

# ICT for Older People to Learn about ICT: Application and Evaluation

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**Abstract.** Information and communication technologies are becoming a common instrument of daily life. They are available to more and more people everyday, but that does not imply that they are usable and useful for everyone. There are specific groups such as older people, with specific characteristics, such as motor control problems or reduced vision, that affect both the way they use these technologies and also how they learn how to use them. In this paper, we propose to use massive open online courses in order to show older people how to take advantage of the resources available through new technologies. This proof of concept shows that the use of ICT for learning about ICT can be an adequate solution for older people.

**Keywords:** ICT · Older people · MOOC · Usability · Mobile devices

## 1 Introduction

Information and Communication Technologies (ICT) have emerged and their use is affordable for almost everyone. That involves a change in individuals' daily lives. Internet use has become popular, mobile devices are used with different aims and not only as phones. It is essential to be always online and connected with friends and family by using social networks. We are continuously using texting tools to contact people, sending pictures, microblogging, etc. However, this landscape is not the same for everyone. People with disabilities or older people do not always see technology in the same way as other users do [1, 2]. In fact, this last collective, that is continuously growing, use ICT in a different way and pursue different aims [3, 4]. Older people were not born in an ICT context but they have to use it because of its high popularity. In this case, ICT, which has, as one of its goals, to promote integration and enhance relationships between people, is not having the expected effect with them. For older people, the use of technology can become something exclusive instead of inclusive [4]. The main problem is that technology has been developed in many cases without taking into account the special needs of older people, and that they have no previous training in this kind of technologies [5].

Given this context, the paper presents a project developed at the University of León that aims to define a learning program about ICT use for older people. The key issue of

this project is that, instead of teaching older people in face-to-face sessions, what we have done is using ICT to teach ICT. As this learning program should have the higher dissemination possible, we have used MOOCs (Massive Open Online Course) as the way to deliver this knowledge. MOOCs allow an undefined number of students, are carried out in online contexts and the contents are available by using the Internet [6]. These type of courses provide significant benefits for older people such as that they can easily access new knowledge, contact with peers with similar aims and reuse and see the contents as many times as needed. Moreover, this type of courses has a key element for older people: Videos. This type of users are used to watch TV, so videos are not something strange to them so that learning can be focused on how to do the things and not only on the concepts. With this in mind, in the University of León, a MOOC experience was developed.

This MOOC shows to older people how to use iOS and Android devices. The researchers explore the main functionalities used by older people, and based on them, they developed the videos and activities to include in the MOOC. The contents are deployed in a learning platform of the University of León and have been tested by an older people group (with individuals with ages from 60 to 85).

This paper is structured as follows. In the following section, the background of this research is described. Later on, in Sect. 3, the contents development and how they have been deployed in a MOOC platform are described. In Sect. 4, a pilot carried out as a proof of concept is presented and the results of that pilot are discussed. Finally some conclusions are posed.

## 2 Research Background

This section aims to describe what can be understood as older people and their relationship with technology. After that, some learning experiences are commented, with special attention to those related to older people and MOOCs.

### 2.1 Older People and ICT

As commented above, ICTs can help people during their daily life. However, not everyone use the technology in the same way, and this is especially noticeable when talking about older or disabled people. But what do we mean by older people, also known as elderly people or senior citizens? This depends on issues such as the life expectancy or quality of aging that are related to the context. This context can have different levels of development; can have different quality of health services, etc. For instance, in Europe, an older person is not the same as in Africa. Most developed countries set the age of 65 years to define when a person is older.

At the moment, there is not a United Nations (UN) standard numerical criterion, but the UN agreed the cut-off is 60+ years to refer to the older population [7]. For this research, this will be the age used to define an older person. However, we should not forget that older people is a very heterogeneous group and for this research we will take also into account the following categories inside the older people group [8]: 1. Age more

or less close to retirement (period of pre-retirement); 2. Autonomous age as a pensioner (period of independent living); 3. Age with increasing handicaps (start of period of dependent living) and 4. Dependent pensioners' age (period of dependent living up to the end of life).

It should be noted that older people is a collective that is continuously growing. An example of this can be observed in the European Union (EU). Due to the dynamics in fertility, life expectancy, and migration, the age structure of the EU population will change strongly in the coming decades. The overall size of the population is projected to be slightly larger by 2060 but much older than it is now [9].

Older people have special features and use ICT in a different way from people that have grown surrounded by ICT [3, 5, 10, 11]. This means that there is an important gap between them [12, 13]. In order to bridge this gap between older persons and digital natives, the different countries and institutions have developed several initiatives. For instance, the European Commission funds research and applied research under The Seventh Research Framework Programme [14] and its successor, Horizon 2020 [15]. For instance, with Member States, the European Commission participates in the Active and Assisted Living Joint Programme (with a grant of 700 million euros) [16]. In 2011 the Commission started the European Innovation Partnership on Active and Healthy Ageing that promotes several projects.

But, is so much money needed to make ICT more accessible and useful for older people? The answer is obviously yes. ICT has a high potential for inclusion of older people but it can also be associated to exclusion. ICT can be inclusive because it promotes social interaction, gives them lots of helpful apps for their daily lives, provides them with new ways to keep contact with family and friends, etc. [17, 18]. However, there are several issues that make difficult for older people to use ICT [3, 11, 19, 20]:

- The older people group is not an homogeneous one concerning education, income or even the different types of disabilities often associated with age. Elderly people as a group are the ones at the greatest risk of being excluded from the benefits of the Information Society.
- They have not directly been involved in the evolution of ICT or the Internet, and they have to learn to use something that has been developed without taking into account their specific needs.
- Older people have problems to use the technology and learn how to use it because, ICT does not always take into account their age-related sensory, physical and cognitive features, and neither possible motor control and cognitive impairment.
- The affordability of ICT. Older people income can be a limitation for using and accessing ICT.
- The availability of ICT services is also a problem because of geographical restrictions. For instance, people with a limited access to Internet in rural areas.
- Accessibility and usability issues are essential for the success of any ICT solution and especially critical with older persons that, as mentioned above, have age-related special features.

A clear example of how this issues influence older people can be how they use mobile devices. This kind of ICT solutions has high penetration and acceptance in our society. By the end of 2015, there are more than 7 billion mobile cellular subscriptions

in the world and more than a mobile device per person in the developed countries [21]. These devices provide access to a complete set of services that can be employed with different purposes. A high percentage of older people in developed countries owns one of these devices, however they use only mobile phones for very limited purposes, such as for calling or texting in emergencies. This is mainly caused because the devices are not adapted to their needs, because they need to learn how to use the device and such tools have not been designed thinking of their special features [2, 3].

Given this context, and in order to reduce this exclusion, several initiatives have been defined. For this research, the most relevant ones are those related to learning activities for older people.

## 2.2 Older People and ICT Learning

As commented above, older people need to use ICT and these persons have several constraints that make it hard for them. Learning initiatives are essential to address this problem, and to make ICT something inclusive for older people, learning is something that does not only happen linked to an institution (university, high school, etc.). People can also learn in non-formal contexts and during their daily life [22–24]. The European Commission, through the lifelong learning program, has defined different initiatives to help older people to learn [25, 26] and also the different countries are enhancing this kind of learning actions [3].

Older people are quite interested in participating in these learning activities. They value the role of ICTs for keeping them in touch with family and friends, using the Internet for information searching, for hobbies and interests, and to make the mechanics of daily life easier [10].

However, older people present also difficulties to learn about ICT. Some common problems are: lack of confidence and fear of using ICTs (they are worried about doing something wrong or break something); the absence of support after the learning action; the high cost of training (although learning initiatives are addressing this problem); memory problems; problems with understanding technical jargon; etc. Some of these barriers are reduced with growing familiarity with ICT's, but some persist and some others are affected by aging constraints (physical and cognitive changes, motor control problems, reduced vision, etc.) [8, 10].

Given these barriers, what is clear is that older people has to be considered in the definition of ICT-based learning solutions and learning activities [11]. Moreover, learning plans should be flexible enough to support technology evolution and the change of older people conditions due to their age [8].

With this constraints, what has resulted to be a good solution is the use of visual contents that older people can see as many times as they want to, and demonstrative videos are specially useful [27]. In Spain, *Fundación Telefónica* and the regional governments have carried out several initiatives in this sense [28], such as courses about how to use an iOS or/and Android smartphone [29].

However, lots of these courses are carried out in face-to-face modality, and for the online courses, a learning platform is not always used [29]. In those cases, the interaction of older people with their peers is missed, and this issue is important in learning

activities. Keeping this in mind, a possible solution would be the use of a learning platform that supports video based contents, facilitate older people evaluation and interaction with their peers.

This solution could be the MOOCs (Massive Open Online Course). This kind of courses can be easily accessible for older people, provide them with tools to interact with others and with contents based mostly on videos that can help them to learn how to use different systems [30]. MOOC courses bring great opportunities to enhance the quality of life of elderly people by enabling lifelong learning and inclusion in learning communities [31]. There are several initiatives of MOOCs for older people, for instance, the ones proposed by some regional governments of Spain such as CyLDigital [32].

However, the use of a MOOC is not necessarily associated to learning success, it is necessary to take into account that each user is different and the contents should be adapted to their specific needs (in what can be known as an adaptive MOOC). In this way, it is possible to mitigate several traditional problems of MOOCs such as: dropout rate; low number of cooperative activities; and the continuity of learning communities beyond the MOOC [33]. Moreover, with older people also MOOC platforms should be adapted considering accessibility issues.

Taking this into account, in the present research several contents were developed and they were deployed on a learning platform as part of a MOOC. This is done with the aim to test if this kind of courses can help old people to learn about ICT.

### 3 Development and Deployment of a MOOC

Once decided to apply a MOOC solution for older people learning, the next decision was which contents to use as a proof of concept. Taking into account the popularization of mobile devices, our idea was to develop a MOOC about smartphones, including both iOS and Android as the most common operating systems. The main aim of this course was to introduce the use of a smartphone to people that was not using it, or to improve the use of those persons that only use a very limited set of functionalities. This means that: (1) It was necessary to know if the course student uses the smartphone or not; (2) Define contents for both beginners with smartphones, and older people with some previous experience; (3) Deploy the contents in a learning platform and present them depending on the student profile, that is, in an adaptive way.

Regarding the first issue, the MOOC included, as the first module, a learning guide with information about the course and a questionnaire. It asks older people about their age, about their experience with smartphones, and about their smartphone operating system (Fig. 1). With this information, two different learning pathways were proposed; a simple one and an advanced one.

The definition of the contents requires to decide which functionalities would be described and what would not. In order to do this, the researchers of this project use studies such as [5, 34] and initiatives such as [29, 32] and the list of functionalities considered were: physical management of the device (buttons and touch-based movements); Basic Settings (main screens, icons management, alarms, apps installation, etc.); Contacts and email management; SMS (management and delivery of SMS);

## Mobile devices for older people - Profile questionnaire

Descripción del formulario

**In which age group are you?\***

- Between 60 and 65
- Between 65 and 70
- Between 70 and 75
- Between 75 and 80
- Between 80 and 85
- Between 85 and 90
- Between 90 and 95
- More than 95

**Do you use an Smartphone?\***

- Yes
- No

**If you use an Smartphone, what of the following Operating Systems are you using?**

- iOS
- Android
- Windows Phone
- Blackberry OS
- I don't know

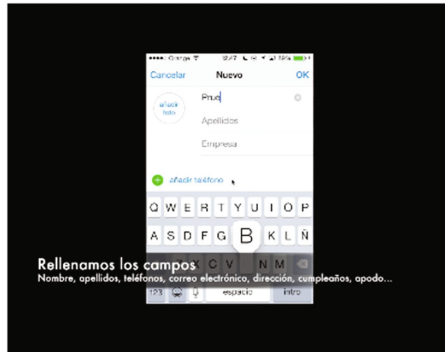
**Fig. 1.** Questionnaire to gather information about older people profile

Instant Messaging Systems (Whatsapp is used as an example); Web Browsing; and Integrated Camera Usage (take photos, make videos, store and manage media files). The authors carried out a presentation video for each of those functionalities and at least two additional videos describing the specific functionality for iOS and Android (although some functionalities are divided into several videos). Each video lasts up to five minutes and has some tasks associated that students can carry out and assess by themselves. Moreover, the student has always a jargon glossary available. In order to evaluate the acquired knowledge, the MOOC is finished with an evaluation questionnaire.

Finally, once the contents were developed, they were deployed in a learning platform. The best option would have been a MOOC platform, but the university did not have a contract with any MOOC platform. Given this situation, the authors decided to use Moodle as a MOOC platform (only for the proof of concept) and its lesson tool, and Google Forms to gather the information about the user and provide them with proper content (Fig. 2 shows the content once deployed).

### Contacts Mangement

The following video shows how contacts are managed.



#### Task 1

1. Create a contact from scratch
2. Find the contact
3. Send a SMS to the contact
4. Phone him/her
3. Create a contact from a phone call

Siguiente

**Fig. 2.** Video and associated task for the Agenda Management in iOS

## 4 Experiment

In order to check the solution proposed, an experiment with a group of older people has been carried out. It involves 10 individuals that will be considered the experimental group, and 10 individuals that would be the control group. The experimental group members answered a questionnaire after carrying out the MOOC. The control group members did not participate in the course but most of them have a smartphone. 8 of the 10 older persons form the experimental group are between 60 and 75 years old and all of them have a smartphone (7 Android and 1 iOS). Besides, in the experimental group there are 2 older persons with an age between 75 and 85 that do not have a smartphone but aim to learn how to use it before buying one. The control group consists of 7 persons with an age between 60 and 75 and 3 more with an age between 75 and 85 that have not a smartphone.

From this experiment it is possible to explore students' perception taking into account the usability of the system (in this case the mobile device).

### 4.1 Methodology

The methodology aims to explore if the perception of the mobile device usability changes when participating in the MOOC.

Usability evaluation may involve the study of several issues such as: the user satisfaction, the perception of use, the efficiency of the system, etc. In this case the issue to consider was satisfaction. It was analysed using a System Usability Scale (SUS). SUS is a simple ten-item scale that gives a global view of subjective assessments of usability [35]. In the experiment, the members from both the experimental and the control groups fulfil the SUS form. In this way, it was possible to compare those that participate in the course and those that do not. Moreover, it would be possible to compare those older persons with a smartphone to those that do not have one.

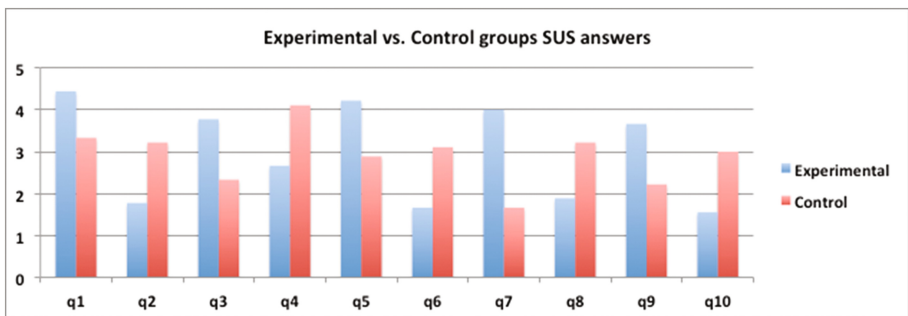
## 4.2 Results and Discussion

As commented above, SUS form was applied to the experimental and the control group so that different results were expected.

The results for SUS in the experimental group was a 76,4 %, which is above the acceptable satisfaction level of 68 % described by Sauro [36]. It could be higher but the contents have been deployed in a platform that is not defined specifically for MOOCs, and there are only 10 students involved in the course, while a MOOC usually has hundreds or thousands. That is, the interaction with peers was poor in this proof of concept.

The results in the control group were of 39,4 %. That can be normal because this group is formed by older people that, although have a smartphone, do not usually use all the functionalities of the device. They perceive the smartphone as a complex device to use and they require the support of expert people in order to use it properly [3, 5].

Figure 3 shows a comparison in the average values of each answer for the experimental and control groups.



**Fig. 3.** Comparison between the average answers for each question of the SUS questionnaire (Color figure online)

It should be noted that there are differences of 1 or more Likert scale level for all questions except for question 1 (q1). This question is “I think that I would like to use this system frequently”. These answers can be similar because both the people of the experimental and control groups would like to use the system frequently, mobile devices are something they use and want to use everyday although in this question is



not defined how easy is to use it. From this comparison, it is also possible to see that there is a special difference for question 7 (q7). That is, “I would imagine that most people would learn to use this system very quickly”. People in the experimental group think that it is easy to learn to use the system, but the persons in the control group have not carried out the course, so they have a very different perception.

From this experiment it is also interesting to compare the SUS average score for the older persons with ages between 75 and 85 years old and that have not a smartphone. These persons in the experimental group have an average score of 71,2 % with a difference of 5,4 % from the average value for the group. This kind of older persons in the control group has a score of 22,5 % with a 16,9 % of difference from the average value of their group. This could be caused because the persons without a smartphone in the experimental group have learned to use it after the course and they have a similar perception of satisfaction with the device; while those in the control group have even more difficulties than their peers because they have not a smartphone to interact with.

## 5 Conclusions

The present research has dealt with an issue as learning ICT by using ICT, but in this case the students involved in this learning activity are older people. People from this collective have very specific needs and special features related to their age. In order to guarantee a successful use of ICT it is necessary to carry out learning actions oriented to them and to take their reality into account.

This paper has explored some of the problems that older people has regarding the use of ICT, and also while carrying out online learning activities. Given this context, we consider that the best learning strategy can be MOOCs because they are oriented to video-contents, are usually free and allow older people to interact with peers with similar problems and/or motivations. In order to test this MOOCs about ICT for older people, we have carried out an implementation as a proof of concept. After assessing the usability of the action, it was possible to see that the satisfaction of the older people was higher in those students that have participated in the MOOC.

However, the pilot carried out has several limitations, most of them because it is only a proof of concept. These limitations are: (1) It should include more older people, because a population of 20 persons is not very meaningful; (2) With only 10 older persons in the experimental group, the interaction into the MOOC is not high; (3) We should use a MOOC oriented platform to achieve all the expected benefits of this kind of courses; (4) The platform was not adapted taking into account usability issues [31] because we were using an institutional environment that can not easily be changed.

As future research lines, it would be useful to explore, in a qualitative way, students perceptions after the learning activity. Moreover, the deployment and publication of the contents in a MOOC platform could be interesting to analyze the results in real contexts.

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