

D.5.2.2. User's acceptance final report

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Summary

In the overall architecture of WP5, Task 5.2 specifically addresses two objectives understood from the **users' point of view**: assessing the solution acceptability and its efficiency. The ambition is to be able to make recommendations and prescribe improvements made in cooperation with WP5.1 and to be implemented in WP4.4 (ICT solution Refinement) before the end of the project.

Section 1 "Introduction and Overall Task 5.2 Methodology" presents the E3SoHo assessment process and the definition of the issues it raises.

Section 2 "Methodological Forewords on Questionnaires" presents the methodological caution to be taken to correctly understand the results from the questionnaire to tenants.

Section 3 "Questionnaire Results Analysis" presents the results of the questionnaire to tenants and the main conclusions and lessons learnt.

Section 4 "Feedbacks from Users as Building Managers" presents the feedbacks of the building managers on their dedicated interface.

Section 5 "Outputs and Inputs from Task 5.2 to the E3SoHo Project" provides an overview of the interactions between refinements actions, measurement campaigns and users feedbacks.

And finally **section 6** "Conclusions and lessons learnt" summarizes the main results obtained in WP5.2 for the E3SoHo project.

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Abbreviations

| | |
|--------|--|
| E3SoHo | Energy Efficiency in European Social Housing |
| ICT | Information and Communication Technologies |
| IHD | In Home Display |

1. Introduction and Overall Task 5.2 Methodology

In order to achieve the WP5 (Monitoring and Evaluation) final objective (i.e. Task 5.3 “Validation of the ICT Solution”), the E3SoHo solution was refined by making recommendations and by implementing improvements. The first step of this process consisted in establishing on the one hand **what** outputs for the users the system is able to produce (Task 5.1: Monitoring and evaluation of the system's performance); and on the other hand **who** the users are and what their requirements as inputs to enhance the system are regarding this specific solution (Task 5.2: Assessment of the user acceptance, behavioural change and analysis of recommendations).

In this perspective, Task 5.2 appears as a crucial step for the E3SoHo project as it is addressing key issues, namely the assessment process and the definition of the solution, regarding its perimeter and its targeted users.

1.1 Reminder on Issues Raised in WP5 by Assessing the E3SoHo Solution

The E3SoHo solution assessment process raises a set of questions related to acceptability process.

In D5.2.1 “User's acceptance initial report”, we stated that the novelty of the solution comes from a hybridization process: acceptability of the solution is dependent to the possible adoption and transposition of devices, technology and know-how from ICT sector into the sector of energy consumption related activity.

In this perspective, studying acceptability of the solution by users is equivalent to study what required adaptations are coming along with the hybridization process to successfully commute an ICT solution to a so-called energy solution.

The E3SoHo project's answer to the acceptability issue is to assess the solution both considering the technical monitoring and the users' feedbacks. Though Task 5.1 consists in measuring the behavioural changes as a variation of energy consumption, whereas Task 5.2 is taking into account the users' discourses and points of view on their behavioural evolution since the solution was installed.

But identifying these two inputs for acceptability assessment only drives reflexion to another step of questioning which concerns the assessment point of reference. Indeed, we wonder then what does it mean to consider that the E3SoHo solution is **operational** and/or **efficient**. Both tasks 5.1 and 5.2 propose answers to this question from the technical and user's perspectives considering the efficiency as the impact of the solution perceived by the users benefiting from it and as the facility to interact with the solution. Assessing the efficiency from these users' point of view is an opportunity to estimate the gap existing between the user's expectations regarding the ICT solution (device and interface) and the reality of the current uses. Thus WP5, with both tasks 5.1 and 5.2 allows implementing refinements during the project (see Task 4.4: Refinement of the ICT solution) to improve the solution and face the challenge of making the ICT solution both operational and efficient.

1.2 Reminder on Definition Issues

The pragmatic and operational questions developed in section 1.1 are clearly and directly related to the definition of the E3SoHo solution. During the previous work done to achieve D5.2.1 User's acceptance initial report, the consortium collectively agreed on a definition strongly standing on a common acceptance of the solution perimeter and target summed up in the two following bullet points.

➤ The Perimeter Working Hypothesis

As the E3SoHo is an experimental project, the consortium decided to adopt an extensive definition of the perimeter of the E3SoHo solution in order to include all the impacting aspects (i.e. technical equipment, telecommunication means, installation process, communication means like user interfaces, training sessions, leaflets, instructions for use, etc.) The solution is thus more understood as an integrated and operational service than as technical equipment.

➤ The User Working Hypothesis

The E3SoHo consortium's working hypothesis in Task 5.2: relies on the extensive definition of user including, besides tenants as core users of the ICT solution, technical and communication staff –users only interacting with

the device- and building managers and owners -users benefiting from the service considering the informational aspects of consumption and performance of building's installations.

1.3 Tools and Previous Results

For achieving the two assessment objectives regarding acceptability and efficiency of the E3SoHo ICT solution, the data feeding Task 5.2 will be extracted according to the methodological plan presented in Table 1 in order to take into account all the elements enabling a wider deployment of the solution.

Table 1 Methodological Plan

| Targeted Users | Methodological Tools | Targeted Data |
|--|--|--|
| The pilot sites' tenants | Questionnaires in face-to-face conditions Observations during visits to tenants Focus groups during collective training sessions | Feedback on interface usability, pertinence of provided data, perception of own behavioural changes and energy savings achieved through the use the ICT solution |
| The cities' staff in charge for training the tenants | Analyses of leaflets and training sessions written contents Focus groups Written feedbacks | Feedback on the organisation and conception of tenants training and awareness campaigns |
| The technical staff | Observations Individual interviews Written feedbacks | Feedback on installation process difficulties and possible optimization |
| The building managers and the building owners | Observations, Individual interviews Written feedbacks | Feedback on the building managers interface usability, pertinence of provided data. |

A first feedback from users as technical staff and staff in charge of training sessions was already provided in D5.2.1. The main conclusions were the following:

- According to the communication staff, the awareness campaign was positively perceived by the tenants considering both duration and technical structure. Possible improvement would concern the problem set by tenants not familiar with ICT devices. In order to fix this problem dedicated guidelines should be prepared for specific populations such as elderly or foreigners. Another possible improvement would concern the possibility to enlarge discussion (in sessions and in leaflets) to more general energetic issues as it would be positive to reinforce tenants' interest as attendance to collective training sessions could be a point for concern.
- According to the technical staff, installing the tablet in the dwellings is simple (done only once and no more action was required when internet connectivity was good). Installation doesn't require a specialized person/worker which appears as a very important thing from the installer side. The connectivity problems should be taken seriously into account for further deployment whether the routers numbers would be increased or the whole issue would be delegated to Internet providers.

To complete this first bunch of information, further actions had been planned (see D5.2.1 User's acceptance initial report Section 6.3 "Forthcoming Actions") and implemented to get feedbacks from users as tenants presented in section 2 "Methodological Forewords on Questionnaires" and section 3 "Questionnaire Results Analysis" (see p.12 and the following) and feedbacks from users as building managers provided in section 4 "Feedbacks from Users as Building Managers" (see p.41).

Finally, in order to feed reflexion between Task 5.1 and Task 5.2, exchanges took place to help in relativizing the tenants questionnaire results and the measured facts (see section 5 "Outputs and Inputs from Task 5.2 to the E3SoHo Project", p.44).

1.4 Work Organisation

In the following schedule (see Table 2), all the actions made since the project started are listed on the three pilot sites (updated synthesis from D.5.2.1 "User's acceptance initial report"). Each line is part of an iterative essay-error process impacting at the same time technical and relational issues or concerns.

Table 2 Schedule of Actions Involving Tenants

| Locations | Dates | Specific Action |
|-----------------------------|----------------------------------|---|
| Warsaw Zaragoza Genoa | Winter 2011 | ➤ Written Guidelines |
| Warsaw | 27 May 2011 | ➤ Information Session |
| Warsaw | June 2011 | ➤ Sensors and metering equipment installation |
| Zaragoza | 1-15 July 2011 | ➤ Metering equipment installation |
| Zaragoza | 19-21 and 29 December 2011 | ➤ Tablet (CECDisplay transitory solution) and Wi-Fi network installation ➤ Written Guidelines ➤ Individual Training Sessions |
| Genoa | 21 and 28 December 2011 | ➤ Tablet and sensors installation ➤ Written Guidelines ➤ Individual Training Sessions ➤ Collective Training Sessions |
| Zaragoza | 24-27 January 2012 | ➤ Individual Training Sessions |
| Warsaw | February 2012 | ➤ Presentation of the 1 st version of the Polish application ➤ Individual Training Sessions |
| Genoa | February 2012 | ➤ Internet Connection testing |
| Zaragoza | 29 February 2012 | ➤ Problem fixing ➤ Individual Training Sessions |
| Zaragoza | 21-22 March 2012 | ➤ Start of deployment of new user interface sDisplay ➤ Written Guidelines ➤ Individual Training Sessions ➤ Collective Training Sessions |
| Genoa | 18 April 2012 | ➤ Display test ➤ Collective Training Sessions |
| Zaragoza | 17-19 April 2012 | ➤ End of deployment of new user interface sDisplay ➤ Individual Training Sessions |
| Zaragoza | 19-20 June 2012 | ➤ Problem fixing (Wi-Fi coverage, etc.) |
| Warsaw | 6-10 August 2012 | ➤ Written Guidelines ➤ Individual Training Sessions |
| E3SoHo Consortium | December 2012 – January 2013 | ➤ Elaboration of the Questionnaire to users as tenants |
| Warsaw Zaragoza Genoa | January 2013 | ➤ Delivery of the Questionnaire to Tenants |
| E3SoHo Consortium | February – March 2013 | ➤ Data gathering and analysis |
| E3SoHo Consortium | April 2013 | ➤ Providing results from the questionnaire as feedbacks to WP5.1. and WP4.4 reflexion |
| Warsaw Zaragoza Genoa | June-July 2013 September 2013 | ➤ Providing feedback to tenants about results obtained regarding savings, according to the updated version of D51.1 submitted in May, and D5.1.2 submitted in September |

Note This table highlights important differences across pilots in the dates of deployment of tablets. December 2011 was the date set for the three pilots of the project to deploy the tablets. However, in addition to the problems common for all the pilots (derived from the necessity to refine the ICT solution at that initial implementation stage), Polish pilot had additional problems related to the integration in project common platform of the data measured in Warsaw. Because of these doubts about the operative status of the solution, the tablet deployment was not completed in Warsaw at the same time as in the other pilots (only some testing experiences were made). Later development of the alternative ICT user interface for Warsaw was started. Once taken this approach, it was decided to wait for this alternative solution to be totally finished before deploying the tablets. This development was finished within Summer 2012, and just after that the tablets were deployed, thus allowing the start of the monitoring phase in August 2012, in alignment with the other two pilots.

Considering actions addressed to building managers, the strong involvement of the cities (Comune di Genova, Warsaw City Hall and Zaragoza Vivienda) allows receiving their inputs since the design phase. Remarks and critics on the solution design were taken into account in the frame of Task 4.4 Refinement of the ICT solution (see D4.4.2 "ICT solution refinement final report" for more details on refinements induced by users' –both tenants and building owners- feedbacks).

The E3SoHo partners agreed on the overall methodology and coordinated their actions in order to achieve the objectives and to comply with Task 5.2.

Data-gathering was done in two steps. First, the cities owning the buildings assisted by the E3SoHo partners in charge of the pilot sites (namely Acciona for Zaragoza, Mostostal for Warsaw and D'Appolonia for Genoa) make in appropriate times the individual and collective (focus groups) interviews and pass the questionnaires both to the tenants and staff. Second, CSTB compiles, consolidates and analyses the data considering the sociological aspects whereas ISA & ISEP deals with the issues of interfaces improvements.

2. Methodological Forewords on Questionnaires

After a period of use lasting between 10 to 5 months depending of the considered site¹ and punctuated by awareness campaigns and training sessions, the questionnaire to tenants as users of the E3SoHo solution was designed to assess:

- the quality of the interface in order to adapt it to enhance acceptability by increasing both the range of people able to use the solution whatever their initial ICT skills and the range of people enjoying or finding useful to use it;
- the evolution of tenants' opinion concerning the impact of such a solution on their behaviour understood both as their perception or sensitivity towards energy or even environmental issues and their factual actions potentially impacting consumptions.
- the reproducibility for a wider deployment of the solution in taking into account the tenants' opinions on the provided service seen as a whole, i.e. including an assessment of technical installation process, of communication means content, of data and advices.

2.1 The Questionnaire Designing Process

During December 2012, CSTB proposed a first English version of the questionnaire divided in 6 parts:

- Environmental Sensitivity in your household: establishing before assessing behavioural evolutions if respondents were inclined previously to the project to adopt environmental friendly actions.
- The E3SoHo ICT solution: opinion on the solution regarding interest, functionalities and users' profile.
- Suggestion to improve the E3SoHo ICT solution: opinion on deployment process and interface characteristics
- Instructions of use: opinion on communication means.
- E3SoHo ICT solution impact on your consumptions: tenants' estimation of the impact of the solution on their energy consumptions.
- Personal information: data on occupation and employment status, etc.

After an iterative collective designing process, a final version of the questionnaire to tenants (see Annex 7.1 "Questionnaire To Tenants", p.48) stabilized at the very beginning of January 2013, compacting the number of questions from 31 to 26. Questions on equipment in dwelling were added whereas some personal data perceived by some project members as too intrusive were removed (mainly data on employment status, relationship between dwelling inhabitants, etc.)².

After the translation process, the questionnaire was passed during February 2013 on the three pilot sites, i.e. in the 47 dwellings concerned by the ICT solution deployment (meaning that the control group in Genoa wasn't included).

During this process at the Zaragoza site a first working version of the questionnaire was passed after translated in Spanish (see Annex 7.2 "First Version of the Questionnaire to Tenants", p.55). In this questionnaire, 13 questions out of the 26 of the questionnaire final version did not get answers from the Spanish sample. But comparing the two versions, we identified cross-references on some questions (see Table 3, p.13). Besides, some questions from the Zaragoza questionnaire version provide useful additional data to complete the overall sample results and see if a clear trend arises. On a later stage, questions of the definite version of the questionnaire which had no equivalent in the previous version that was passed in Zaragoza pilot site were answered by the tenants with the information obtained through additional interviews with them.

¹ Despite having different periods of use, focusing strictly on the monitoring phase shows that the time of use is the same for all pilots sites.

² To have a detailed idea of the modifications which occurred between the 1st questionnaire and its final version, please see Annex 7.1 "Questionnaire To Tenants" (p.58) and Annex 7.2 "First Version of the Questionnaire to Tenants" (p.68).

Table 3 Approximate Matching between Final and Zaragoza Versions of The Questionnaire

| Final version | Zaragoza version |
|--|--|
| No equivalent question | Q1 Would you say that you/your household are/is sensitive to environment protection issues? |
| Q21. Since you got the E3SoHo ICT solution, do you think you reduced your energy consumption? Q22. Did your behaviour change since using the E3SoHo ICT solution? Q23. How has your behaviour changed since using the ICT solution? Q24. Why do you think there was no change of behaviour? | Q4 Do you think the deployment of the E3SoHo ICT solution changed the sensitivity to environmental issues for you? for your family as a whole? |
| Q6. Why does nobody use the E3SoHo solution in your home? | No equivalent question |
| Q8. What functionalities of the E3SoHo ICT solution are used in your home? Q15. What do you think about the solution? | Q9 What is the E3SoHo ICT solution useful for? |
| Q9. What did you think of the E3SoHo ICT solution technical installation at your home? | Q10 What did you think of the E3SoHo ICT solution technical installation at home? |
| Q11. Which were the main technical problems that you had? | Q12 Do you know why these dysfunctions happened? |
| Q13. Did you have any difficulties when using the tablet? Q14. How do you rate the application in terms of the following features? | Q14 How do you find the connection procedure, i.e. steps to reach the interface application (including, when relevant, switching the tablet on, opening the user interface application, entering the login and password, etc.)? Q15 Why? |
| Q13. Did you have any difficulties when using the tablet? Q14. How do you rate the application in terms of the following features? | Q16 How do you find the disconnection procedure i.e. steps to quite the interface application (including, when relevant, disconnecting, closing the user interface application, switching the tablet off, etc.)? Q17 Why? |
| Q16. What would you improve or change in this solution? | Q18 Would you like to change the information presentation? Q20 Do you think there is too much dragging to access the information on the pages? Q21 Would you change the kind of information the E3SoHo ICT solution provides? |
| Q18. How do you rate the information received to learn to use the solution? | Q22 Considering the information you already get, what was the more efficient way to appropriate the instructions of use? (1 stand for "very efficient" 5 for "not efficient") Q24 What do you think of the training sessions you attended? Q25 What do you think of the schedule of the collective training sessions? Q26 Would you think other training sessions would be helpful? |
| No equivalent question | Q28 Is anyone staying at home during the whole day (is the heating or cooling system working all the day long)? |
| No equivalent question | Q29. When the dwelling is occupied, what is the heating/cooling temperature in the heating period/summer? (°C) |
| No equivalent question | Q29. Satisfaction rate for heating period/summer |

| Final version | Zaragoza version |
|---|---|
| Q22. Did your behaviour change since using the E3SoHo ICT solution? | Q30. Since you got the E3SoHo ICT solution, do you think you reduced your energy consumption? |
| Q23. How has your behaviour changed since using the ICT solution? | Q32. Which of the following best describes your present employment status? |
| No equivalent question | Q34. Since when have you been living in this dwelling? |
| No equivalent question | |

2.2 The Questionnaire Delivering Process

In order to guarantee strong similarity for the questionnaire delivering conditions, strong methodological recommendations (see below Text Box 1) addressed to the interviewers (the staff in charge for passing the questionnaires on the sites) were inserted at the top of the questionnaire (see Annex 7.1 "Questionnaire To Tenants", p.48) after being discussed and approved by the project partners.

Text Box 1 Methodological Recommendations for Questionnaire Passing

Instructions to deliver the questionnaires

- *Carefully read the questions before visiting the people in order to avoid misunderstanding (some questions were difficult to formulate because requiring precise and/or detailed answers).*
- *Visit people rather than call them, send a mail or put a questionnaire paper version in their mailbox.*
- *During the visit, try to pick several persons from the same household to get the „family point of view“.*
- *For open questions, after letting people answering ask them gently to sum their answer in a sentence to write down a reliable synthesis done or agreed by the people themselves.*
- *Don't forget to replace in the questionnaire the expression „E3SoHo ICT solution“ by the name of the device actually used in the pilot site.*

CLEARLY SPECIFY THAT ANSWERS WON'T BE USE TO ASSESS TENANTS' BEHAVIOUR OR GOOD WILL AND WILL HAVE NO IMPACT FOR THEM. HONNEST (EVEN CRITICAL) ANSWERS WILL HELP US TO IMPROVE THE SOLUTIONS MORE THAN CONVENIENT OR „NICE“ ONES.

These methodological precautions were strictly followed but it appeared quite difficult to comply totally with the "theoretical" questionnaire passing process as defined above. Indeed about ten dwellings didn't answered to the questionnaire (whether the tenants were unreachable or do not returned the questionnaire or returned it empty). Here is the detailed of the empirical delivering process:

- In Zaragoza, 15 responses were received (the questionnaire wasn't passed in one dwelling) and out of these 15, one (included in the 38 answers gathered and analysed) was returned empty.
- In Genoa, out of 15 questionnaires, 7 were delivered in face to face conditions by City of Genoa, 8 were delivered in the mailbox among which only 3 were returned fulfilled.
- In Warsaw, 11 out of 13 questionnaires were delivered in face-to-face conditions. The reason why 2 questionnaires from the Polish sample were not conducted in person is that the tenants were unreachable. These questionnaires, delivered through the building caretaker, were returned partly incomplete. Two other questionnaires from the Polish sample were also returned incomplete because the tenants declared they don't use the solution because they are unfamiliar with such technology device (even after training sessions, they were unable to use the device).

After the delivery process, City of Warsaw, D'Appolonia and Acciona gathered their questionnaires answered in an Excel file provided by CSTB. An evolution of the results gathering interface took place after CSTB realised that the Excel matrix wasn't properly designed to avoid uncertainty mainly for questions with multiple answers, open questions and empty answers as it implied important database cleaning conveying too many approximations. Therefore City of Warsaw, D'Appolonia and Acciona had to re-enter the questionnaire results in a new online interface, introducing 15 days delay in the data analysis.

2.3 Methodological Caution and Sample Representativeness

All the analyses produced on the questionnaire results basis are to be handled with extra caution. Indeed it is based on a limited number of persons (38 as a whole) and only on declarative answers implying no commitment of any kind for the respondents.

This implies 1) that figures (and specifically percentages) are to be understood in a very caution way and 2) that generalization is not a reliable exercise on the base of such a small sample.

We recommend for instance always to report to values to fully get in mind the reality of percentages representativeness.

These methodological precautions being now stated, we will present the results of the survey as being taken only as the tenants' opinion expressed through a questionnaire in order to gather their feedbacks on the E3SoHo solution.

3. Questionnaire Results Analysis

3.1 Answering Rate

We collected 38 answers to the questionnaire survey out of 47 dwellings involved in the E3SoHo experimentation, i.e. 80.85% answering rate which is a high answering rate by itself. But this is off course counterbalanced by the fact that respondents are part of the project since several months now. So such a high rate of answer was expected for the questionnaire.

Among the sample, the repartition is about 1/3 for each pilot site (see Table 4).

Table 4 Repartition of the sample of questionnaires among pilot sites

| Location | Number of questionnaires | % of the pilot site |
|-----------------------------------|--------------------------|---------------------|
| Italian pilot site | 10 | 66.7% |
| Polish pilot site | 13 | 81.25% |
| Spanish pilot site | 15 | 93.75% |
| Total sample 3 pilot sites | 38 | 80.85% |

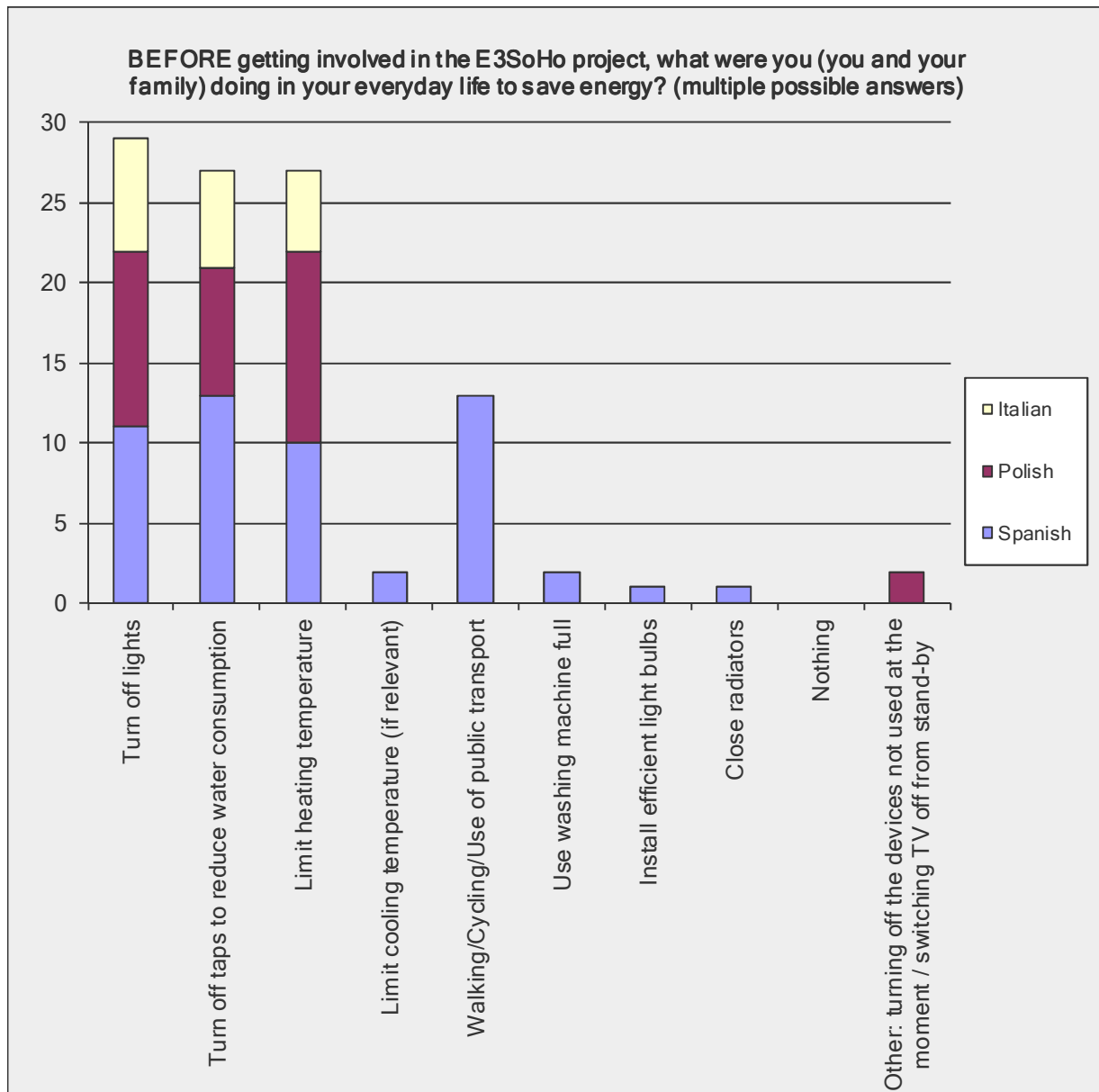
3.2 Behavioural Evolutions

We asked the tenants what kind of actions they do for saving energy, before and since the start of the E3SoHo project.

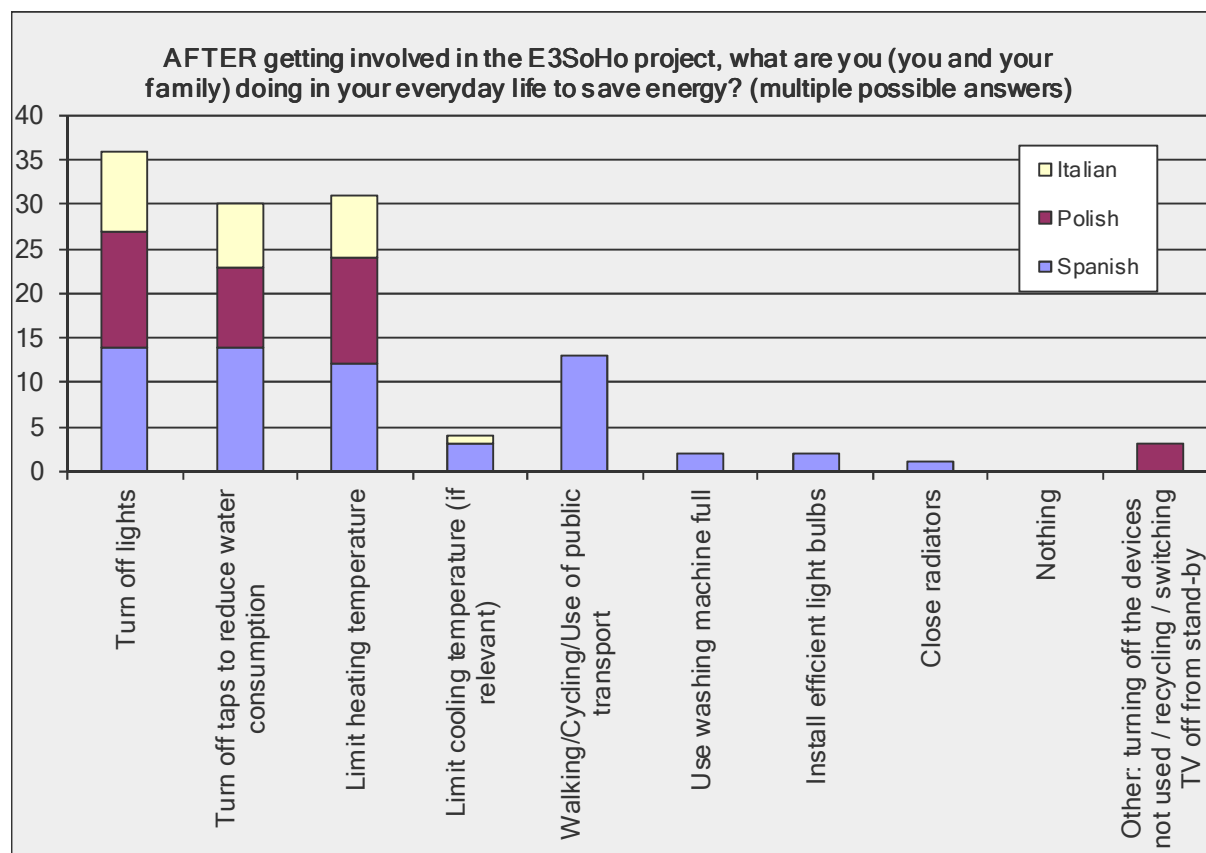
We see on Graph 1 that the by far 3 more popular actions considering the global sample are to turn off lights and taps and to limit heating temperature. It also appears that the Spanish group implements several strategies for energy savings whereas the Italian and the Polish groups focus on the 3 actions named before. Considering the Spanish group, we see that mobility, even if it is not related to specific actions within dwellings, is an important issue for energy savings and general attitude towards environment in a similar share than the 3 previous actions (it is first ex æquo with turning off taps)³. In Warsaw, people are more attentive to light and heating and some also signals that they are turning off unused appliances (2 people). In Genoa, priority is on lighting.

³ The fact that mobility appears as an important strategy in Spain is explained because tenants were explicitly asked about it in the old questionnaire version, while for the other two pilot sites this strategy was not mentioned.

Graph 1 Energy Saving Actions before the E3SoHo Start

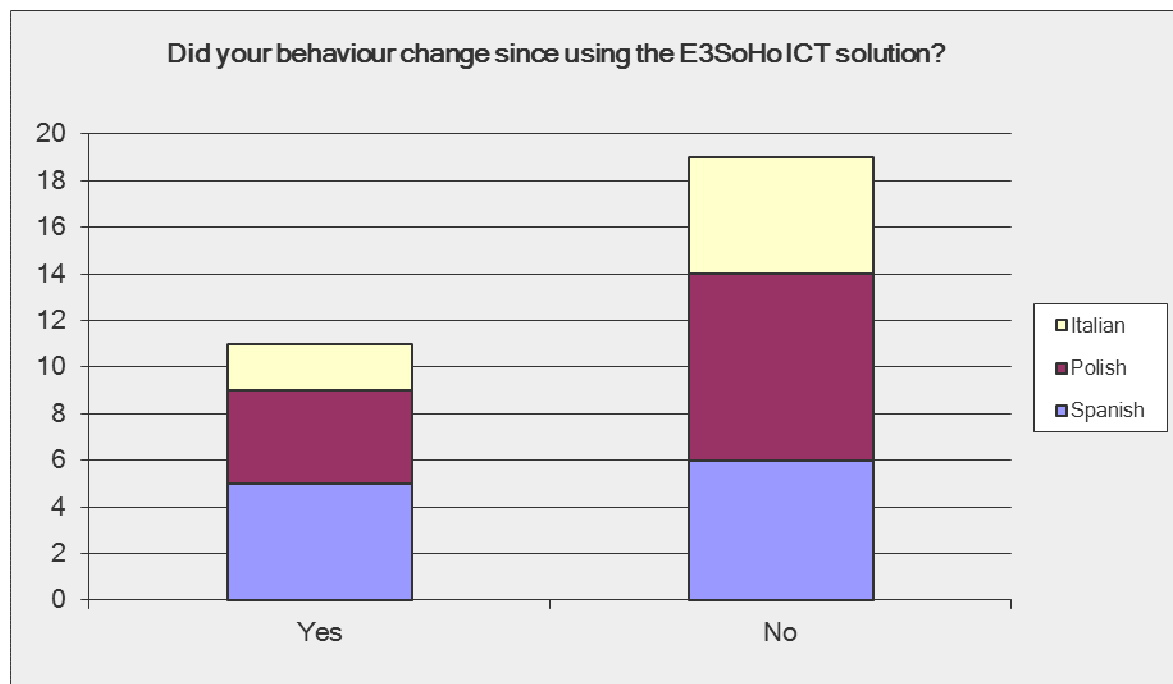


If we look now to what actions people declared since they get involved in E3SoHo (see Graph 2), we observe a small increase (see Table 5), confirming national priorities trends previously highlighted. This increase is mostly visible concerning turning light off as 7 persons declared to do so since the project started.

Graph 2 Energy Saving Actions since the E3SoHo Start**Table 5 Evolution of Energy Saving Behaviour before/after the E3SoHo Start**

| Increase of energy saving behaviours | | | | | |
|---|---------|--------|---------|------------|-----------|
| | Italian | Polish | Spanish | Increase % | Number |
| Turn off lights | 2 | 2 | 3 | 19% | 7 |
| Turn off taps to reduce water consumption | 1 | 1 | 1 | 10% | 3 |
| Limit heating temperature | 2 | 0 | 2 | 13% | 4 |
| Limit cooling temperature (if relevant) | 1 | 0 | 1 | 50% | 2 |
| Walking/Cycling/Use of public transport | 0 | 0 | 0 | 0% | 0 |
| Use washing machine full | 0 | 0 | 0 | 0% | 0 |
| Install efficient light bulbs | 0 | 0 | 1 | 50% | 1 |
| Close radiators | 0 | 0 | 0 | 0% | 0 |
| Nothing | 0 | 0 | 0 | | 0 |
| Other: recycling | 0 | 1 | 0 | 33% | 1 |
| Number of person who answered the question | | | | | 37 |
| Number of person who skipped the question | | | | | 1 |

This moderate evolution of behaviours questions the real impact of the E3SoHo solution. Indeed when we asked tenants if they changed their behaviour since they get the solution at home (see Graph 3), they mainly say “no” (19 persons out of 30 answering the question).

Graph 3 Occurrence of Behavioural Changes related to the Solution

From these data we can make the hypothesis that the reason why people didn't really change their behaviour is that they already adopted energy saving behaviours before the E3SoHo experimentation started, because of environmental sensitivity or, more realistically in social housing, because of economic constraints. This second hypothesis seems more suitable according to complementary data. Indeed the existence of strong economic constraints on tenants was one of the results from D2.1 "Set of users' requirements, specification and evaluation". Moreover, in the Spanish sample 9 persons out of 14 declared not to be sensitive to environmental protection issues and 11 that the E3SoHo deployment didn't change their environmental sensitivity, confirming the hypothesis of an economic constraint rather than the environmental concern pre-existing to the project deployment.

This explicative hypothesis seems to be reinforced because, even if people declared they are doing things to save energy, only half of them think they reduced their electricity consumption since they got the E3SoHo solution (see Graph 4). Regarding gas, if we exclude the answers from Genova (where gas consumption was not addressed by the ICT solution) and from Warsaw (where this question was not answered, maybe because tenants did not understand that gas consumption is equivalent to heating and DHW consumption), we see that 5 out of 9 respondents in Zaragoza think that they have reduced their gas consumption. In the case of water, if we again exclude the results from Genova, where this consumption was neither addressed, 11 out 21 respondents of Warsaw and Zaragoza think that they have reduced their water consumption.

In fact, these percentages of tenants who have perceived savings are not very different from the percentage of tenants who actually achieved savings in Zaragoza and in Warsaw pilot sites, according to deliverable D5.1.2 "ICT system performance report"(in Genova this could not be evaluated in all dwellings due to the unsatisfactory results rendered by the control group approach). We can conclude therefore that the perception of tenants about energy consumption reduction is not far from reality.

Graph 4 Energy Consumption Evolution related to the Solution⁴

| Since you got the E3SoHo ICT solution, do you think you reduced your energy consumption? | | | | |
|---|---|---------------|----------------|---------------|
| | Italian | Polish | Spanish | Number |
| Electricity | | | | |
| Yes | 3 | 4 | 6 | 13 |
| No | 1 | 7 | 5 | 13 |
| | 4 | 11 | 11 | 26 |
| Gas | | | | |
| Yes | 0 | 0 | 5 | 5 |
| No | 4 | 0 | 4 | 8 |
| | 4 | 0 | 9 | 13 |
| Water | | | | |
| Yes | 0 | 5 | 6 | 11 |
| No | 3 | 6 | 4 | 13 |
| | 3 | 11 | 10 | 24 |
| | <i>Number of persons who answered the question</i> | | | 26 |
| | <i>Number of persons who skipped the question</i> | | | 12 |
| | <i>Number of persons in the sample</i> | | | 38 |

Until now, people seem not to be massively convinced the E3SoHo solution helps reducing energy consumptions. This can be explained by the fact that, according to the analysis done in D5.1.2, there is not a clear majority of dwellings which have achieved energy savings, even if the global results of the Zaragoza and Warsaw pilot sites show that, all in all, energy has been saved.

Additional qualitative explanations have been provided by the social housing companies of the consortium. For instance, some tenants think they already had good habits regarding energy, so the usage of the ICT solution has helped them no to change their habits, but to prove that their energy consumption habits were correct.

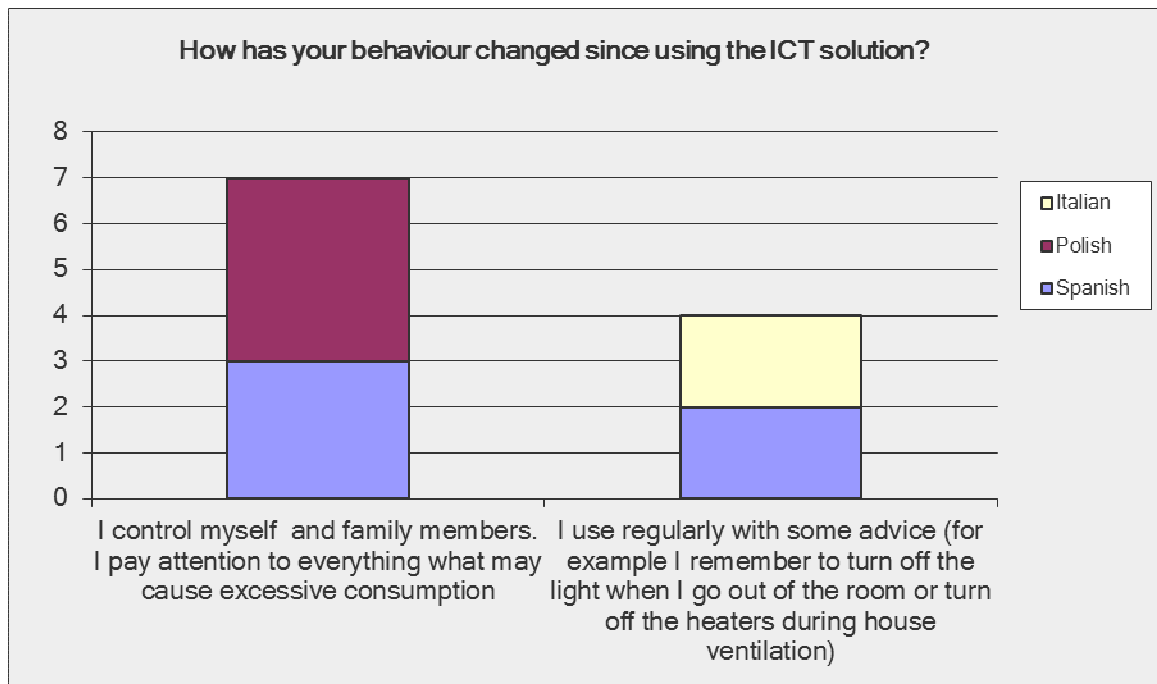
Furthermore, in the case of Spain, some of the tenants who believe they already had good habits before the E3SoHo solution came in to their homes made a remark that this last year, even if they haven't changed their behaviour towards energy, they believe that with the price increase in electricity and gas, they will spend more money.

Therefore in the interpretation of the answers to the question about perceived energy savings, it should be taken into account that some tenants may have referred to the amount of their energy bills, and others to the actual consumptions, and the evolution of both parameters might not always be the same due to the variation of energy prices (particularly if there is variation in the fixed terms of the energy bills).

If we come back now on the 11 persons declaring they changed their behaviour since the project started, it seems that they became more attentive to excessive consumptions (see Graph 5).

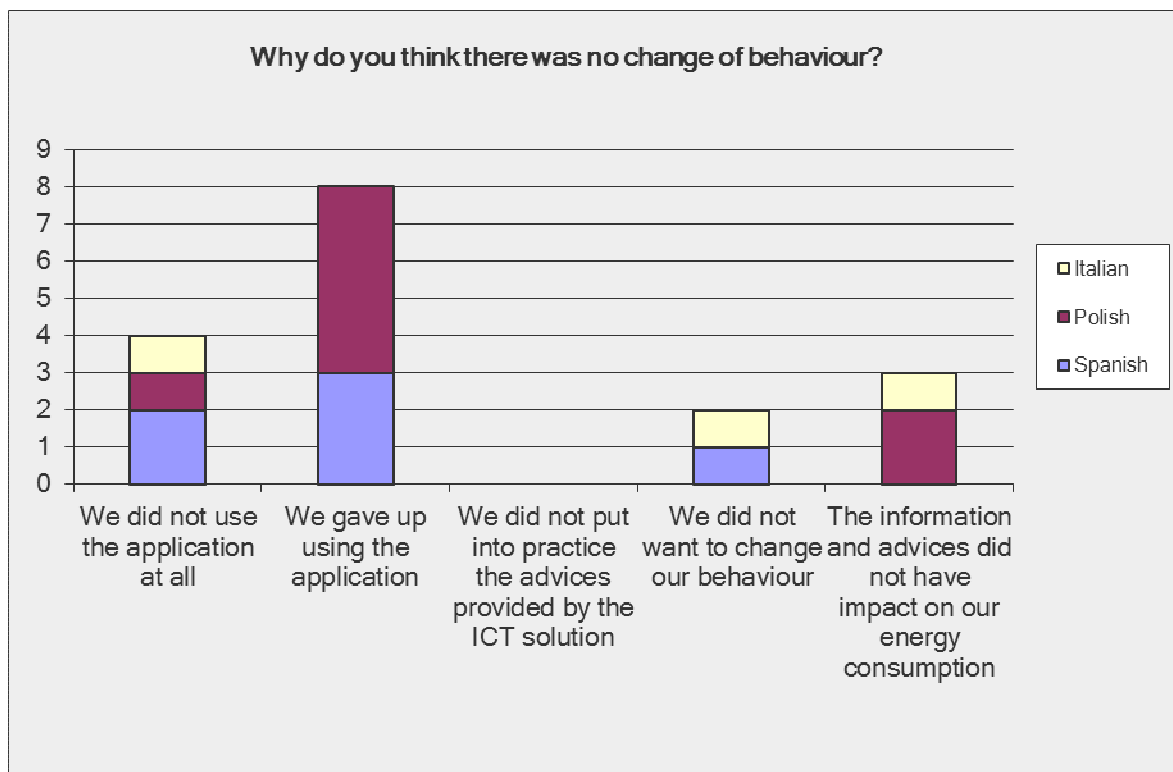
⁴ In the case of the Italian pilot, tenants were asked only about the electricity consumption, which is the only one addressed by the ICT solution deployed in the site

Graph 5 Behavioural Evolution related to the Solution



For the 19 persons declaring they didn't change their behaviour since they got the solution (see Graph 6), 12 are not using it or gave up and 3 think the solution is not helpful to reduce consumptions.

Graph 6 Reasons for Not Changing Behaviours



These answers are quite encouraging because only two persons do not want to change behaviour. It leaves thus room for progression in involving more people in behavioural evolutions. Indeed, it seems to be strongly dependent on the solution improvements to be made and on the reality of energy savings. As stated in the previous question, additional qualitative feedback from the tenants indicate that many of them have not changed behaviours because they were already convinced about the appropriateness of the energy habits before the start of E3SoHo project.

The first conclusion is that yet people are not massively convinced of the efficiency of the E3SoHo solution but they can soon change their mind if we ease the application usability even for people without ICT skills and if we are able to demonstrate effective results.

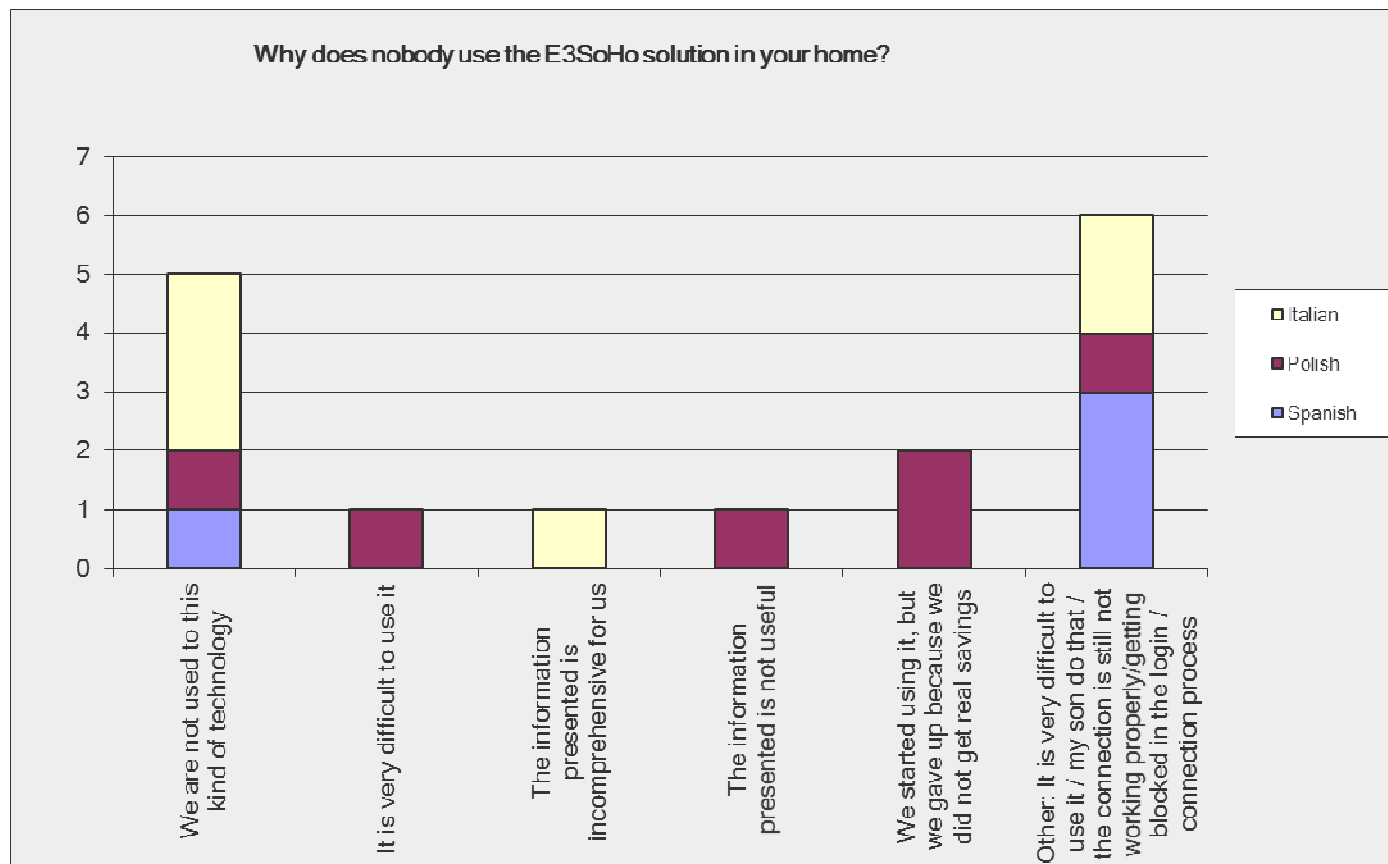
3.3 Uses and Users' Profiles

A little bit more than half of the respondents declared that at least one person at their home is using the solution (see Table 6). We can notice that the Spanish sample is more numerous to use it (2/3 of the Spanish group) than Italian and Polish samples.

Table 6 Use of the E3SoHo Solution

| Does anyone use the E3SoHo ICT solution (either using the tablet or the Internet website) in your home? | | | | | |
|--|----------------|---------------|----------------|----------|---------------|
| | Italian | Polish | Spanish | % | Number |
| Yes | 4 | 6 | 10 | 55,6% | 20 |
| No | 5 | 7 | 4 | 44,4% | 16 |
| <i>Number of person who answered the question</i> | | | | | 36 |
| <i>Number of person who skipped the question</i> | | | | | 2 |
| <i>Number of persons in the sample</i> | | | | | 38 |

When we asked the 16 people what is the reason for declaring no one is using the solution at their home (see Graph 7), the Italian answers are all dealing with ability and comprehension issues (3 persons don't know how to use the technology and 1 doesn't understand the information delivered); Polish answers are dealing with comprehension too and also with efficiency (utility of the information, reality of energy savings); Spanish answers are all related with the use of new technologies: either they directly stated that they are not used to this kind of technologies (1 person), or cited that they were getting blocked since they were not able to complete alone certain steps needed to use the solution, such as the login procedure.

Graph 7 Reasons for Not Using the Solution

Out of the 20 persons saying that at least one person is using the solution at their home, 18 persons answered the questions on user(s)' age, gender, device preferences and frequency of use. In the following analysis, the group of users includes these 18 respondents and the other persons they signalled in the questionnaire as using the solution. The user group is thus gathering 38 persons⁵.

The average age of the users is slightly under 40 years old. There are 23 women (60% of the sample) and 15 men (40% of the sample) respectively aged on average of 41 and 38 years old.

The population quartile repartition on age shows that $\frac{1}{4}$ is under 31 years old, another $\frac{1}{4}$ is between 31 and 37, another $\frac{1}{4}$ is between 37 and 56.5 and the last $\frac{1}{4}$ is between 56.5 and 76. But in order to use age categories making sense, we decided for further analysis including aging consideration, to part the sample in 3 groups:

- people under 23⁶ presumably still studying; they are 9 in the sample.
- people between 31 and 60 presumably active population; they are 21 in the sample.
- and people over 60 presumably retired⁷; they are 8 in the sample.

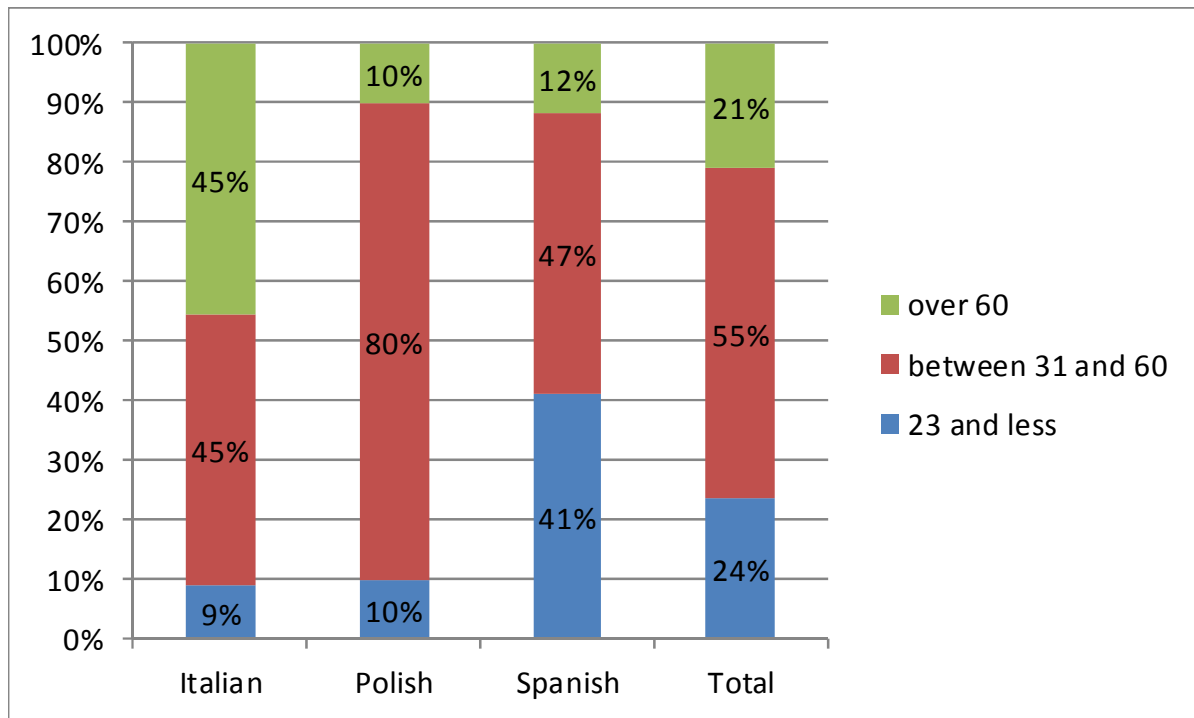
The average age is much higher for the Italian users sample (55 years old) than in the Polish and Spanish ones (both 33.5 years old). Indeed, 45% of the Italian sample is over 60 (see Graph 8) whereas it is only 21% of the overall sample; and 41% of the Spanish sample is under 23 (whereas it is only 24% of the sample).

⁵ NB: the fact that 38 is also the total number of respondents to the questionnaire is pure coincidence.

⁶ There is nobody aged between 23 and 31 in the sample that is why we picked these bounds for categorizing.

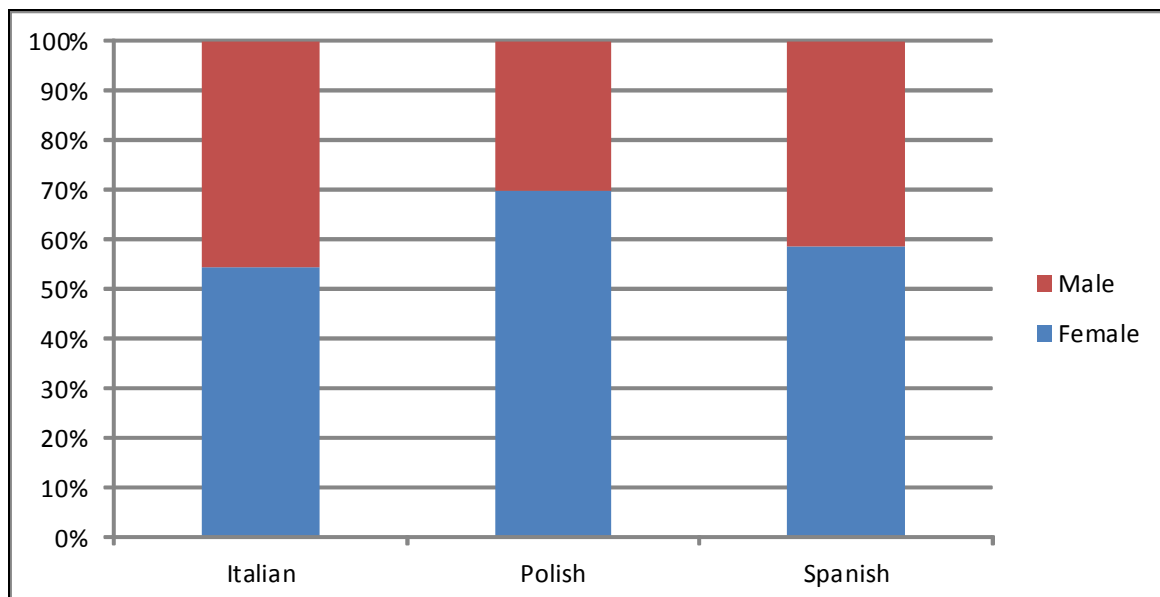
⁷ 60 years old as retirement age is questionable. Indeed legal dispositions for retirement are 65 in Spain (recently extended to 67 but with no impact on the tenants' samples), 60 for women and 65 for men both in Poland and Italy. Real figures for retirement are on average 62.4 years old in Spain, 59.7 in Italy and 59.5 in Poland.

Graph 8 Age Repartition by pilot site



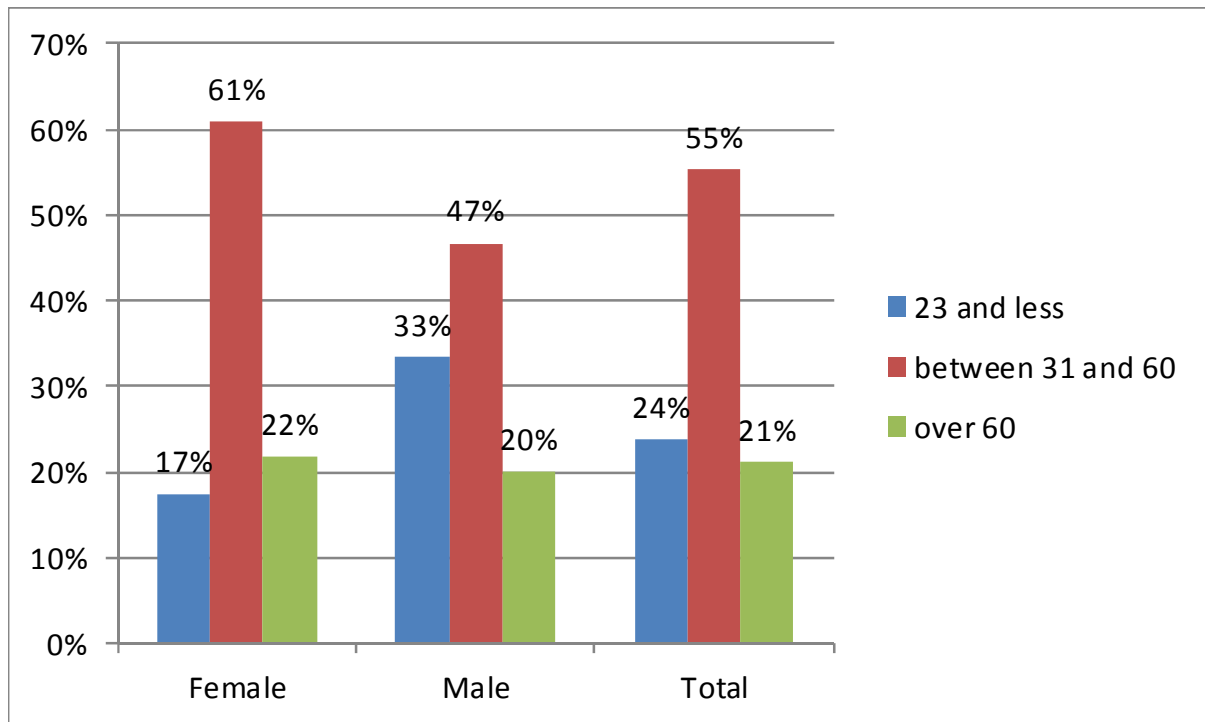
Considering the national samples on gender, we see that the Italian sample is about parity whereas Spanish and especially Polish samples are not (see Graph 9) where women are much more numerous. In the overall sample, women are 60% and men 40%.

Graph 9 Gender Repartition in the Sample



If we go now more in more details (see Graph 10), we observe that the women population is made for 61% of persons between 21 and 60 (men are 47% in this category) whereas 33% of the men sample of users is under 23 years old (11% above the percentage of the overall sample).

Graph 10 Age Categories by Gender



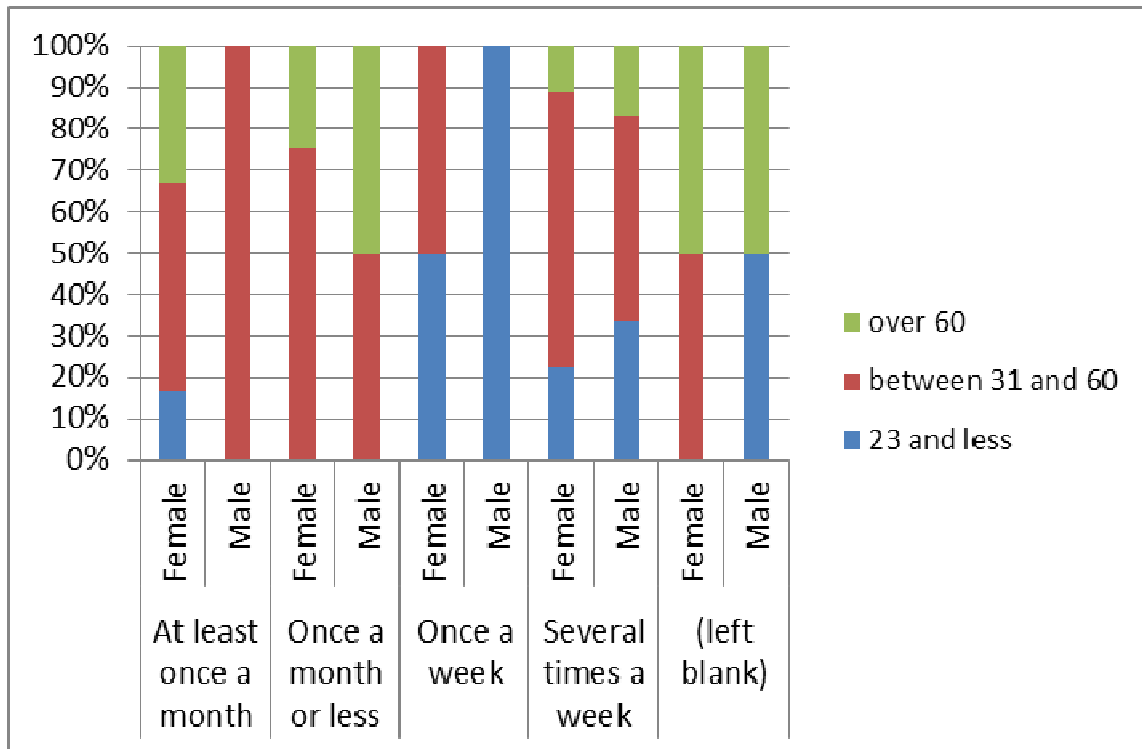
Considering frequency of use (see Graph 11, Total column), we notice that 50% of the sample is frequently using the solution (once a week or more), 24% are using it at least once a month and 16% less than once a month, the remaining 10% didn't answer the question. Dispatching data on frequency of use by gender shows that men and women are quite similar users regarding frequency.

Graph 11 Frequency by Gender

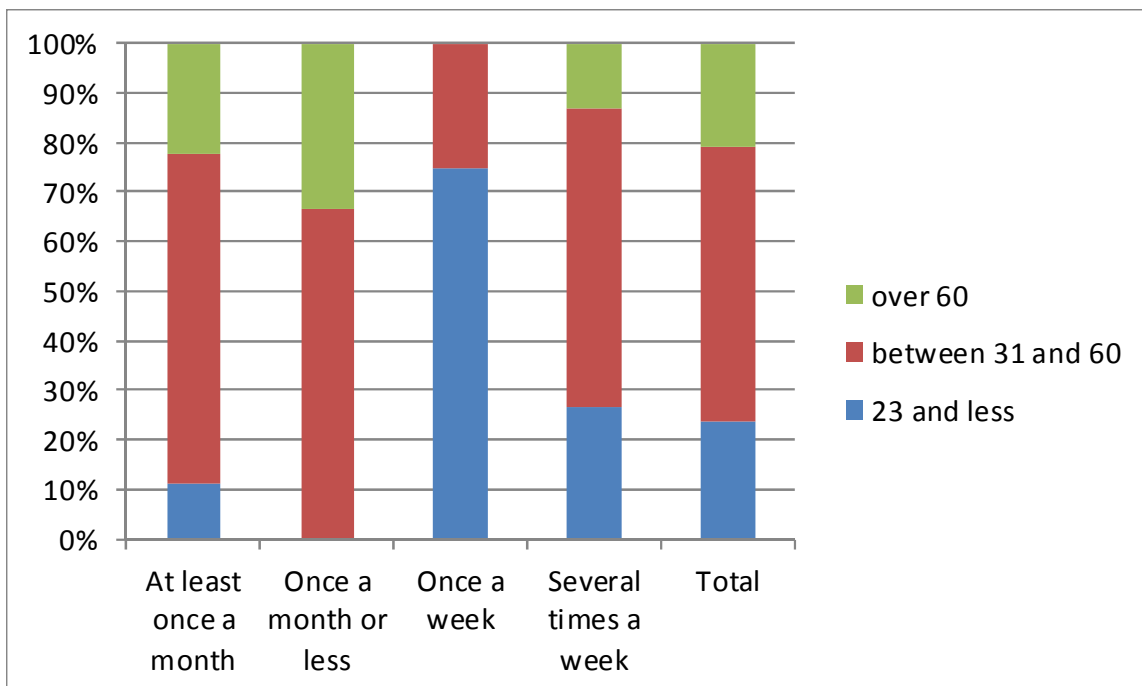


The small variations between frequency in female and male samples are explained by the fact that the weight of men under 23 is much more important than in women sample (see Graph 12) and young people are much more incline to frequently use the solution (see Graph 13). We observe too that people over 60 are less frequent users than others (i.e. mostly using the solution at least one a month of less) whereas people between 31 and 60 are much more balanced between frequent and less frequent users.

Graph 12 Frequency of Use by Gender and Age

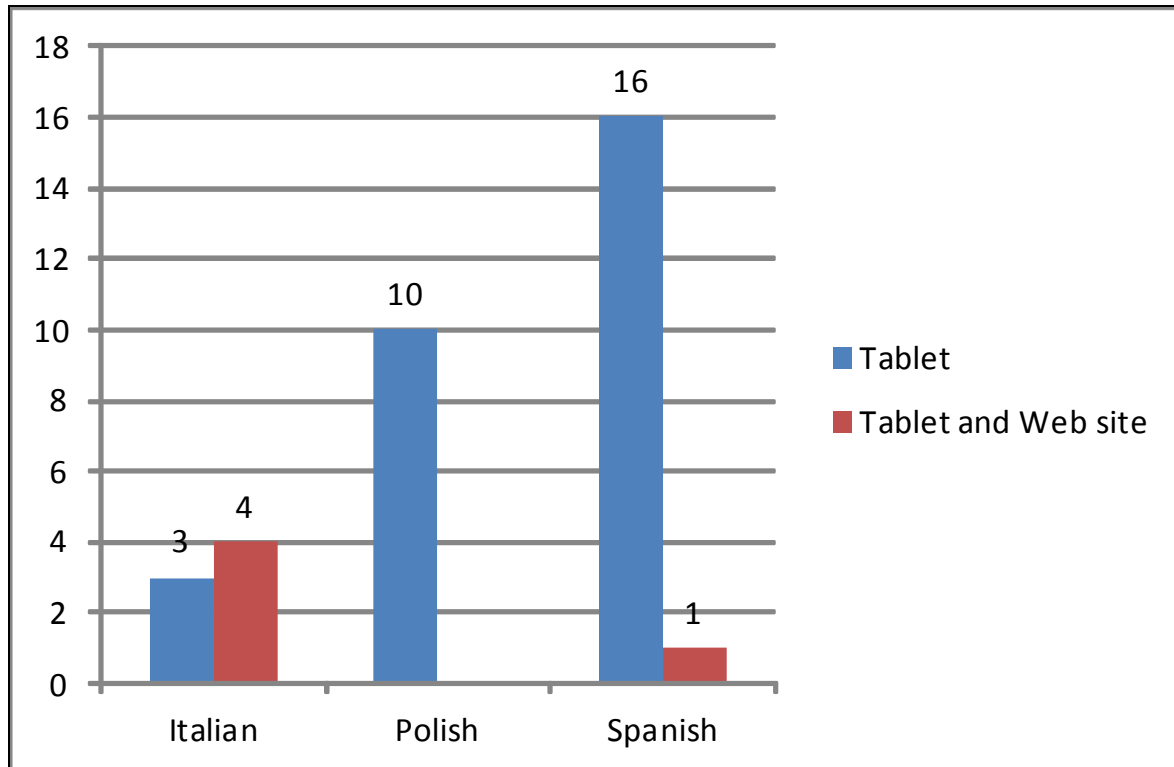


Graph 13 Age by Frequency



We can notice (see Table 14) that people are using the tablet only and sometimes, in addition to the tablet, the web site (never used by itself without being associated to the tablet use). Consequently, the device is exclusively used at home.

Graph 14 Interface Preferences

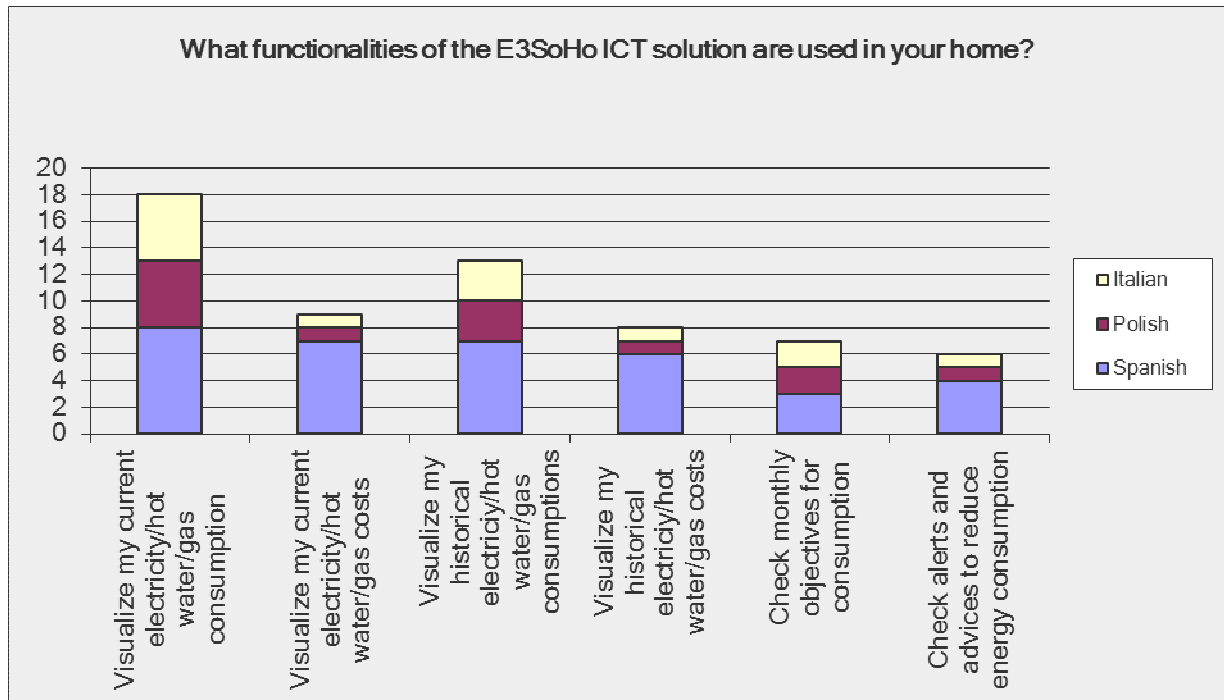


The **second conclusion** is that for half of the users sample the use frequency amplitude is the week or less and that gender is not a discriminant factor for frequency variation whereas age seems to be. The users sample uses the application through the tablet.

3.4 Device Assessment

The most used functionalities of the solution are the visualization of current and historical consumptions. It is a surprising fact that much less people reported the use of the visualization of current and historical costs, in the case of Genova, especially if we consider that both consumptions and costs are visualized simultaneously in sDisplay, so maybe the tenants did not differentiate correctly between these two functionalities when they were asked; in the case of Warsaw this same difference can be explained by the fact that VAS shows as default value the consumptions, and users have to push a button to switch to costs.. Monthly objectives and alerts seem less interesting for the people considered, a fact that draws attention on the need to refine these functionalities, as they should be key drivers for inducing behaviour changes in the tenants (see Graph 15).

Graph 15 Assessment of Device Functionalities



Data from the Spanish group confirm these trends. 7 up to 8 people (out of 15) declare they use every day consumption monitoring, and historical data visualization (electricity, water and gas). 6 to 7 declare they use the device for invoices information but only 3 to 4 use the advices to limit consumption or to reduce bills. In this case there is not so big difference between the use of the visualization of current/historical consumptions, and visualization of current/historical costs, which is the logical result because as we already mentioned, both data are displayed simultaneously in sDisplay.

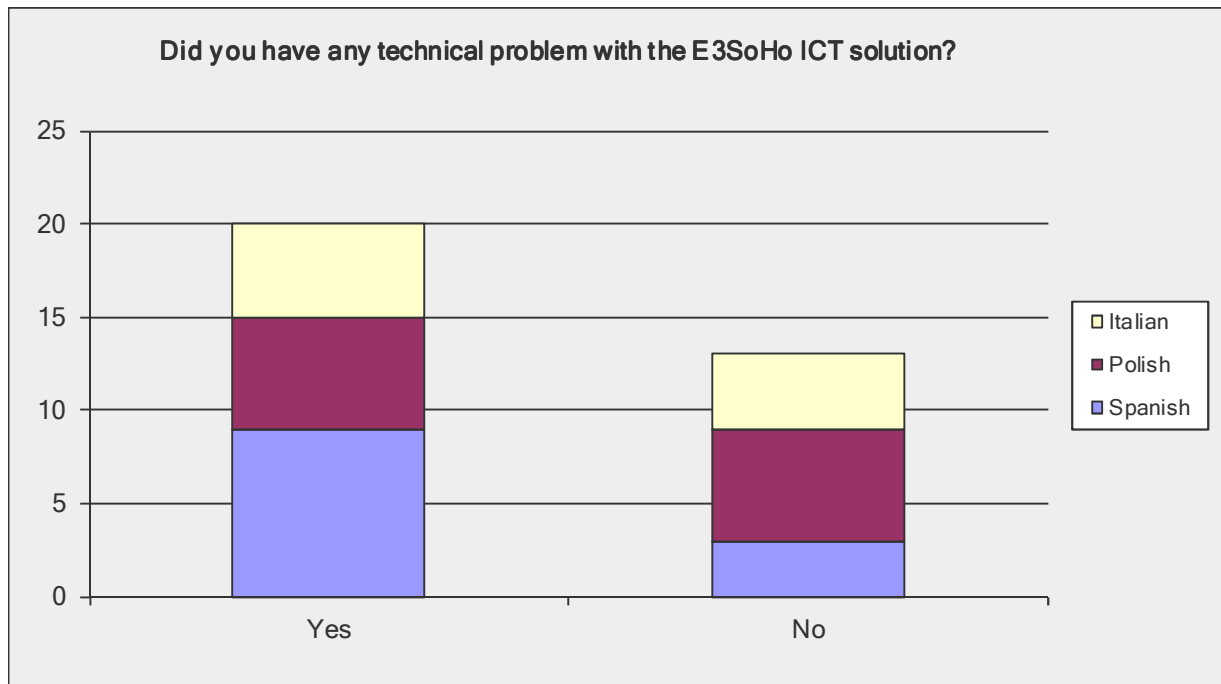
Considering now the technical installation, people are quite satisfied with the process. It is not too long, nor too annoying, nor too intrusive and it was done quite properly (see details in Table 7).

Table 7 Technical Installation Assessment

| What did you think of the E3SoHo ICT solution technical installation at your home? | | | | |
|---|--|---------------|----------------|---------------|
| | Italian | Polish | Spanish | Number |
| Was it too long? | | | | |
| Yes | 2 | 2 | 0 | |
| No | 1 | 11 | 13 | |
| | 3 | 13 | 13 | 29 |
| Was it annoying (noisy, dirty...)? | | | | |
| Yes | 1 | 1 | 0 | |
| No | 2 | 12 | 13 | |
| | 3 | 13 | 13 | 29 |
| Was it intrusive? | | | | |
| Yes | 1 | 0 | 0 | |
| No | 2 | 13 | 13 | |
| | 3 | 13 | 13 | 29 |
| Was it done properly? | | | | |
| Yes | 6 | 12 | 12 | |
| No | 0 | 1 | 0 | |
| | 6 | 13 | 12 | 31 |
| | <i>Number of person who answered the question</i> | | | 31 |
| | <i>Number of person who skipped the question</i> | | | 7 |
| | <i>Number of persons in the sample</i> | | | 38 |

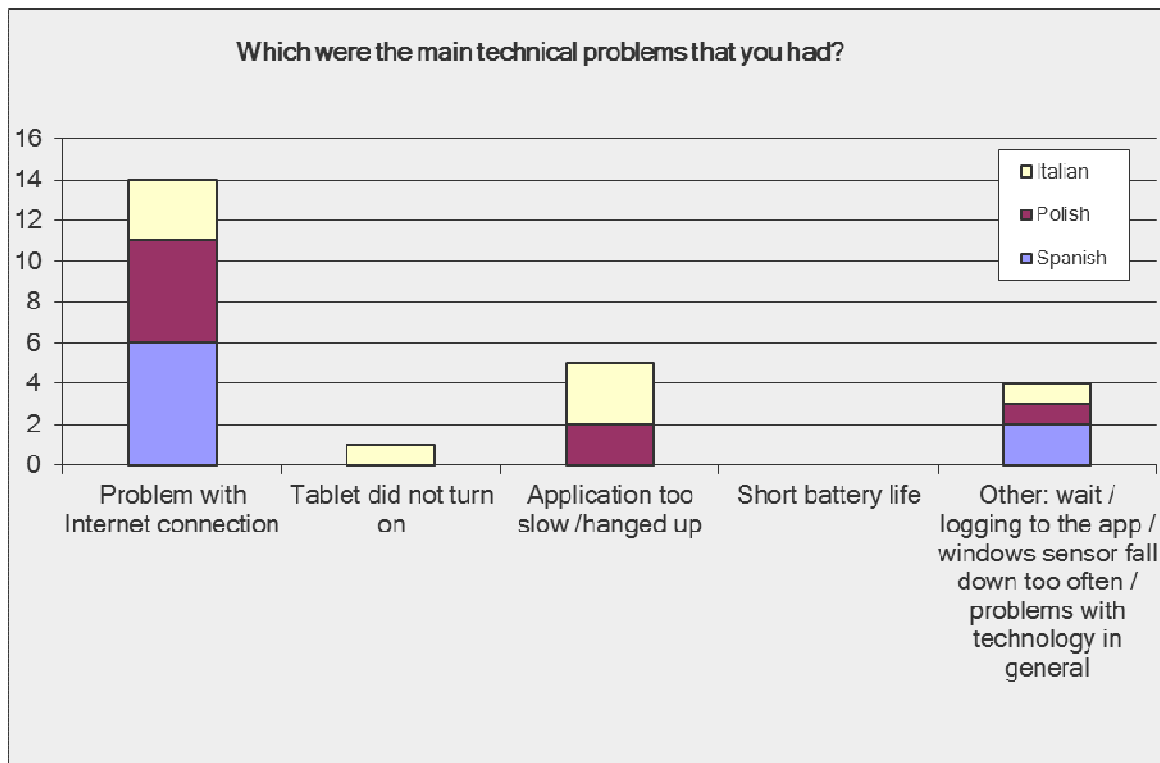
And people have these positive assessments even if most of them had technical problems with the solution after installation (see Graph 16).

Graph 16 Occurrence of Technical Problems



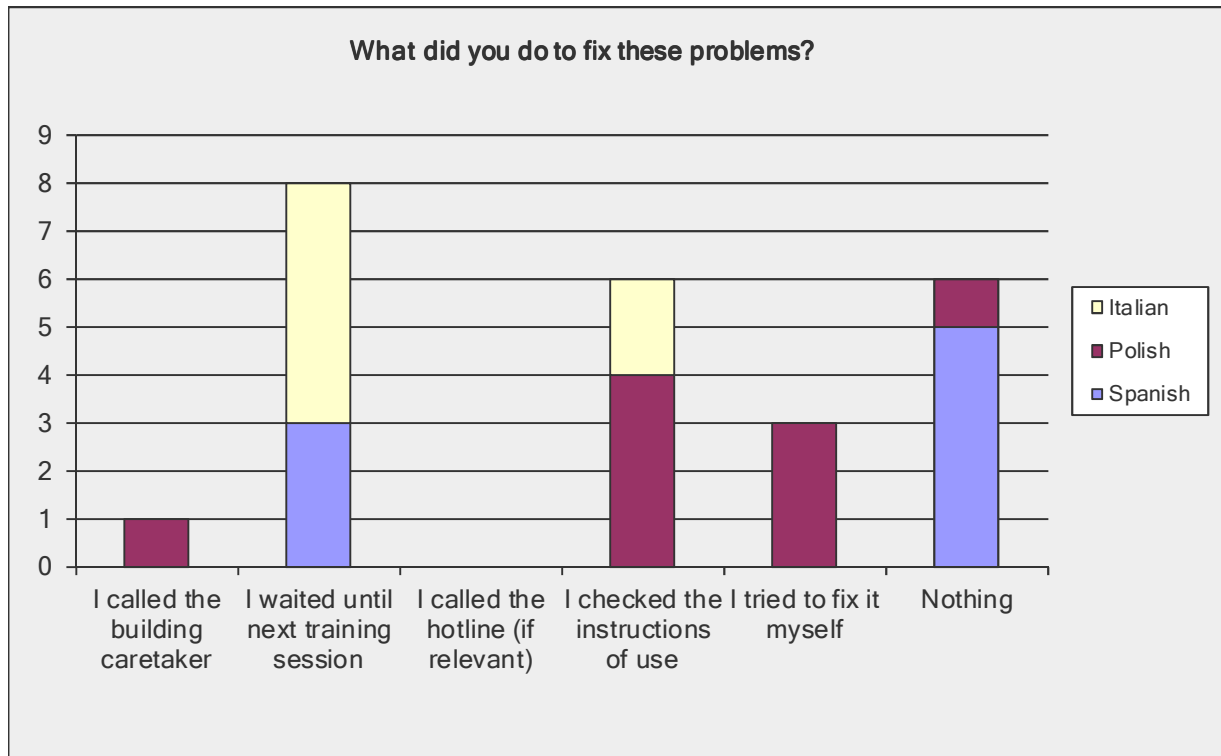
The technical problems mainly dealt with the Internet connection quality (see Graph 17). Data from the Spanish group confirm this trend: 6 persons complained from connectivity problems. Problems with the performance of the user interface (application too slow or hanged up) is the second most frequently reported issue, and should be given special attention.

Graph 17 Characterisation of Technical Problems

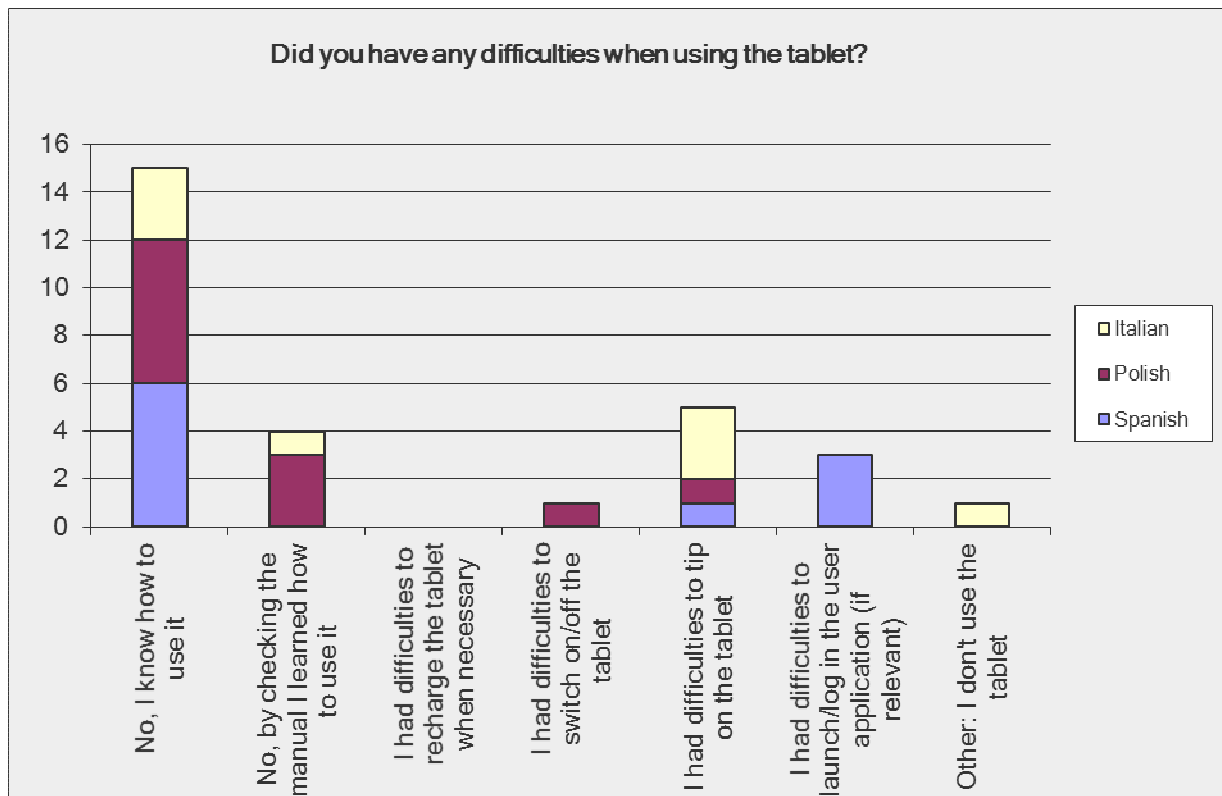


The actions undertaken by the tenants are quite heterogeneous according to nationality (see Graph 18). Spanish people adopted a passive reaction: they did nothing or waited until the next training session, this is due to the fact that tenants are frequently visited by social workers of Zaragoza Vivienda (independently from the framework of the project), and therefore decide to wait for the next visit to get their problems solved. The Italian tried to get help but remaining in the frame of the project: they waited for the next training session or checked the use instructions. And the Polish had a much more active reaction as they tried to fix the problem by checking the use manual or by trying to fix it by themselves.

Graph 18 Reaction to Technical Problems



If we focus now on people using the device, they positively assess the interface (see Graph 19): 13 persons from Genova and Warsaw (out of 23) declared they don’t have problem using the tablet. In the case of Zaragoza, 6 persons out of 15 declared the same. Nevertheless up to 10 people in the pilot sites reported some kind of problem, so there is still significant room for improvement.

Graph 19 Difficulties in Use

Considering now the application itself, most people find clarity & readability and attractiveness good (respectively 12 and 10 persons rated it Good in Genova and Warsaw, together with 9 and 8 persons in Zaragoza). Still more than half people rate the ease of use, the functionality and the operation good (8 to 9 persons in Genova and Warsaw, and 8 to 6 people in Zaragoza). But the bad point is the speed of operation⁸ which 9 people in Genova and Warsaw (and 3 in Zaragoza) assessed average (see Table 8). It is noticeable that very few people rated poor in any of the categories.

⁸ Speed of operation can be influenced by the quality of the internet connection, about which, as stated above, many tenants complained. There is probably a correlation between these two low rated items.

Table 8 Application Assessment

| How do you rate the application in terms of the following features? | | | | |
|--|----------------|---------------|----------------|---------------|
| | Italian | Polish | Spanish | Number |
| Attractiveness | | | | |
| Good | 1 | 9 | 8 | 18 |
| Average | 3 | 2 | 1 | 6 |
| Poor | 0 | 0 | 0 | 0 |
| | 4 | 11 | 9 | 24 |
| Ease of use | | | | |
| Good | 0 | 9 | 6 | 15 |
| Average | 4 | 1 | 3 | 8 |
| Poor | 1 | 2 | 0 | 3 |
| | 5 | 12 | 9 | 26 |
| Clarity and readability | | | | |
| Good | 2 | 10 | 9 | 21 |
| Average | 3 | 2 | 0 | 5 |
| Poor | 0 | 0 | 0 | 0 |
| | 5 | 12 | 9 | 26 |
| Functionalities offered | | | | |
| Good | 0 | 8 | 8 | 16 |
| Average | 4 | 3 | 1 | 8 |
| Poor | 0 | 0 | 0 | 0 |
| | 4 | 11 | 9 | 24 |
| Correct operation | | | | |
| Good | 1 | 8 | 6 | 15 |
| Average | 3 | 2 | 3 | 8 |
| Poor | 0 | 1 | 0 | 1 |
| | 4 | 11 | 9 | 24 |
| Speed of operation | | | | |
| Good | 0 | 6 | 6 | 12 |
| Average | 4 | 5 | 3 | 12 |
| Poor | 1 | 0 | 0 | 1 |
| | 5 | 11 | 9 | 25 |
| Number of persons who answered the question | | | | 26 |
| Number of persons who skipped the question | | | | 12 |
| Number of persons in the sample | | | | 38 |

Concerning now the information provided to the tenants, they globally find it useful (see Table 9), easy to understand (see Table 10) and numerous enough (see Table 11).

Regarding usability, alerts and advices are relatively less positively assessed, especially in Zaragoza pilot site.

Regarding volume, only alerts are not massively positively assessed.

It is also noticeable that all the people using the device find it easy to understand (see Table 10).

Table 9 Information Usability

| Usability | | | Number |
|---|--------|------------|--------|
| | Useful | Not useful | |
| General Advices | 16 | 9 | 25 |
| Comfort (temperature) | 22 | 3 | 25 |
| Information about current energy consumption and costs | 21 | 3 | 24 |
| Information about historical energy consumption and costs | 22 | 4 | 26 |
| Alerts | 19 | 6 | 25 |

Table 10 Information Understandability

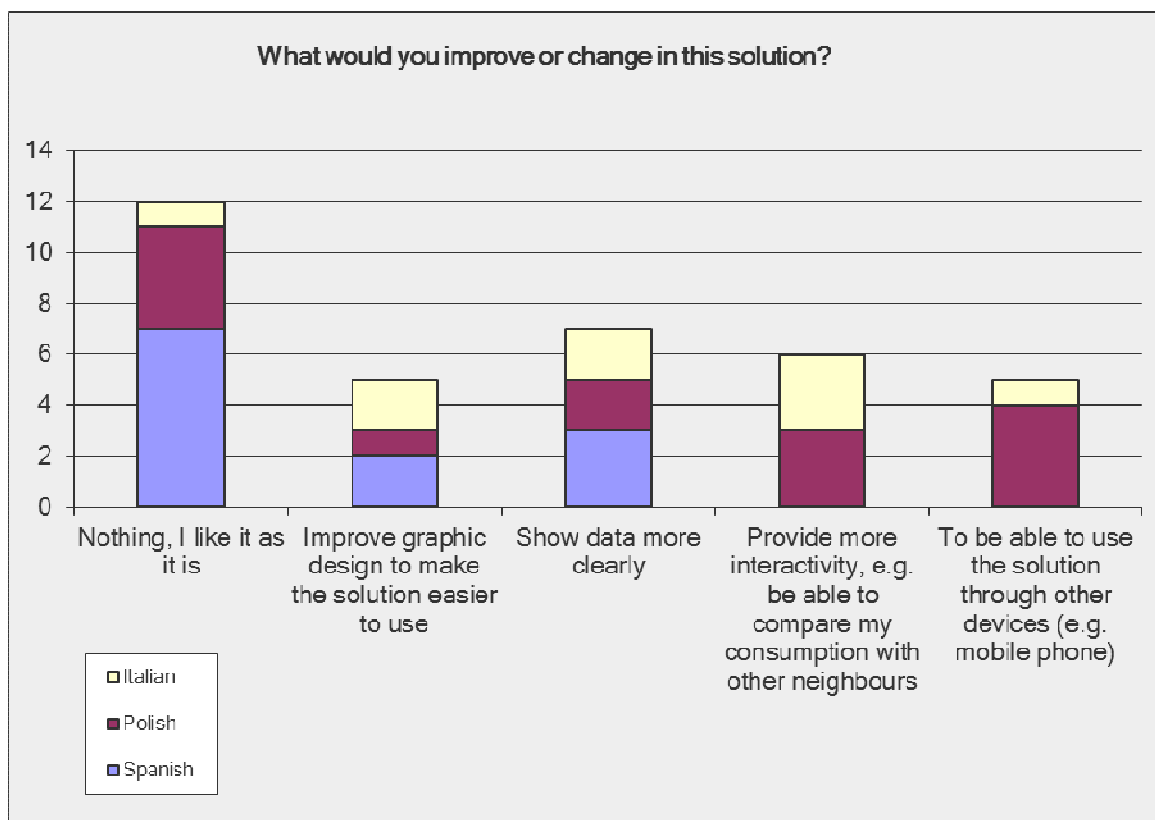
| Understandability | | | | Number |
|---|--------------------|-------------------------|---------------------------------|--------|
| | Easy to understand | Difficult to understand | We don't understand them at all | |
| General Advices | 19 | 0 | 0 | 19 |
| Comfort (temperature) | 19 | 0 | 0 | 19 |
| Information about current energy consumption and costs | 19 | 0 | 0 | 19 |
| Information about historical energy consumption and costs | 20 | 0 | 0 | 20 |
| Alerts | 19 | 0 | 0 | 19 |

Table 11 Information volume

| Volume | | | | Number |
|---|------------|--------|----------|--------|
| | Not enough | Enough | Too much | |
| General Advices | 0 | 20 | 1 | 21 |
| Comfort (temperature) | 0 | 19 | 1 | 20 |
| Information about current energy consumption and costs | 0 | 21 | 0 | 21 |
| Information about historical energy consumption and costs | 2 | 20 | 0 | 22 |
| Alerts | 0 | 15 | 4 | 19 |

Considering now the overall sample's suggestions to improve the solution (see Graph 20) deal with interactivity, i.e. possibility to compare with other consumptions (6 persons), and the possibility to use the solution on other devices (5 persons). It is noticeable that 5 persons in Genova and Warsaw, together with 7 persons from Zaragoza, don't see any improvements to be useful.

If we now get into national details, we see that Italians have more suggestions than Polishes (only one Italian would keep the device as it is). The Polish sample is slightly more demanding on application interoperability with other devices whether Italian one focuses on comparison. Improvements suggestions from Zaragoza focus on data presentation and usability of the graphical design.

Graph 20 Possible Improvements

When we go through more details, this positive assessment of the solution is confirmed. Concerning screen size, 23 persons out of 30 answering the question, declared to like it as it is (see Table 12); for font size it is 21 persons out of 27 (see Table 13); and for screen contrast it is 24 out of 27 (see Table 14).

Table 12 Tablet Screen Size

| Would you change the home device itself regarding... the screen size? | | | |
|---|--------------------------------|---------------------------------|--------|
| I like it as it is | I would prefer a larger screen | I would prefer a smaller screen | Number |
| 23 | 7 | 0 | 30 |

Table 13 Tablet Font Sizes

| Would you change the home device itself regarding... the font sizes? | | | |
|--|-----------------------------|------------------------------|--------|
| I like it as it is | I would prefer larger fonts | I would prefer smaller fonts | Number |
| 21 | 6 | 0 | 27 |

Table 14 Tablet Screen Contrast

| Would you change the home device itself regarding... the screen contrast? | | | | |
|---|--------------------------------|-------------------------------|--|--------|
| I like it as it is | I would prefer higher contrast | I would prefer lower contrast | I would prefer to be able to configure the contrast myself | Number |
| 24 | 2 | 0 | 1 | 27 |

The main possible improvement would be to offer to tenants the possibility to choose whether the tablet should be fixed or not, as 20 persons out of the 28 sample declared to prefer it not fixed (see Table 15)

Table 15 Tablet Location

| Would you change the home device itself regarding... having the tablet in a fixed place (e.g. fixed to a wall) or not? | | |
|--|-----------------------|--------|
| I prefer it fixed | I prefer it not fixed | Number |
| 8 | 20 | 28 |

The **third conclusion** is that people are quite satisfied with the solution considering functionalities, interface, installation process (even if they got technical problems, mainly on connection issues). The device by itself is appreciated as it is. The data provided are also appropriately delivered and useful. Only alerts are less appreciated (4 persons considering it not useful and too numerous).

3.5 Information Means for Tenants' Training

We asked the tenants what is their opinion about training devices (written guidelines, collective and individual sessions) regarding frequency, usefulness, etc.

16 out of the 19 persons answering this question declared the user manual and leaflets are useful (see Graph 21).

Graph 21 Usefulness of Manual and Leaflets

| User manual and leaflets | | | | | Number |
|--------------------------|-------------|--------|------------|-----------------|--------|
| | Very useful | Useful | Not useful | Not used at all | |
| Information rating | 8 | 8 | 3 | 0 | 19 |

On individual training sessions (see Graph 22 and Graph 23), 18 people out of 24 find them numerous enough (only 6 find them too few) and almost unanimously useful (23 out of 24).

Graph 22 Number of Individual Training Sessions

| Number of individual training sessions received | | | | | Number |
|---|----------|--------|---------|--------------|--------|
| | Too many | Enough | Too few | Not attended | |
| Information rating | 0 | 18 | 6 | 0 | 24 |

Graph 23 Usefulness of Individual Training Sessions

| Usefulness of the individual training sessions | | | | Number |
|--|-------------|--------|------------|--------|
| | Very useful | Useful | Not useful | |
| Information rating | 11 | 12 | 1 | 24 |

On collective training sessions (see Table 16 and Table 17), 17 people out of 28 find them numerous enough (only 1 finds them too few) and mostly useful (16 out of 17).

Table 16 Number of Collective Training Sessions

| Number of collective training sessions received | | | | | Number |
|---|----------|--------|---------|--------------|--------|
| | Too many | Enough | Too few | Not attended | |
| Information rating | 0 | 17 | 1 | 10 | 28 |

Table 17 Usefulness of Collective Training Sessions

| Usefulness of the collective training sessions | | | | Number |
|--|-------------|--------|------------|--------|
| | Very useful | Useful | Not useful | |
| Information rating | 7 | 9 | 1 | 17 |

When we asked people what other mean of communication would be efficient to help to appropriate the solution, 2 people mentioned phone calls and 2 others talked about informatics training lessons (out of 8 responding people).

The **fourth conclusion** is that awareness campaign and training tools are very positively assessed by the users.

3.6 Dwellings Equipment and Occupation

In order to understand consumptions measured in WP5.1, we asked tenants to describe their way of living. We focused on dwelling equipment and occupation.

Regarding equipment, we observed that out of 37 persons answering this question, 31 declared they own at least one washing machine, 30 have a television (up to 4 in one of the dwellings) and a fridge with deep freezer compartment, 24 have a cooker, 22 own a computer (up to 3 in one of the dwellings) and a hoven and 21 a microwave (see Table 18). Internet boxes and dish washers are less common.

Table 18 Equipment in Tenants' Dwellings

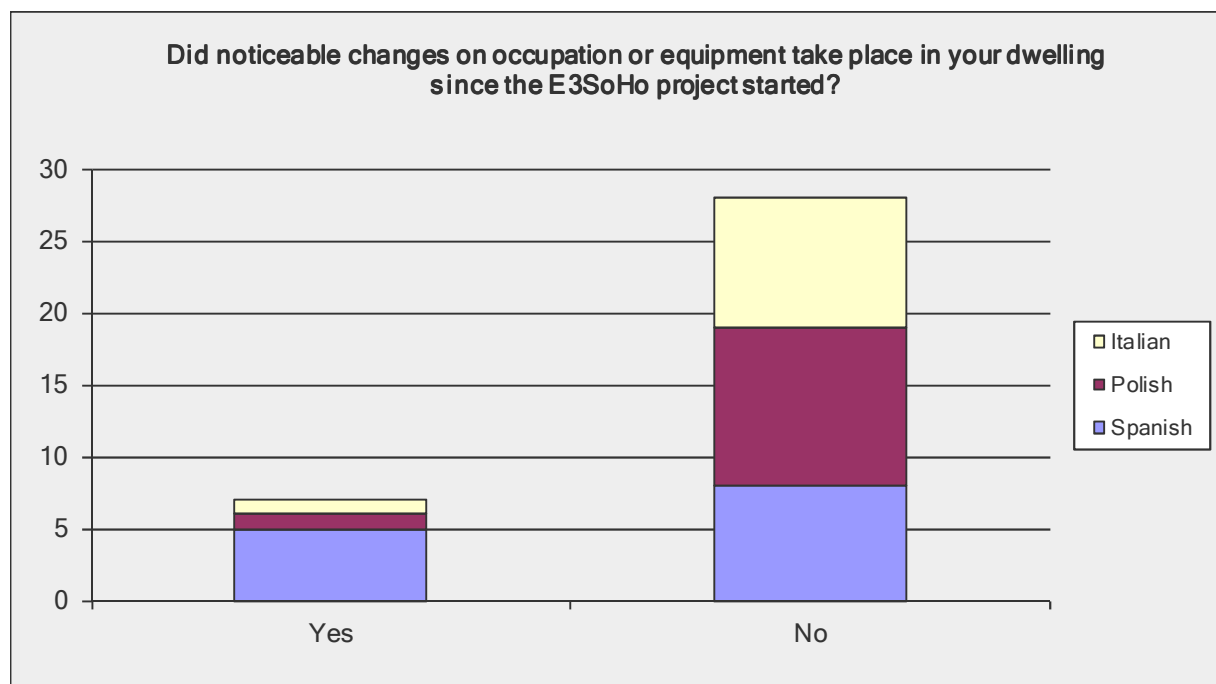
| Can you specify what appliances are installed in your dwelling? | | | |
|---|----------------------------|--------------------------|---|
| | Average Number per Personn | Median Age for Appliance | Number of Persons owning at least one appliance |
| Washing Machine | 1,0 | 2007 | 31 |
| Television | 1,4 | 2006,5 | 30 |
| Fridge with deep freezer compartment | 1,0 | 2006 | 30 |
| Cooker | 1,0 | 2004 | 24 |
| Computers | 1,1 | 2008,5 | 22 |
| Hoven | 1,0 | 2004 | 22 |
| Microwave | 1,0 | 2008 | 21 |
| Internet Box | 1,0 | 2010 | 12 |
| Dish washer | 1,0 | 2006 | 11 |
| Fridge | 1,0 | 2004 | 8 |
| Deep Freezer | 1,0 | 2008,5 | 5 |
| Dryer | 1,0 | 2011 | 4 |
| Mobile Air Conditionner | 1,3 | 2006 | 3 |
| Other: eBook | 0,4 | 2010 | 2 |
| Other: Iron | 0,5 | 1995 | 2 |
| Other: Vacuum cleaner | 1,0 | 1997 | 2 |
| Drying and Washing machine | 1,0 | 2005 | 1 |
| Other: Fan | 1,0 | 2010 | 1 |
| Other: Fixed air conditionner | 1,0 | 2008 | 1 |

This table also shows that median age for washing machines is 2007, meaning that half of the washing machines were bought after 2007, which is quite recent. Median age is 2006 for televisions and fridges (with deep freezer). In comparison cookers and hoven are older (median age at 2004).

These data, detailed device by device, could be helpful to estimate possible savings according to theoretical consumptions of devices taking their date of buying into account.

Considering occupation changes since the solution was deployed, 28 persons declared no evolution occurred (see Graph 24).

Graph 24 Occupation Evolutions



Considering the 7 persons declaring changes, Spanish sample is the more concerned by increase (3 persons) or decrease (2 persons) of the number of occupants (see Table 19).

Table 19 Evolution in Dwelling Occupancy

| If Yes: what kind of change? | | | | | |
|---|---------|--------|---------|-------|-----------|
| | Italian | Polish | Spanish | % | Number |
| Increase of the number of occupants in the dwelling (ex: a new child was born) | 0 | 0 | 3 | 33,3% | 3 |
| Increase of the presence in the dwelling (ex: someone is now staying the whole day at home) | 0 | 1 | 0 | 11,1% | 1 |
| Decrease of the number of occupants in the dwelling (ex: a children left home) | 0 | 0 | 2 | 22,2% | 2 |
| Other: installation of new windows | 1 | 0 | 0 | 33,3% | 1 |
| Number of person who answered the question | | | | | 7 |
| Number of person who skipped the question | | | | | 31 |

These data will be provided to WP5.1 task leader in order to clarify possible evolution on consumption measures in order to establish if it is really due to energy savings actions or only to changes in dwelling occupation.

4. Feedbacks from Users as Building Managers

As we already stated it in D5.2.1., after the ICT solution deployment, the building managers of Genoa, Warsaw and Zaragoza accessed to a back office interface (web interface of iEnergy). In order to improve it, they were asked about the data and indicators they would find useful at their user's level.

The following table (extract from D.5.2.1) summarized the collected answers:

Table 20 Building Managers and Owners Expectations Regarding Indicators, Frequency and Scales of Information

| Information | Frequency | | | Comments |
|--|---|-------------------|-------------------|---------------------|
| | Day | Week | Month | |
| Heat consumption | Building | | Building | Warsaw and Zaragoza |
| Gas consumption | Building* | | Building* | Warsaw and Zaragoza |
| Indoor temperature (minimum and maximum) | Dwelling | | | Warsaw and Zaragoza |
| Spending for heating | Dwelling | | | Warsaw and Zaragoza |
| Usage of water | | | Dwelling* | Warsaw and Zaragoza |
| Usage of electricity | Dwelling* | | | Warsaw and Zaragoza |
| Temperature humidity | Dwelling | | | Genoa and Zaragoza |
| Outdoor temperature | Building Location (max, min and average temperature) | Building Location | Building Location | Zaragoza |
| Temperature in common areas | Building (max, min and average temperature) | Building | Building | Zaragoza |
| Status of windows | Dwelling (percentage of time that windows remain open) | | | Genoa and Zaragoza |
| Energy consumption | Dwelling | Dwelling | | Genoa and Zaragoza |
| Solar panels hot water production | Building (energy saved for hot water production with gas boilers) | Building | Building | Zaragoza |

Note: "*" signals a request for an alarm development on the specified item.

Two levels of managers were identified at this step: the building manager (i.e. the building keeper) and the building stock manager (i.e. the city). In order to answer this issue, 2 levels of interface and management tools are expected by the users: one for the building management and another for building stock management.

In the cases that the managers need to access information from individual dwellings, it is needed to have different means for data presentation to the ones present in the end user interfaces, which are more adapted to the tenants needs. For instance, it would be useful to have synoptic dashboards for each dwelling in order to be able to visualize in a single "snapshot" an overview of the status of all energy consumptions.

Information about energy consumptions shall be presented not only in physical consumption units, but also converted to currency units, providing the means to configure the tariff applicable for each kind of consumption.

A key functionality requested for the management tools is the capacity to easily visualize in parallel different parameters in order to establish easy correlations. For instance, comparison between outdoor temperatures, indoor temperatures, and energy consumption for heating.

Monitoring of energy production for buildings which are equipped with it (such as the pilot site in Zaragoza) is also considered a key feature, in order to be able to remotely detect any malfunction of the system.

Management tools shall avoid the presentation of too much detailed information and parameters which are not relevant for the facility manager. As an example, information about electricity consumption must display the effective electricity consumption, omitting other parameters that are also usually measured by smart meters (such as voltage, current, etc.).

These feedbacks were completed by informal exchanges between building managers and D'Appolonia, Mostostal and Acciona on each pilot site. And these exchanges fed ISA and ISEP's refinements actions on the interfaces, which resulted in the integration of a new dedicated interface in the ICT solution (see the application for Building Managers (BMUI) documented in D4.4.2 for more details on refinement actions). The evaluation of the compliance of the BMUI with the requirements from the technical point of view is presented in the table below.

Table 21 Application for building managers functional evaluation

| Specific Requirement | BMUI |
|--------------------------------|--|
| Monitoring | Yes |
| Disaggregation | Yes, if there is the supporting measurement infrastructure |
| Availability and accessibility | Web-based interface |
| Information integration | Aggregates several types of data such as: temperature, humidity (indoors and outdoors); electricity, gas, water, hot water consumptions and respective costs; historical data. Calculates sum of consumptions and averages of indoor parameters. |
| Affordability | The equipment and operating costs of the solution for building managers is similar to the costs of the solution for one tenant (for monitoring common areas and global consumptions of the building). Control of energy production would imply an additional cost. |
| Control | Not implemented but the solution can be upgraded to allow control tools. |
| Security and Privacy | Yes, both solutions have encrypted protocols and authentication procedures. |
| Intelligence and Analytics | Indicators for variables that have an ecologic footprint. |

Building owners within the consortium consider that the BMUI can be useful for the following purposes:

- Monitoring of the evolution of general gas consumption of the building: this could help to assess the effect of different management strategies of the central heating system. Furthermore, it can be a tool for assessing any refurbishment action (with active or passive technologies) accomplished in the building.

- Monitoring the general electricity consumption of the building: this would serve for benchmarking purposes with other similar buildings of the owner's stock.
- Monitoring of electricity consumption in common areas: this would help to detect abnormal consumptions due to improper usage or malfunction of the common areas installation. It would also be useful for assessing the effect of refurbishment actions such as automation of lighting.
- Monitoring of energy production in the building: this functionality will support the evaluation of the performance of the installation, the quick detection of failures, and the assessment of CO₂ emissions reduction due to the use of renewable energy.

5. Outputs and Inputs from Task 5.2 to the E3SoHo Project

Task 5.2 (Assessment of the user acceptance, behavioural change and analysis of recommendations) feeds several parts of the E3SoHo project during the last period. Indeed, the results gathered and presented in D5.2.1 (User's Acceptance Initial Report) and then completed by the questionnaire results presented in section 3 (see this report p.17) were exploited in Task 4.4 (ICT Solution refinement) to refine the solution (see D.4.4.2 "ICT Solution refinement final report" for more details). Feedbacks from tenants on the solution were indeed useful to improve the ICT interface mainly concerning its ergonomic design and the indicators presentation and understandability. Expectations and then feedbacks from building owners were also very helpful in conceiving, designing and then improving the specific interface dedicated to building management.

Exchanges also took place between tasks 5.1 (Monitoring and evaluation of the system's performance) and 5.2 mainly about the appliances described by the tenants in the questionnaires. Indeed, the data collected -such as the number and the acquisition year of the devices- allow postulating estimated consumptions for each equipment. These elements were useful to help to analyse in detail and understand the consumption data, both measured in the dwellings and deduced from the collected bills.

6. Conclusions and lessons learnt

The first issue addressed in task 5.2. (Assessment of the user acceptance, behavioural change and analysis of recommendations) was to establish **who** the users of the E3SoHo solution are. From the different feedbacks collected by the various people involved in the ICT solution deployment and use, we can confirm that our initial hypothesis -according to which users of the ICT solution should include the whole community of person interacting with it i.e. tenants, building owners, communication staff and technical staff- is relevant.

The other important issue for task 5.2 was to identify **what** the users' requirements are to ease the solution acceptability. On this topic, the questionnaire results analysis leads to four main conclusions confirmed by the feedbacks from technical and communication staffs presented in D5.2.1 (User's acceptance initial report).

The first conclusion from the questionnaire to tenants is that people are not yet massively convinced of the efficiency of the E3SoHo solution, because the percentage of use is 55.6 %. The main reason why they do not use it is the lack of familiarity with ICT technologies, which may imply that they do not even try, as well as difficulties found when starting to use the solution.

The improvement in usability can be a key factor to change the mind of tenants, thus increasing the adoption of the solution. Example of an action that can be taken is the inclusion of larger buttons and fonts specially designed for elderly people. Other external factors, such as the quality of Internet connection, can affect the performance of the application, and should be considered.

The evolution of behaviours has been moderate, and in fact when tenants were asked directly whether they have changed their behaviour since they were provided with the E3SoHo ICT solution, the majority said No. This moderate evolution of behaviours questions the real impact of the E3SoHo solution.

From these data we can make the hypothesis that the reason why people didn't really change their behaviour is that they already adopted energy saving behaviours before the E3SoHo experimentation started, because of environmental sensitivity or, more realistically in social housing, because of economic constraints. In the case of Spain, some of the tenants who believe they already had good habits before the E3SoHo solution came in to their homes made a remark that this last year, even if they haven't changed their behaviour towards energy, they believed that with the price increase in electricity and gas, they would spend more money.

Until now, people seem not to be massively convinced the E3SoHo solution helps reducing energy consumptions. This can be explained by the fact that, according to the analysis done in D5.1.2 (ICT System Performance Final Report), there is not a clear majority of dwellings which have achieved energy savings, even if the global results of the Zaragoza and Warsaw pilot sites show that energy has been saved globally in the pilot site.

The size of the samples makes it difficult to extract conclusions from the correlation of data from questionnaires, such as the number of people using the ICT solution and the number of people answering that they had saved energy, with the actual energy savings reported in D5.1.2. For instance, in the case of Zaragoza, from the 10 people who said that they had used the solution, 6 of them achieved energy savings in at least two of the three types of consumptions (electricity, heating and DHW), which is not a clear majority. The other 4 dwellings using the solution did not achieve savings at all, or they only slightly saved in one type of energy. Besides, 2 of the 6 dwellings with savings were not aware of this fact (they thought that they had spent more), from which it can be concluded that maybe we could try to provide clearer information to tenants through the ICT solution regarding the savings achieved. On the other hand, in the side of the 4 tenants in Zaragoza who reported not having used the solution, there have been 2 of them with savings in at least two types of consumption. Therefore it is difficult to confirm to what extent the energy savings achieved in the pilot site are directly linked to the use of the ICT solution, to the simple fact of participating in the project (which may have induced energy saving habits, even without using the solution), or just to natural evolution.

The most estimated used functionalities of the solution are the visualization of current and historical consumptions. Monthly objectives and alerts seem less interesting for the people considered, a fact that draws attention on the need to further refine these functionalities, as they should be key drivers for inducing behaviour changes in the tenants.

For half of the users sample the tablet⁹ use frequency amplitude is the week or less (while for the rest is once a month or less) and gender is not a discriminant factor for frequency variation whereas age seems to be. This conclusion reinforces the feedbacks from communication staff on the opportunity to develop specific communication means for instance adapted to elderly, which includes some of the graphical improvements mentioned above (e.g. larger fonts, simplified login procedure), but also the use of traditional means such as simple paper reports, which has been adopted to present the results of the monitoring period to the tenants (see section 1.3 "Tools and Previous Results", p.9). Main motivation to check the tablet is economical: how much does it cost the everyday use of appliances.

People are quite satisfied with the solution considering functionalities, interface, and installation process (even if they got technical problems, mainly on connection issues). This corroborates the feedbacks from technical staff (see section 1.3 "Tools and Previous Results", p.9). The device by itself (i.e. the tablet provided to the tenants) is appreciated as it is (except for fixed location on walls, an approach tested in Zaragoza pilot site, which doesn't meet tenants' expectations, as they prefer to be able to move it whenever they want). The data provided through the tablet are also appropriately delivered and useful, according to the feedback provided to the tenants, although there seems to be room for improvement for the advices and alerts functionalities, which were comparatively less appreciated than visualization of current and historical consumptions.

Awareness campaign and training tools are very positively assessed by the users.

Considering now the building owners, we can conclude that the integration in the ICT solution of a dedicated interface for building managers (BMUI), as reported in the already mentioned deliverable D4.4.2, providing a specific tool dedicated to their needs, answers a real demand from their side. If the data and indicators expected are quite different than the ones provided to the tenants, the overall objective remains identical: be able quite instantaneously to see what is not normal in building consumptions or in the energy production systems of the building (if applicable) in order to properly answer to fix the problem as soon as possible.

⁹ As the website is not used by many people, we focus on the tablet.

7. Annexes

7.1 Questionnaire To Tenants

➤ Questionnaire passed in Warsaw and Genoa.

Instructions to deliver the questionnaires

- Carefully read the questions before visiting the people in order to avoid misunderstanding (some questions were difficult to formulate because requiring precise and/or detailed answers).
- Visit people rather than call them, send a mail or put a questionnaire paper version in their mailbox.
- During the visit, try to pick several persons from the same household to get the „family point of view”.
- For open questions, after letting people answering ask them gently to sum their answer in a sentence to write down a reliable synthesis done or agreed by the people themselves.
- Don't forget to replace in the questionnaire the expression „E3SoHo ICT solution” by the name of the device actually used in the pilot site.

CLEARLY SPECIFY THAT ANSWERS WON'T BE USE TO ASSESS TENANTS' BEHAVIOUR OR GOOD WILL AND WILL HAVE NO IMPACT FOR THEM. HONNEST (EVEN CRITICAL) ANSWERS WILL HELP US TO IMPROVE THE SOLUTIONS MORE THAN CONVENIENT OR „NICE” ONES.

Question 1 (TO BE ATTRIBUTED BY THE INTERVIEWER. FOR QUESTIONNAIRE ANALYSIS MANAGEMENT PURPOSE ONLY)

N°

Question 2 What is your nationality? (TO BE ANSWERED BY THE INTERVIEWER. FOR QUESTIONNAIRE ANALYSIS PURPOSE ONLY)

- a Italian
- b Spanish
- c Polish

Question 3 BEFORE getting involved in the E3SoHo project, what were you (you and your family) doing in your everyday life to save energy? (multiple possible answers)

| Actions | Done <u>BEFORE</u> getting involved in E3SoHo |
|---|---|
| Turn off lights | |
| Turn off taps to reduce water consumption | |
| Limit heating temperature | |
| Limit cooling temperature (if relevant) | |
| Other (please specify): | |
| Nothing | |

Question 4 AFTER getting involved in the E3SoHo project, what are you (you and your family) doing in your everyday life to save energy? (multiple possible answers)

Please cross actions done before and continued since getting involved in the E3SoHo project as well as „new” actions initiated since getting involved.

| Actions | Done <u>AFTER</u> getting involved in E3SoHo |
|---|--|
| Turn off lights | |
| Turn off taps to reduce water consumption | |

| | |
|---|--|
| Limit heating temperature | |
| Limit cooling temperature (if relevant) | |
| Other (please specify): | |
| Nothing | |

Question 5 Does anyone use the E3SoHo ICT solution (either using the tablet or the Internet website) in your home?

- a. Yes *if yes, please skip to Q7)*
- b. No

Question 6 Why does nobody use the E3SoHo solution in your home?

- a. We are not used to this kind of technology
- b. It is very difficult to use it
- c. The information presented is incomprehensive for us
- d. The information presented is not useful
- e. We started using it, but we gave up because we did not get real savings
- f. Other *(please specify)*

.....
Now please skip to Q9

Question 7 Can you specify the people in the dwelling who is currently using the solution and how often?

| Who? | Age (years) | Gender (male / female) | Interface used | | Use the device at home? | | Frequency (cross only one block for each relevant line) | | | | | | |
|-------------------------------------|-------------|------------------------|----------------|----------|-------------------------|----|---|----------------------|-------------|-----------------------|----------------------|-----------------|-------|
| | | | Tablet | Web site | Yes | No | At least once a day | Several times a week | Once a week | At least once a month | Once a month or less | Comment if some | |
| You | | | | | | | | | | | | | |
| Other person living with you No 1 | | | | | | | | | | | | | |
| Other person living with you No 2 | | | | | | | | | | | | | |
| Other person living with you No ... | | | | | | | | | | | | | |

Question 8 What functionalities of the E3SoHo ICT solution are used in your home? (multiple answers possible)

- a. Visualize my current electricity/hot water/gas consumption and costs
- b. Visualize my current electricity/hot water/gas costs
- c. Visualize my historical electricity/hot water/gas consumptions
- d. Visualize my historical electricity/hot water/gas costs
- e. Check monthly objectives for consumption
- f. Check alerts and advices to reduce energy consumption

Question 9 What did you think of the E3SoHo ICT solution technical installation at your home? (answer Yes or No to points a., b., c. and d.)

- a. Was it too long? (Yes/No)
- b. Was it annoying (noisy, dirty...)? (Yes/No)
- c. Was it intrusive? (Yes/No)
- d. Was it done properly? (Yes/No)

Question 10 Did you have any technical problem with the E3SoHo ICT solution?

- a. Yes
- b. No *if No skip to Q13.*

Question 11 Which were the main technical problems that you had? (multiple answers possible)

- a. Problem with Internet connection
- b. Tablet did not turn on
- c. Application too slow /hanged up
- d. Short battery life
- e. Other (please specify).

.....

Question 12 What did you do to fix these problems? (multiple answers possible)

- a. I called the building caretaker
- b. I waited until next training session
- c. I called the hotline (*if relevant*)
- d. I checked the instructions of use
- e. I tried to fix it myself
- f. Other.....

From this point, please keep on with the questionnaire looking at the tablet with the tenant in order to show what you are talking about

Question 13 Did you have any difficulties when using the tablet? (multiple answers possible)

- a. No, I know how to use it
- b. No, by checking the manual I learned how to use it
- c. I had difficulties to recharge the tablet when necessary
- d. I had difficulties to switch on/off the tablet
- e. I had difficulties to tip on the tablet
- f. I had difficulties to launch/log in the user application (*if relevant*)
- g. Other (please specify)

.....

Question 14 How do you rate the application in terms of the following features? (answer to points a., b., c., d., e., and f.)

- a. Attractiveness (good/average/poor)

- b. Ease of use (good/average/poor)
- c. Clarity and readability (good/average/poor)
- d. Functionalities offered (good/average/poor)
- e. Correct operation (good/average/poor)
- f. Speed of operation (good/average/poor)

Question 15 What do you think about...

... the general advices provided by the solution? (answer to points a., b., and c., d. is optional)

- a. Useful/not useful
 - b. Easy to understand/Difficult to understand/We don't understand them at all
 - c. Not enough/enough/too much
 - d. Open comments
-

... the comfort (temperature) information provided by the solution? (answer to points a., b., and c., d. is optional)

- a. Useful/not useful
 - b. Easy to understand/Difficult to understand/We don't understand this at all
 - c. Not enough/enough/too much
 - d. Open comments
-

... the information about current energy consumption and costs? (answer to points a., b., and c., only d. is optional)

- a. Useful/not useful
 - b. Easy to understand/Difficult to understand/We don't understand this at all
 - c. Not enough/enough/too much
 - d. Open comments
-

... the information about historical energy consumption and costs? (answer to points a., b., and c., d. is optional)

- a. Useful/not useful
 - b. Easy to understand/Difficult to understand/We don't understand this at all
 - c. Not enough/enough/too much
 - d. Open comments
-

... the alerts provided by the solution? (answer to points a., b., and c., d. is optional)

- a. Useful/not useful
 - b. Easy to understand/Difficult to understand/We don't understand them at all
 - c. Not enough/enough/too much
 - d. Open comments
-

Question 16 What would you improve or change in this solution? (multiple answers possible)

Multiple answers are possible

- a. Nothing, I like it as it is
 - b. Improve graphic design to make the solution easier to use
 - c. Show data more clearly
 - d. Provide more interactivity, e.g. be able to compare my consumption with other neighbours
 - e. To be able to use the solution through other devices (e.g. mobile phone)
 - f. Other (please specify)
-

Question 17 Would you change the home device itself regarding....

....having the tablet in a fixed place (e.g. fixed to a wall) or not?

- a. I prefer it fixed
- b. I prefer it not fixed

...the screen size?

- a. I like it as it is
- b. I would prefer a larger screen
- c. I would prefer a smaller screen

...the font sizes?

- a. I like it as it is
- b. I would prefer larger fonts
- c. I would prefer smaller fonts

...the screen contrast?

- a. I like it as it is
- b. I would prefer higher contrast
- c. I would prefer lower contrast
- d. I would prefer to be able to configure the contrast myself

Question 18 How do you rate the information received to learn to use the solution? (answer to points a., b., c., d. and e.)

- a. User manual and leaflets (very useful/useful/not useful/not used at all)
- b. Number of individual training sessions received (too many/enough/too few/not attended)
- c. Usefulness of the individual training sessions (very useful/useful/not useful)
- d. Number of collective training sessions received (too many/enough/too few/not attended)
- e. Usefulness of the collective training sessions (very useful/useful/not useful)

Question 19 According to you, what other mean of communication would be efficient to help you to appropriate the way the E3SoHo solution works?

.....

Question 20 Can you specify what appliances are installed in your dwelling? (please walk in the dwelling to talk „in situ” of the equipment)

| Appliances | Number | Date of the appliance (even estimated) |
|--------------------------------------|--------|--|
| Dish washer | | |
| Washing Machine | | |
| Dryer | | |
| Drying and Washing machine | | |
| Fridge | | |
| Deep Freezer | | |
| Fridge with deep freezer compartment | | |
| Computers | | |
| Internet Box | | |
| Television | | |
| Cooker | | |
| Hoven | | |

| Appliances | Number | Date of the appliance (even estimated) |
|------------------------|--------|---|
| Microwave | | |
| Mobile Air Conditioner | | |
| Other:..... | | |

Question 21 Since you got the E3SoHo ICT solution, do you think you reduced your energy consumption? (answer to points a., b., and c.)

- Electricity (Yes/No)
- Gas (Yes/No)
- Water (Yes/No)

Question 22 Did your behaviour change since using the E3SoHo ICT solution?

- Yes.
- No. *Please skip to Q24*

Question 23 How has your behaviour changed since using the ICT solution?

- I control myself and family members. I pay attention to everything what may cause excessive consumption
- I use regularly with some advice (for example I remember to turn off the light when I go out of the room or turn off the heaters during house ventilation)
- From time to time. I pay attention to the mine and family members bad behaviour (for example: I am trying to turn off the light when anyone is not in the room, but I do not always remember about that)

Please skip now to Q25

Question 24 Why do you think there was no change of behaviour?

- We did not use the application at all
- We gave up using the application
- We did not put into practice the advices provided by the ICT solution
- We did not want to change our behaviour
- The information and advices did not have impact on our energy consumption

Question 25 Did noticeable changes on occupation or equipment take place in your dwelling since the E3SoHo project started?

- Yes
- No *End of the Questionnaire*

Question 26 If Yes: what kind of change? (multiple answer possible)

- Installation of an air conditioning system
- Installation of an extra heating system
- Increase of the number of occupants in the dwelling (ex: a new child was born)
- Increase of the presence in the dwelling (ex: someone is now staying the whole day at home)
- Decrease of the number of occupants in the dwelling (ex: a children left home)
- Decrease of the presence in the dwelling (ex: the dwelling is now unoccupied during the whole day)
- Other (please specify):

.....
.....

7.2 First Version of the Questionnaire to Tenants

➤ Questionnaire passed in Zaragoza

This questionnaire is an intermediary version of Annex 7.1 Questionnaire To Tenants (see p.48)

The identical questions comparing to the final version of the questionnaire are underlined.

Instructions to deliver the questionnaires

- *Carefully read the questions before visiting the people in order to avoid misunderstanding (some questions were difficult to formulate because requiring precise and/or detailed answers).*
- *Visit people rather than calling them, sending a mail or putting a questionnaire paper version in their mailbox*
- *During the visit, try to pick several persons from the same household to get the „family point of view“*
- *For open questions, after letting people answering ask them gently to sum their answer in a sentence to write down a reliable synthesis done or agreed by the people themselves.*
- *Don't forget to replace in the questionnaire the expression „E3SoHo ICT solution“ by the name of the device actually used in the pilot site.*

ENVIRONMENTAL SENSITIVITY IN YOUR HOUSEHOLD

1. **Would you say that you/your household are/is sensitive to environment protection issues?** (*only one possible answer*)
 - a. Definitely yes
 - b. Rather yes
 - c. Rather no
 - d. Definitely no
 - e. Hard to say (*do not read*)

2. Could you please specify the sensitivity to environmental issues of each person living in your dwelling?

Can you specify for each people his/her gender and how old he/she is?

1 stands for "very sensitive" and 5 stand for "not sensitive at all"

| Who? | Sensitivity to environment issues (cross only one box) | | | | | Gender | | Age (in years) | Full time (no other residence) occupant in the dwelling | |
|---|--|---|---|---|---|--------|------|----------------|---|----|
| | 1 | 2 | 3 | 4 | 5 | Female | Male | | Yes | No |
| You | | | | | | | | | | |
| Wife/husband or assimilated | | | | | | | | | | |
| Children n°1 | | | | | | | | | | |
| Children n°2 | | | | | | | | | | |
| Children n°3 | | | | | | | | | | |
| Children n°4 | | | | | | | | | | |
| Children n°5 | | | | | | | | | | |
| Other people living with you (specify the relationship): | | | | | | | | | | |
| Other people living with you (specify the relationship): | | | | | | | | | | |
| Other people living with you (specify the relationship): | | | | | | | | | | |

3. Before and since getting involved in the E3SoHo project, what are you (you and your family) doing in your everyday life to protect environment? (multiple possible answers)

Please for „currently done actions”, cross both actions done before and continued since getting involved in the E3SoHo project and „new” actions initiated since getting involved.

| Actions | Done <u>before</u> getting involved in E3SoHo | Currently done (<u>anterior</u> and <u>new actions</u>) |
|--|---|---|
| Turn off lights | | |
| Turn off taps | | |
| Limit heating temperature | | |
| Limit cooling temperature (if relevant) | | |
| Use public transport or carpool | | |
| Walk or ride when possible instead of using my motor vehicle | | |
| Through trash in litter | | |
| Apply the selective sorting of household waste | | |
| Other (please specify): | | |
| Other (please specify): | | |
| Other (please specify): | | |
| Nothing | | |

THE E3SoHo ICT SOLUTION

4. Do you think the deployment of the E3SoHo ICT solution changed the sensitivity to environmental issues for

- **You:** (only one possible answer)
 - a. Definitely yes
 - b. Rather yes
 - c. Rather no
 - d. Definitely no
 - e. Hard to say (do not read)

- **Your family as a whole:** (only one possible answer)
 - a. Definitely yes
 - b. Rather yes
 - c. Rather no
 - d. Definitely no
 - e. Hard to say (do not read)

5. Does anyone consult the E3SoHo ICT solution at home using the tablet provided?

- a. Yes
- b. No if no move on to Q0.

6. Can you specify for the people in the dwelling who is currently using the home device (tablet) and how often?

| Who? | Use the device at home? | | Frequency (cross only one block for each relevant line) | | | | | |
|---|-------------------------|----|---|-----------|----------------------|-------------|-----------------------|-----------------|
| | Yes | No | Several times a day | Every day | Several times a week | Once a week | Less than once a week | Comment if some |
| You | | | | | | | | |
| Wife/husband or assimilated | | | | | | | | |
| Children n°1 | | | | | | | | |
| Children n°2 | | | | | | | | |
| Children n°3 | | | | | | | | |
| Children n°4 | | | | | | | | |
| Children n°5 | | | | | | | | |
| Other people living with you (specify the relationship): | | | | | | | | |
| Other people living with you (specify the relationship): | | | | | | | | |

7. Does anyone consult the E3SoHo ICT solution on the internet web site?

- a. Yes
- b. No

8. Can you specify for the people in your dwelling who is currently using the internet website and how often?

| Who? | Use the website? | | Frequency (cross only one block for each relevant line) | | | | | |
|-----------------------------|------------------|----|---|-----------|----------------------|-------------|-----------------------|-----------------|
| | Yes | No | Several times a day | Every day | Several times a week | Once a week | Less than once a week | Comment if some |
| You | | | | | | | | |
| Wife/husband or assimilated | | | | | | | | |
| Children n°1 | | | | | | | | |

| | | | | | | | | |
|---|--|--|--|--|--|--|--|-------|
| | | | | | | | | ... |
| Children n°2 |  |  |  |  |  |  |  | ..... |
| Children n°3 |  |  |  |  |  |  |  | ..... |
| Children n°4 |  |  |  |  |  |  |  | ..... |
| Children n°5 |  |  |  |  |  |  |  | ..... |
| Other people living with you (specify the relationship): ..... |  |  |  |  |  |  |  | ..... |
| Other people living with you (specify the relationship):..... |  |  |  |  |  |  |  | ..... |

9. What is the E3SoHo ICT solution useful for? (Specify that it is a quiz and circle Yes or No in each box)

| | Monitor every day consumption | Monitor evolution of the consumption | Control the consumption | Give advice to limit consumption | Give advice to reduce bills | Inform about the invoice amounts |
|-----------------------------|-------------------------------|--------------------------------------|-------------------------|----------------------------------|-----------------------------|----------------------------------|
| For electricity consumption | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |
| For water consumption | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |
| For gas consumption | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No | Yes/No |

- g. Difficulty to remember the login and password (*if relevant*)
- h. Other:

16. How do you find the disconnection procedure i.e. steps to quite the interface application (including, when relevant, disconnecting, closing the user interface application, switching the tablet off, etc.)?

- a. Easy *move on to Q0*
- b. Difficult

17. Why? (multiple answer possible)

- a. Difficulty to find the on/off button
- b. Difficulty to tip on the tablet
- c. Difficulty to launch the user application (*if relevant*)
- d. Difficulty to read the information asked
- e. Difficulty to understand the information asked
- f. Difficulty to understand what this procedure if for
- g. Difficulty to remember the login and password (*if relevant*)
- h. Other:

18. Would you like to change the information presentation?

- a. Yes
- b. No *please skip to Q0*

• **If yes, what do you think of** (*answer to each line*):

| Name of the page | What? | Number | | | Comprehension | | Usefulness | | Improvement suggested when relevant |
|-------------------------|---------------------------------|------------|--------|----------|--------------------|-------------------------|------------|---------|-------------------------------------|
| | | Not enough | Enough | Too much | Easy to understand | Difficult to understand | useful | useless | |
| General overview | Global Information on each page |  |  |  |  |  |  |  | ..... |
| | Number of pages |  |  |  |  |  |  |  | ..... |
| | The icon button to other pages |  |  |  |  |  |  |  | ..... |
| | The exit button |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| News | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The general advices |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| Comfort | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The icons |  |  |  |  |  |  |  | ..... |
| | The indicators |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| Daily usage | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The icons |  |  |  |  |  |  |  | ..... |
| | The indicators |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| History | The graphs |  |  |  |  |  |  |  | ..... |

| Name of the page | What? | Number | | | Comprehension | | Usefulness | | Improvement suggested when relevant |
|---------------------|----------------------------------|------------|--------|----------|--------------------|-------------------------|------------|---------|-------------------------------------|
| | | Not enough | Enough | Too much | Easy to understand | Difficult to understand | useful | useless | |
| | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The icons |  |  |  |  |  |  |  | ..... |
| | The indicators |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| Notifications | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The icons |  |  |  |  |  |  |  | ..... |
| | The indicators |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| Monthly objectives | The general information |  |  |  |  |  |  |  | ..... |
| | The pictures |  |  |  |  |  |  |  | ..... |
| | The icons |  |  |  |  |  |  |  | ..... |
| | The indicators |  |  |  |  |  |  |  | ..... |
| | Other: (please specify) ..... |  |  |  |  |  |  |  | ..... |
| Other..... | Please specify: ..... |  |  |  |  |  |  |  | ..... |
| Other..... | Please specify: ..... |  |  |  |  |  |  |  | ..... |

19. Would you change the home device itself regarding....

The possibility to move the tablet

For Zaragoza site:

- a. Yes, I would prefer to be able to move the tablet
- b. No, I like to have a fixed located tablet

- **If b) crossed, where would put it?**

For Genova and Warsaw sites:

- a. Yes, I would prefer to have a fixed located tablet
- b. No, I like to be able to move the tablet

- **If a) crossed, where would put it?**

The screen size

- a. Yes
- b. No

- **If yes: would like to increase/decrease the screen size (circle the answer)**
- **Other.....**

The screen color

- a. Yes
- b. No

- **If yes: what color would suite better:**
- **Other.....**

The font size:

- a. Yes
- b. No

- **If yes: would like to increase/decrease the letter size (circle the answer)**
- **Other.....**

The lighting contrast

- a. Yes lighter/darker contrast
- b. No

- **If yes: would like a lighter/darker contrast (circle the answer)**
- **Other.....**

The battery lasting

- a. Yes more longevity
- b. No

- **Other.....**

20. Do you think there is too much dragging to access the information on the pages?

- a. Yes
- b. No

21. Would you change the kind of information the E3SoHo ICT solution provides?

- a. Yes
- b. No

- **If Yes: what kind of information would you like?**
.....

INSTRUCTIONS OF USE

22. Considering the information you already get, what was the more efficient way to appropriate the instructions of use? (1 stand for "very efficient" 5 for "not efficient")

| Mean of information | Efficiency (cross one box) | | | | | If no opinion, reason for it (circle the reason) | | |
|---|----------------------------|---|---|---|---|--|-------------------------------------|-------------|
| | 1 | 2 | 3 | 4 | 5 | | | |
| Reading the leaflet on instructions of use | | | | | | Written instruction lost | Never received written instructions | Other |
| Explanations given during the installation | | | | | | Was absent | Other | |
| Information get during the individual training sessions | | | | | | Attended no session | Other | |
| Information get during the collective training sessions | | | | | | Attended no session | Other | |
| Other:..... | | | | | | | | |

23. According to you, what other mean of communication would be efficient to help you to appropriate the way the E3SoHo solution works?

.....

24. What do you think of the training sessions you attended?

a. I attended no training session yet

| Number you attended | Understanding: 1 is "very easy to understand" and 5 is "very difficult" (cross one box) | Quality of the moment: 1 is "very good moment" and 5 is for a "bad/boring moment" (cross one box) | Useful information: 1 is for "useful information" and 5 for "useless information" | Usefulness of the sessions: 1 is for "very helpful for appropriate the device" and 5 for "not helpful to appropriate the | Comments if any |
|---------------------|---|---|---|--|-----------------|
| | | | | | |

| | | | | | | | | | | | | <i>device''</i> | | | | | |
|------------------------------------|--|---|---|---|---|---|---|---|---|---|---|-----------------|---|---|---|---|-------|
| | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | |
| Individual training session | | | | | | | | | | | | | | | | | |
| Collective training session | | | | | | | | | | | | | | | | | |
| Other..... | | | | | | | | | | | | | | | | | |

25. What do you think of the schedule of the collective training sessions?

- a. Convenient date and hours
- b. Inconvenient date and hours

26. Would you think other training sessions would be helpful?

- a. Yes
- b. No

HABITS AND CONSUMPTIONS

27. Can you specify what appliances are installed in your dwelling? (please walk in the dwelling to talk „in situ” of the equipment)

| Appliances | Number | Use of stand-by (if relevant, cross if yes) | Date of the appliance (even estimated) |
|--------------------------------------|--------|---|--|
| Dish washer | | | |
| Washing Machine | | | |
| Dryer | | | |
| Drying and Washing machine | | | |
| Fridge | | | |
| Deep Freezer | | | |
| Fridge with deep freezer compartment | | | |
| Computers | | | |
| Internet Box | | | |
| Television | | | |
| Cooker | | | |
| Hoven | | | |
| Microwave | | | |
| Mobile Air Conditioner | | | |
| Other: | | | |
| Other: | | | |
| Other: | | | |

28. Is anyone staying at home during the whole day (is the heating or cooling system working all the day long)?

- a. Yes
- b. No

29. When the dwelling is occupied, what is the heating/cooling temperature in the heating period/summer? (°C)

Can you rate your satisfaction on temperature?

| Seasons | Temperature in °C | Satisfaction rate (1 stand for “positive |
|---------|-------------------|--|
|---------|-------------------|--|

| | | opinion" and 5 for "negative opinion") | | | | |
|----------------|--|--|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Heating period | | | | | | |
| Summer | | | | | | |

30. Since you got the E3SoHo ICT solution, do you think you reduced your energy consumption?

- Yes
- No

| Energy | Yes, I reduced my dwelling consumption | No | Estimated amount of saved money in euros/złoty |
|-----------------------------|--|----|--|
| Electricity | | | €/zł |
| Gas (heating and hot water) | | | €/zł |
| Cold water | | | €/zł |

31. Did noticeable changes take place in your dwelling since the E3SoHo project started?

- Yes
- No

• **If Yes: what kind of change? (multiple answer possible)**

- Installation of an air conditioning system
- Installation of an extra heating system
- Increase of the number of occupants in the dwelling (ex: a new child was born)
- Increase of the presence in the dwelling (ex: some is now staying the whole day at home)
- Decrease of the number of occupants in the dwelling (ex: a children left home)
- Decrease of the presence in the dwelling (ex: the dwelling is now unoccupied during the whole day)
- Other (please specify):
.....
.....

PERSONAL DATA

32. Which of the following best describes your present employment status?

- Employee employed in a company or corporation
- Owner or co-owner of a company or a spouse/husband helping in the company
- School pupil/Student
- Unemployed/ No stable employment
- Pensioner
- Disability pensioner
- I run the household and raise children./ Housewife-houseman

33. What is the total area of your dwelling (sq m)?

.....

34. Since when have you been living in this dwelling?

.....