is always in late with respect to the real position and this is disorienting, above all, in the corners, when the user has to change direction (turn left or right).
- The movement of the map during the navigation is considered disorienting, by some testers
- Some testers said that the usage is too difficult
- The availability of medical data is considered a very useful function in case of emergency, but the privacy must be assured

6. CONCLUSIONS

The test campaign of Virgilius system, conducted in the Perugia hospital in the days 24-26 September 2014 had, as main goal, not the performance verification of the system (already internally tested in previous test sessions within the hospital), but an affordable evaluation of the final users feeling with the new technology proposed.
Unfortunately, the number of over 65 people that accepted to participate to the campaign has been very poor, notwithstanding the high number of people previously involved in the meetings presentation and in the pre-test questionnaires submission. Only 31 people over 191, participated to the final test campaign.
The general impression that emerged from the three days of test campaign is that people are very interested to the product presented. They participated to the test showing an high level of attention and asking a lot of questions about the Virgilius functionalities and performances.
The questionnaire results shown that, most of the testers should personally use Virgilius and, in some cases, they ask if Virgilius is already available on the market.
From the functions point of view emerged a well defined need from the users: the personal safety. They particularly appreciated all the functions related to this topic, such as, the emergency management and the possibility for the relatives/caregivers to remotely track the user position at any moment.
The choices made for the interface graphical design (colours, buttons and text dimension) have been very well evaluated.
Some refinements and modifications have been requested for the logic of data insertion, that in some cases (trip creation and personal POI storage) have been considered quite difficult and long.
Other refinements are also requested for the navigation function that is requested to be richer of graphical information and more flexible in recomputing the indoor final destination (currently the indoor navigation from current position to toilet, restaurant and other internal POIs not explicitly included in the static list of internal destinations, is not available)
Suggestions about new functions that could be useful for Virgilius system show that the exploitation plan to transform Virgilius in a product ready for the market, passes through the integration with other platforms such as the national emergency services and the local public transport networks.