A reflective characterization of Occasional User

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Abstract This work revisits established user classifications and aims to characterise a historically unspecified user category, the Occasional User (OU). Three user categories, *novice*, *intermediate* and *expert*, have dominated the work of user interface (UI) designers, researchers and educators for decades. These categories were created to conceptualise user's needs, strategies and goals around the 80s. Since then, UI paradigm shifts, such as direct manipulation and touch, along with other advances in technology, gave new access to people with little computer knowledge. This fact produced a *diversification* of the existing user categories not observed in the literature review of traditional classification of users. The findings of this work include a new characterisation of the occasional user, distinguished by user's uncertainty of repetitive use of an interface and little knowledge about its functioning. In addition, the specification of the OU, together with principles and recommendations will help UI community to informatively design for users without requiring a prospective use and previous knowledge of the UI. The OU is an essential type of user to apply user-centred design approach to understand the interaction with technology as universal, accessible and transparent for the user, independently of accumulated experience and technological era that users live in.

Keywords: user classification, occasional use, user models, HCI theory, concepts and models.

1. Introduction

Despite the fact that throughout the years different words have been used to label users who infrequently used systems, e.g., *intermittent*, *causal*, *naïve*, little has been done in order to formally categorise such use, offering instead more than a category, i.e., a generally imprecise label that impeded its systematic use. The main goal of this work is to describe and newly characterise the *Occasional User* (OU), defined as a user who is going to use a system but does not have sufficient knowledge about the interface, and may not know whether they would use the system ever again.

Infrequent users have been scarcely mentioned and imprecisely defined in most classifications of users. Several reasons may explain such exclusion or ambiguity in their definition. Originally, the early user classifications were made at the time of *command line* interfaces (Shneiderman, 1987), a whose complex syntax was difficult to learn for non-experts (Whiteside, Jones, Levy, & Wixon, 1985). Following, new interface elements such as windows, icons, menus and pointer (WIMP) became easily recognisable across different platforms. These items represented metaphors (Carroll and Thomas, 1982) of real world objects which were transparently connected with computer logic instances, and, for the first time, allowed the user to interact with them on the screen through a peripheral (e.g., mouse). This approach made user interfaces (UIs) intuitive because they allowed direct manipulation of its elements (Shneiderman, 1983). *Command line* interfaces forced the user to directly deal with computer logic elements requiring a substantial knowledge of machine concepts and entailing a considerable human memory demand. When compared to command line ones, WIMP interfaces resulted in a qualitatively more approachable interaction paradigm for non-knowledgeable users. However, WIMP interfaces still require a process of familiarity with their functionalities (Stasko, 1996; van Dam, 1997). In particular, Stasko stated: “[...] Although GUI and WIMP interfaces are a big step past line-oriented terminals, they still have a learning curve and they can be awkward to use”. Many WIMP interface systems were built on the general assumption that user expertise acquisition is granted by continuous use of the same system interface. WIMP user interfaces assume the recognition of certain familiar elements orchestrating a metaphor for the system model. The direct manipulation of the elements teaches the way in which they can combine or interact with each other so, through trial and error, a user learns how to operate a WIMP UI. Depending on the complexity of such UI, the learning process may require extensive or repetitive use of the same interface across time to be able to explore the whole functionality of the system. The learning process can be supported by descriptive text of specific key elements and graphics - animated frames or movie - based help systems to help the user make a mental model of the UI.

The requirement of learning across time has been one of the main obstacles for users who, without technology experience in general and/or in a specific computer system, want to occasionally achieve a specific goal by performing a single transaction. Thus, a problem arises when a system is used in an occasional fashion, when the frequency of use is irregular, unknown or unplanned and whatever is remembered from previous uses, if anything, does not provide sufficient knowledge for an optimal interface interaction.

At least three arguments support an explicit design of systems for its occasional use: advances in UIs, new approaches in design, and new technologies and computer networks. Firstly, the evolution of *Graphical User Interface (GUI)* (Shneiderman and Plaisant, 2010; Myers, Hudson, & Pausch,, 2000) with *multi-touch input* (Norman, 2010; Selker, 2008; Buxton, 2007) has allowed the introduction of new kind of devices and new styles of interaction, increasing the heterogeneity and the potential number of users. Secondly, in the same way, the incorporation of *Accessibility* (Americans with Disabilities 2008; Mueller, 2003; US Rehabilitation Act Amendments section 508, 1998), *Usability* (Nielsen and Budiu, 2012; Nielsen, 1993) and *Inclusive Design* (Clarkson and Coleman, 2015; Savidis and Stephanidis, 2004) principles influenced them. Thirdly, the emergence of new context of use of technology in spaces traditionally dedicated to non-technological purposes, from shopping centres to airports and supermarkets, due largely to the introduction and expansion of the *Internet, mobile technologies* (Charland and Leroux, 2011; Gong and Tarasewich; 2004; Sharpless, 2000) and *Self-Service Technologies* (SSTs) (Meuter, Ostrom, Bitner, & Roundtree, 2003; Meuter, Ostrom, Roundtree, & Bitner, 2000; Bitner, Ostrom, & Meuter, 2002) has taken place. These technologies have facilitated new scenarios of use where human-computer interaction (HCI) is on the move, using technology as a mean to achieve an immediate goal. Therefore, technology allows the user now to perform not only routine pre-planned activities but also those with immediate goal in time and effectiveness, such as buying a transport ticket, or checking weather forecast or instant communication, these being examples of widely available tasks that can be spontaneously carried out. Designing systems for their *occasional use* requires the definition of the users who are already using such systems, their needs and their goals. However, the definition of the established user categories does not fulfil the requirements, characteristics and scenarios of the use previously described. The mismatch between the widely accepted 3-category user classification with the briefly described OU, was the motivation for this paper.

The reasons presented above *motivated* the authors to make a revision of the existing user classifications, cross-analyse them to establish the definition variables and range of values used to define the infrequent and inexperienced users, and frame accordingly the newly characterised type of user among the established user categories. Section 2 of this paper introduces a description of user's representation and classification. Section 3 frames user classification in the context of UID and lack of recent literature. Section 4 presents a review of the literature of user classifications, underlining their strengths and weaknesses referred to the occasional use. Section 5 describes the lessons learned from the literature review of infrequency and inexperience in use. A synthesis of the paper findings is presented in section 6. In section 7, the OU is newly characterised, with values assigned to their representative parameters, presenting a decision-tree to aid designers to categorise OU, enumerating several unequivocal examples of OUs. Section 8 describes the implications of the OU and the recommendations for UID. Finally in section 9, the overall conclusions are enumerated in the context of interface design and future work.

2. User representation and classification

The way a user is represented in the system design process is an instrument for technology designers in general, and user interface designers in particular, to address the defined characteristics, skills and conditions that potential users of such systems may have. The appropriateness of user representation is an important factor that may influence not only the system design but also the way in which users will or will not use the system.

One way to represent users is through a user classification. In a user classification, users are grouped into defined categories. Based on their experience with technology in general or with a specific system in particular, users progress or digress across categories depending on their process of learning.

2.1. Representing system's users: average user versus user categories

Among the number of concepts that computer system interface designers work with is the *representative user* (Johnson, 2007; Norman and Draper, 1986). The intention is to gather in a stereotype a set of representative characteristics of the potential users of a specific system that is to be designed. This user is supposed to represent the average of the range of possible values that users' characteristics may have. However, the downside of a unique representative or average user may be equivalent to the downside associated with the process of numerical average or mean calculation. This is, the values of the extremes can be very different from the average, up to the point where the average value represents one that is very far from its extremes. When the matter to deal with is conceptual instead of numerical, as it is the case when the system to be designed is intended for different types of users, the average user inherently blurs the distinction between user categories, impeding an effective differentiation between them. The concept of an *average user*, as opposed to a richer user categorisation from the perspective of user's needs and goals, may not fairly represent the different categories of system users. One consequence is that the design cycle of computer systems based on an average user or a unique representative user (opposed to a set of representative users, e.g., Persona template (Pruitt and Adlin, 2010; Cooper 1999)), predominantly incorporates a perspective of a homogeneous user category, needs and strategies. In contrast, the continuous introduction of new technologies alters and extends prevalent scenarios of use, increasing the number of users and, more importantly, diversifying user stereotypes. Whilst it is true that the incorporation of Accessibility and Usability principles have increased the heterogeneity in design for users of mainstream technology, in comparison, there is still a reduced number of applications effectively developed for specific target users, such as the elderly, children, disabled, or any other with special needs (Ling, 2008; Martinez, Carrillo, Scott-Brown, & Falgueras, 2013;

Marschollek, Mix, Wolf, Effertz, Haux, & Steinhagen-Thiessen, 2007; Madden and Hogan, 1997). Quoting Langdon and Thimbleby (2010, p. 439):

> "Much of the accepted research [on usability work], is likely to be inadequate for informing user interface design in the future, and certainly inadequate for informing inclusive design of user interfaces."

On the other hand, fields such as *Universal Design* (Goldsmith, 1976) and *Inclusive Design* (Clarkson and Coleman, 2015; Savidis and Stephanidis, 2004) attempted to re-balance the User Interface (UI) research scene by increasing the quality and number of designs for those considered special types of users, while laying aside the traditional marginal approach of supposed user uniformity. However, the problem still persists showing that different categories of software, hardware and context of use may easily result in a different representative or average user for each one, because what average user definition means in one context may differ in another. For instance, an average user of an old typewriter with an analog and mechanical interface does not exactly fit into the same parameters as an average user using a Self-Service Checkout with a touch-screen digital interface on a daily shopping trip to the supermarket. The participation of the user in the first scenario may or may not translate to the context of the second, but both users could be the same person. In addition, it is unclear whether the model based on the average user is transferable to other devices, or other types of users, or different contexts of use. The average user stereotype does not always embed a description of its context of use, and does not always cover the developments in accessibility, usability and interaction techniques required by the evolution of technology. Therefore, when considering a realistic set of users, a wide variability in their spectrum seems prudent.

To summarise, the arguments discussed above produce doubts about the utility of the concept of average user in UID. This means that, at present, an average of all user profiles does not always entirely reflect a spectrum of users growing in variability, which invites to a fairer analysis of user needs and context of use. These issues suggest that an unequivocal relationship between the cognitive and physical human aptitudes on the one hand, and new types of devices and their scenarios of use on the other has to be devised.

2.2. Classifying system's users: experience and learning

For UID, it is important to understand the relationship between user, experience and learning. Fig. 1 illustrates one of the underlying concepts of user classifications, the learning curve (Nielsen, 1993). Given a user and an interface, it plots the knowledge a user acquires throughout the repeated uses (also called 'sessions') with the same interface. The graph represents the usage (x-axis) and the knowledge the user acquires about the interface and functionality of the system (y-axis).

The average or representative user discussed in the previous section would be hypothetically placed in the centre of the curve (region B), representing the group of users with an average experience of the system. This central region of the distribution delimits two different sets of users with less and more knowledge about the interface (region A and region C) respectively. Novice users or other users with special needs do not fit into any region with certain amount of knowledge (B or C), therefore belonging to the region with least knowledge about the interface (A).

Fig. 1 depicts how traditional user classifications conceive user expertise acquisition, and gives some clues about why inexperienced and infrequent users may be outside the mainstream. The underlying concept of interface knowledge obtained through previous experience or expected repeated sessions explains the lack of success of users unfamiliar with the interface. In these cases, the UID is based on the assumption that a user will have more than one session with the same interface. In theory through this mechanism of repetition they should acquire the sufficient knowledge to know how to use it. This leaves users with no other alternative than to apply simplistic strategies such as trial and error, which can lead to frustration particularly during the first or one-time use. The risk of an averaging approach is that unconsidered users might inadequately interact with the interface, becoming unsuccessful users who may develop fear towards technology or see themselves as incompetent users (Pirsig, 1974; Wilson 1999). This is the reason why there is a clear mismatch between UIDs based on average users and those that address user needs integrating other values from the potential spectrum of users for an interface, which are normally excluded by the concept of average, such as the elderly or special needs users.

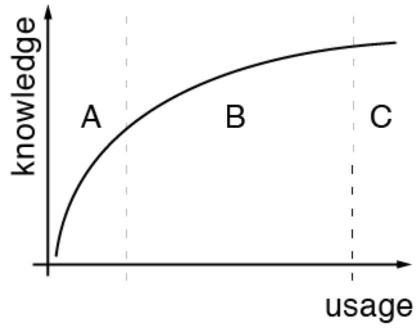

Fig. 1 Interface knowledge evolution acquired by a user of a system throughout the repeated sessions with the same interface.

3. User classification in context

The experience and insights that the authors gained from working closely with manufacturers, system designers and a great variety of end-users prompted a search and analysis of the user classification literature. The results of such search and analysis are explained in the section 4.

3.1. User taxonomy is useful for user interface design

Technology designs are addressed to the benefit and knowledge of their community of users. To *know the user* is an essential principle in UID (Hansen, 1971). The reasons for such importance are: more usable systems, more appropriate interfaces, less trial and error in design, and reduced user training (Potosnak, Hayes, Rosson, Schneider, & Whiteside, 1986). Classifications of users provide interface designers with a catalogue of user needs and skills that can positively inform their work. Historically, one of the precursors of user classification was developed in a database research context (Vassiliou and Jarke, 1984), to assess the best approach for query languages and data management. Studies to find the best practices were motivated by the problems associated with using command languages to communicate with the machine (Whiteside, Jones, Levy, & Wixon

1985). At that time, the main concern was to establish how users could satisfactorily deal with the information with the smallest number of errors and dissatisfaction when performing data queries. Thorough analyses of information queries were carried out to reduce the number of errors and outcome dissatisfaction.

A classification of users helps in knowing the expertise of a potential user of an application. For instance, Schneider (1981) created a user classification of five categories, running from the person who uses the system without understanding what they are doing, i.e., *parrot*, through *novice*, *intermediate*, *expert* until *master*. This five-stage model was called *prescriptive* because it provided designers with valuable information about the level of expertise users could present when using a system. There are more reasons that explain why classifications of users are *objectively* useful. They contribute to a better understanding of the end-user. A reliable classification should include the most representative and relevant characteristics of the user. The range and associated values of these characteristics contribute to drawing an appropriated map of user needs, virtues and potential deficiencies that should be the pillars of all stages of the design process (ISO 9241-210:2010, 2010). Therefore, a well-defined set of variables is important to specify what a user can potentially do using a defined system, what they could expect from it, what their needs are, and what is the best way to prevent and deal with possible errors. Classifications of users ease the study and work of designing for users. Additionally, there is a time factor associated to every classification made. They serve as a reflection on how technology has been changing habits of the user population, showing collective advances on the one hand, and issues on the other, both of which are contemporary to the time in which the classification was made. It also conversely reflects on how the evolution of user's habits and society has influenced the direction in which the technology has evolved.

3.2. Reduced number of recent publications in the literature concerning user classifications

User classifications have not always been of main interest to UID research and practice. From their appearance in the middle 1970s and early 1980s in parallel with computer emergence, explicit works on specific user classification slightly decreased their number in scientific journals, with only a few numbers in the 1990s and very few in the 2000s. All this time, while there has been an increase in the number and type of users, due to the two paradigm shifts described in section 1, scientific publications related with technology and computers looked in another direction. However, the fact of having a reduced number of recent publications in the literature about user classifications has encouraged the authors to revise more carefully the information available and refine their search. In fact, one of the findings is that many of the concepts used for user classification are still valid, and several of them are even active after adjusting their terminology to current technology and use scenarios. For instance, *intermediary users* defined by Martin (1973) referred to a situation where a user found a command line interface too difficult to use and delegated it to another more experienced user that could execute the task on their behalf and provide the information needed. This and other early descriptions of users can still be found in different contexts, such as a child downloading an app for their parent's tablet, or a frequent flyer helping an elderly couple printing the boarding passes from the self check-in kiosk at the airport. Finally, the limited number of recent literature about user classifications has reinforced the value of the earliest ones, whose theoretical underlying is still valid when adapted to the new scenarios of use and evolved technologies.

4. User classification literature review

The literature review presented here provides a chronological perspective on users without experience extracted from established user classifications, valuable for the new characterisation of the OU, and other future classifications. The review is divided into two subsections. The first subsection presents and describes the definition variables employed in other user categories, focused on inexperienced and infrequent users, who could share the dimensions of time and knowledge with the OU. The second subsection describes other informal descriptions found in non-academic information sources, such as the Internet web pages.

4.1. Review of inexperienced and infrequent users from established user classifications

To differentiate the OU from other user definitions that conceptually share the same dimensions of time and experience, other user categories are explored. The search and analysis have taken into account the following definitions: *inexperienced user* is a user of a system without sufficient general computer knowledge and/or knowledge of a specific system about to use; *infrequent user* is a user that does not comply with an established frequency of use, this is, using a specific system a certain number of times in a given period of time. Next, a uniform approach across different authors is chronologically presented (see a summary in Table 1 and Table 2) to underline coincidences and divergences among the variables on which they based their categorisation of users in general and inexperienced and infrequent users in particular. The first eight descriptions except Eason (1976) are extracted from Cuff (1980). Cuff's research is considered a seminal work about inexperienced or casual users. He explored the definition of the term *casual user* in other authors, introducing new characteristics and guidelines for design.

Classifications of users have traditionally relied on specific variables to group users by differentiable characteristics. In the literature, it is common to find similarities between the names used to classify user groups across independent classifications. However, it is less common to find a formal description of the variables used for such division. There have been several user classifications widely established in the research literature. We have selected these classifications from the set of all classifications because they fairly frame the scene in the literature and draw a true picture of values and concepts used for their user categorisations. Where possible, the variables in which such classifications built on their criteria have been stated.

In the first analysed classification, Martin's (1973), the *frequency of use* of the system was considered as a variable for user classification. He described the computer application use in intermittent times because users are (at that time) most likely to be doing different tasks rather than using a computer. It referred to the years when computers were not omnipresent and the majority of the working time was spent on non-automated tasks, such as electro-mechanical, manual, or verbal. Training in specific computer application usage was little or non-existent, and it was recommended to design the interface to be natural and intuitive to avoid user confusion and the risk of rejecting the system.

Codd (1974) defined a *casual user* based on the existing irregularity in the frequency of interactions with the system. Job or social reasons were excluded in the motivations for such use. This user was not versed in computers, programming or any technical procedural aspects.

Mann (1975), contrary to the common practice at that time, argued that command language should be only addressed to professionals or heavy users, who have experience using it. Therefore, command language was not recommended for *computer-naïve users* because it did not solve the obstacles they would find while using computers.

Shapiro and Kwasny (1975) defined *casual user* in terms of novelty based on the unfamiliarity with a part or the whole system. It was defined as an infrequent user who did not like short and unexplained computer input and output, such as *yes/no* prompts or imprecise menus. Shapiro and Kwasny made the case for applications which could understand natural language, to explain the unfamiliar part of the system to casual users but also to frequent users who want to acquire the knowledge to use it in a quick way.

Zloof (1975, 1978) described, in the first instance, the *non-professional user* who did not have a computer or mathematical background. Three years later he refined the concept for a person without a programming background who could be a professional in other field rather than computing. In contrast to Codd (1974), job and familiarity with the application were the motivations for technology use. That user had to be ready to learn formal language and relational models. He enumerated profession-based examples to which casual users would typically belong: secretary, clerk, engineer and analyst.

Kennedy (1975) determined that the *computer naïve* has a limited knowledge about the system, which is based on records, lists or files. Cuff (1980) described the implications of such definition adding that a user's mental model of the computer system is based on *pre-computer concepts*; thus, identifying a key aspect of *casual users*. The familiarity with the system functioning and the training in it would evolve the original mental model.

Eason (1976) defined the *naive computer user* as the one assisted by the computer to perform a task. This type of user does not have deep knowledge of technology or particular system in question and they probably do not seek such knowledge. They seek to minimise the learning time and effort to use the system. The interests and aspirations of most naive computer users lie in the work they do and not in the tool they are obliged to use. He claimed that naive users may be represented by people in different jobs, such as managers, clerks, engineers, members of the public, scientists, process controllers, and he argued that there was little to guide the designer in meeting the needs of particular user groups. Eason used the concept of *frequency of use* and the term *intermittent*, to define as *naïve intermittent* someone who needed to be reminded of the details of use.

Lough and Burns (1977) were in line with the second definition of Zloof (1978) where *casual users* were professionals in a field other than computing, such as managers, lawyers or planners. However, they stated an important difference: those users did not want to know the intricacies of the system and neither should they be required to learn data model, methods or programming issues. They included those users who used the system on a random basis, e.g., bank tellers or insurance company clerks, who do the same routines and have a well-structured set of needs allowing to have formal queries for such repetitive use. The influence of the *frequency of use* in the learning procedures of the system use was noticeable.

Bjerre (1977) defined the *casual user* as one who occasionally used the system only to extract some data and who did not need to have any programming skills.

Cuff (1980) explicitly avoided cataloguing the *casual user* – "no definition will come from this study" (p. 164). In contrast, Cuff analysed the *casual user* interpretations of other authors, through which he proposed a list of features that characterised this type of user. With a set of attributes, he roughly modelled a class conveniently labelled as *casual user*. Despite the internal variety among this kind of user, they share important features that are concreted in several requirements for the design of systems for this type of users: *frequency of use*, *skill level* (e.g., computer knowledge), and *familiarity* (with the system).

Moran (1981) presented two main categories of users: *expert* and *novice*. The classification was a two dimensional division, based on the variables *user knowledge* and *task structure*. User knowledge was related with the frequency of use of the system and skill level of the user. By task structure, Moran meant the range of actions a user can and cannot take, whose most representative component is the interface. Moran argued that the *novice* is vulnerable to many task structure variations, in contrast to the *expert* who is relatively insusceptible. Novices were focused on how to overcome the task and how to learn the use of the interface. Experts were skilled in using the application and, compared with novices, barely had cognitive load doing it. Both types of users would likely have used the application in the future. His classification was implicitly based on *frequency of use*, and explicitly on *computer and interface knowledge* and *task structure*.

Vassiliou and Jarke (1982) based their classification on four different variables, grouped two by two. For syntactic knowledge, as it was described in Shneiderman's (see page 8), they used *familiarity with programming concepts* (familiarity with GUI concepts and patterns could be their equivalent terms today) for a user who was not afraid of computers and had acquired logical or algorithmic problem-solving abilities; and *frequency of use* to directly determine the acceptable amount of training. For semantic knowledge, the variables were *application knowledge* to measure the precision of the conceptual model the user had about the structure and contents of the database; and *range of operations* to describe how many different types of queries the user wanted to ask in the language. The *casual user* was one with a low value in all those four variables described.

Rutkowski (1982) distinguished between *professional* and *novice users*, in the context of engineering and product market realising that "(...) for the more-than-casual user, control-letter functions are much quicker; in this fashion both the novice or occasional user as well as the professional are well accommodated." He advised that complex functionalities should be only assigned for users with more experience: "More complex functions may be handled in a more complex manner because these will typically be used by more experienced user." Additionally, he also enumerated the type of user targeted in each stage of a product market release: *technical specialist*, *enthusiast* and *consumer*.

Carroll's and Thomas's (1982) work was in the direction of consistently defining the metaphor as a useful component of the interface for all types of users, and especially for those with little experience, as the *naïve user*. They highlighted as an example of metaphor the office desktop that effectively compared the system features with the physical workspace, such as files and folders. The naïve or *optional users,* such as the office principal, approaches a new system with pre-existing models of things they already know, such as their job, office tasks and strategies for everyday work problems.

Nielsen (1993) proposed a three-dimensional analysis of users that drew distinctions in terms of domain knowledge, computing experience and application experience. However, he clarified that users' experience regards the specific UI is the dimension that is normally referred to when discussing user expertise. For Nielsen, a *casual user* is the third major category of users, besides *novice* and *expert*:

> "(…) [casual users] are people who are using a system intermittently rather than having the fairly frequent use assumed for expert users. However, in contrast to novice users, casual users have used a system before, so they do not need to learn it from scratch, they just need to remember how to use it based on their previous learning."

Nielsen also talked about the *complete novice*, those without any prior computer experience. However, he argued that at that time, they were less common than in the early years because many people have used computers and already know how to use them.

Marsden and Hollnagel (1996), and later Hollnagel and Woods (2005), defined the *accidental user*, "a person who is forced to use a specific system or artefact to achieve an end, but who would prefer to do it in a different way, if there is an alternative". The accidental user sees the technology as a barrier that difficulties goal achievement. These authors do not consider this kind of user necessarily inexperienced, nor infrequent or occasional.

Turoff (1997) claimed that a classification of users plays a functional role in the design of systems, distinguishing a great variety of users: *novice, casual, experienced, intermediaries, frequent, operators, routine, power, problem solvers,* and *real time users.* He distinguished and detailed a wide range of users, but the closest categories to represent irregular user and/or without previous knowledge or ICT experience are his *novice user* and *casual user*. The *novice user* is trying to learn during their first time of use. Turoff also considered motivation as a key factor that decides whether the effort of learning is carried out or not, and it depends upon how the system is presented to the user. A *casual user* "will use the system only a few times a week or less". They are "continuous novices, in the sense that they will not retain much of what they learn about the system during these interactions". The *casual user* is not only an infrequent user but also, and more importantly, "does not have any ambition to master the system and may often prefer to be led by the hand to accomplish what they need to do."

Shneiderman (1980, 1987) differentiated two types of knowledge regarding user interface: *syntactic*, describing a device-dependent knowledge of how to use a particular system; and *semantic*, device-independent and related to computer concepts and task concepts. Later, since 2005, Shneiderman and Plaisant (2005, pp. 67-68; 2010, pp. 80-81) adjusted the two types of knowledge: the one related to *task concepts* and the one related to *interface concepts.* Thus dividing the user spectrum into three distinctive categories: *novice* or *first-time* user, *knowledgeable intermittent* and *expert frequent* user. They explained that the first category encompasses the *novice*, a user who knows little of the task or interface concepts, and the *first-time* user, a professional who knows the task concepts but has shallow knowledge of the interface. In both cases, users "may arrive with learning-inhibiting anxiety about using computers." The second category includes the users that are *knowledgeable but intermittent* of a variety of systems, which have stable task concepts and broad knowledge of interface concepts. By contrast, "they may have a difficulty retaining the structure of menus or the location of features." Finally, the category of *expert* defines the "power" and frequent user who is familiar with the task and interface concepts who seeks to get their work done quickly.

Cooper (2007) differentiated three types of users: *beginners*, *intermediates* (that are perpetual) and *experts*. The classification is based on the knowledge the user has about the product and its domain of application, by virtue of the frequency of use. However, he considered that most users are neither beginners nor experts, because they tend over time to gravitate towards intermediates, depending on how frequently they use the application. Beginners want to learn and improve, so they may become intermediates very quickly. Sometimes, intermediates can use the product intensively, increasing their knowledge, reaching the level of expert. Conversely, if experts do not use the application for a long period of time, they can forget significant portions of what they knew; thus, becoming intermediates.

For Gillingham (2014) an *occasional user* is "someone within a human service organization who would only need to use a particular information system on an occasional rather than regular basis." He said that the specific idea that assisted with conceptualizing the occasional user was that of the Marsden and Hollnagel's (1996) *accidental user*. He also affirms "where accidental and occasional users differ is that the accidental user is not necessarily an infrequent user. Accidental users may begin as novices, but frequent use of an artifact will eventually lead to an acceptable level of competency." Finally, Gillingham added that designing for *occasional users* is similar to designing for *accidental users*, except that it cannot be expected that familiarity with the system will develop over time.

4.2. Review of inexperienced and infrequent users from other sources

Usability experts have mentioned terms related with inexperienced and infrequent users informally in other sources. For example, Mark Baker (2012) highlighted the differences between *novice* and *casual user:* "a novice is someone who has just embarked upon a course of study and whose intent is to become a master of that subject. A casual user is someone who just wants to get a job done and has no interest in mastery. Their information needs are very different." Adrian Reed (2013) pointed out that frequent users may be more prepared to accept a learning process (e.g., learning curve) than infrequent users, and the importance of the usability for the latter is also more significant: "A particularly important dynamic in situations like this, where each individual user might log on only occasionally, is to ensure that the system is designed to cater to infrequent users. You might log on to your Internet banking website every week; if so, it's likely that you'll be prepared to accept a slight learning curve. However, you're likely to have less patience for systems you access only occasionally. I know I'd be unlikely to go paper free and login once a year to view an annual pension statement if the system were extremely hard to use.

Table 1 Reviewed authors' variables to classify user.

		Parameters used to establish the classification of users					
Author	Year	***Frequency of use***	***Computer knowledge***	***Interface knowledge***	***Task domain knowledge***	***Motivation***	Other
Martin	1973	**x**					
Codd	1974	**x**	**x**			**x**	*Technical knowledge*
Mann	1975						*Programming experience*
Shapiro & Kwasny	1975	**x**		**x**			
Zloof	1975, 1978		**x**	**x**		**x**	
Kennedy	1975			**x**			
Eason	1976		**x**		**x**	**x**	
Lough & Burns	1977	**x**	**x**	**x**		**x**	
Bjerre	1977	**x**					*Programming skills*
Cuff	1980	**x**	**x**	**x**			
Moran	1981	**x**	**x**	**x**			*Task structure*
Rutkowski	1982						*Experience*
Vassiliou & Jarke	1982	**x**	**x**	**x**			*Range of operations*
Carroll & Thomas	1982						*Experience*
Nielsen	1993	**x**	**x**	**x**	**x**		
Turoff	1997	**x**		**x**		**x**	
Shneiderman	1980	**x**	**x**		**x**		
Shneiderman & Plaisant	2005, 2010	**x**		**x**	**x**		
Marsden & Hollnagel	1996					**x**	*Forced to use the system*
Hollnagel & Woods	2005						
Cooper	2007	**x**		**x**	**x**	**x**	
Gillingham	2014	**x**					*Organization's member*
Carrillo et al.	2016			**x**			*Prospective use*

Table 2 Review of inexperienced and infrequent user concept across established user classifications.

Author	*Year*	*Inexperienced and/or infrequent user*
Martin	1973	Infrequent use of computer
Codd	1974	Irregular interactions, such as occasional extracting of data, and not motivated, not versed in computers and technical aspects
Mann	1975	Naïve user (vs. computer professionals and heavy users)
Shapiro & Kwasny	1975	Face unfamiliar new system and dislike prompts and imprecise menus
Zloof	1975 1978	Non-programmer, motivated by job
Kennedy	1975	Computer naïve
Eason	1975	Naïve user, without computer technology knowledge. Motivated only by job, seeks to minimize learning, time and effort.
Lough & Burns	1977	Professional in a field rather than computer, without need to learn data model or access methods
Bjerre	1977	Occasional extracting of data
Cuff	1980	No computer experience
Shneiderman	1980	Novice: no syntactic knowledge, little knowledge about computer semantics, professional on task domain and deduced prospective use of same application
Moran	1981	Novice with assured prospective use of same application
Rutkowski	1982	Novice without complex functionalities
Vassiliou & Jarke	1982	Non-extensive familiarity and narrow range of operations intended, with low grade on Shneiderman's syntactic and semantic knowledge
Carroll & Thomas	1982	Naïve: no domain experience and no training on data processing
Nielsen	1993	Novice: computer experience but no application experience, need to learn interface use from the beginning Complete novice: novice without computer experience
Turoff	1997	Novice: learning for the first time a new system or a part of it Casual user: infrequent, without any ambition to master the system
Shneiderman & Plaisant	2005, 2010	Novice: no task knowledge or no interface knowledge and deduced prospective use of same application First-time: task knowledge + no interface knowledge and deduced prospective use of same application
Marsden & Hollnagel **Hollnagel & Woods**	1996 2005	Accidental: forced to use a specific system or artefact (not necessarily inexperienced nor infrequent)
Cooper	2007	Beginners without interest to learn or improve
Gillingham	2014	Occasional: infrequent user within a human service organization that use a particular IS

4.3. Analysis of the representative variables used to define inexperienced and infrequent users in previous classifications

From the set of the authors' classifications previously described (a summary of them can be seen in Table 1 and Table 2), a selection of common variables across the authors has been listed. These variables are described below to later examine their suitability for their inclusion in a new characterisation of the occasional user. A set made of the five most relevant variables across the reviewed work is defined:

- *Frequency of use*: the rate at which the use of a system occurred over a particular period of time in the past.
- *Computer Knowledge*: the skill level or capability a user has regarding the use of technology in general, or a specific computer system in particular.
- *Interface Knowledge*: the user's familiarity or acquaintance with the system's interface and analogous systems.
- *Motivation*: the reason that triggers the use of the system.
- Other: such as *task domain knowledge*, *programming experience*, *technical knowledge*, *ambition of mastering the system*, or range of operations (i.e., *task structures*).

5. Lessons learned from literature review of user classifications

Several lessons learned from the literature review of established user classifications performed in the previous section are described next. These lessons are related to the significance that *inexperience* and *infrequency* have for technology use, and their implications for UID. The review and the lessons learned led the authors to make a critical reflection in this paper and present the need for a newly characterised user category that sets those two key factors in use.

5.1. Significance of inexperience in use

There is no specific value for *inexperience* or *incompetence* in technological domain assigned across the classifications analysed. For instance, a minimum level of natural language syntax knowledge was originally necessary to work effectively with systems that used it, such as the command language. From there, it resulted in the rationale to include *novice users* with certain experience in programming languages, because even the most inexperienced user had to deal with commands to extract the information to be able to work with the system. One of the exceptions was Martin (1973), who considered users without programming background. He called them *intermediary users*, i.e., who had to delegate the given task to other users with sufficient knowledge. However, actual users do not have to commonly deal with databases with complex information extraction. There is still the possibility to deal with databases through command languages, but each day more easy-to-use access using other interaction styles, such as forms or direct manipulation, break the barrier of programming experience requirement.

In contrast with the fine-grained descriptions of *intermediate* (Santhanam and Wiedenbeck, 1993) and *expert* users described in the literature, definitions of the *novice* user category, if found, were characterised by their incompleteness or their informality (see Eason 1976 as noticeable exception). Behind the term *novice* or *naïve user*, there are slight but important semantic and functional connotations that need to be explained in order to distinguish the rationale to classify a user as a *novice*. Novices are generally defined as those users without knowledge about the system.

They are mostly associated with users who are at the beginning of using a system frequently, and they are expected to be willing to learn throughout that continuous use. In the cases where the *novice user* does not have any ICT experience, their characteristics and potential requests are generally not gathered in classifications, especially on those designed in the era of databases which were focused on users with an existing knowledge about the task, or the programming language necessary to be able to use the technology. Wilson (1999) defined the user who did not have any technology experience by going one step further and referring to them as one: "(...) who may be not only technologically naïve, but also fearful of the technology."

According to Coe (1996), there are great differences between how novices and experts perceive and use software applications. On the one hand, the novices' mental model has not improved through the experience, because an inexperienced user has not had enough practice and information to evolve their notion of how the system works. They are generally more focused on how to deal with the interface (in line with Moran, 1981). In addition, their comprehension of the application functionalities is incomplete suggesting that an explicit assistance might be valuable to build a more suitable conceptual model, providing help and support in case of mistakes. On the other hand, experts have a refined mental model based on their experience that provides a good mechanism for observing and dealing with problems during interactions, and, as opposed to novices, requiring less amount of guidance and help.

From an HCI perspective, the usability component of the interface is especially applicable to both types of users. For novices, the ease of use is an indispensable step to go forward in the interaction. For experts, the usability represents the speed of access and affordability of the functionality with less or no effort. Citing Hartson (1998):

> "The common saying of '*Lead, follow, or get out of the way'* can be successfully applied to interface design for all type of users: Novice through task performance; Intermediate with informative feedback; and get out of the way of Expert users."

5.2. Significance of infrequency in use

Another aspect found across the classifications studied is the set of different terms to represent the frequency (or absence of it) of the use of a system: *naïve*, *first-time*, *novice*, *frequent*, *casual*, *intermittent*, *discretionary*, *irregular, infrequent*, etc. Not all these terms are equivalent. For example, a *novice user* may never use the system again and, thus, not be catalogued as *frequent*. This reflects the amalgam of concepts enclosed in the different terminology, and the need of a clear organisation of these categories and variables that distinguish them, especially with regard to inexperienced users. Among the variables that may help to define the *occasional use* of technology, the absence of certain specificity has been observed. For instance, a wider spectrum of values for *prospective use* has not been found across many of the classifications studied. Most of the authors interpreted the *frequency of use*, assuming that there would be a repetitive use of the system. The possibility that a user may not repeat the use of the same interface in the future has not been formally defined by the values of the frequency of use, and this may have a serious impact on any classification. In this current paper, the term *frequency of use* refers to facts that already occurred in the past, this is, a proven frequency of use that has already happened and it is verifiable. In contrast, the term *prospective use* refers to the future, expressing the meaning in terms of probability. The term *prospective use* has direct implications on the goals associated to the different frequency of use. The frequent user is likely to use the system in the near time, and be interested in proficiency and learning to lessen interaction times and find the effortless ways to achieve goals. By contrast, for the infrequent user who is not ensured to use the system in the near time, goal achievement and the time elapse become priorities.

Moran (1981) argued that for novices learning the interface was more important than being able to do the task. The time employed to do the task and its achievement was, in his opinion, relegated to an inferior priority:

> "Learning is, of course, paramount for the novice whereas the time it takes to do a task is secondary— getting the task done at all is the big concern."

However, it seems that this is not the case in contexts where the factor of *learnability* does not have the same level of importance as the time elapsed. On the contrary, many users just wish to proceed with the task at hand in cases where time is critical, i.e., purchasing a train ticket in a self-service train ticket machine for the train about to depart. There are two conflicts when considering these type of contexts. On the one hand, there is an aim to accomplish the transaction as quickly as possible. On the other hand, there may be awareness that future interactions may be faster if the user spends some time to learn the task during the transaction. In the latter case, individual differences account for various degrees of willingness to take the extra time to learn, and, in addition, the uncertainty about the likely number of future interactions may also inhibit the choice of learning. Some questions arise: What if that prospective use is not going to happen, or not with a defined probability? What if the use is the first and the last use, therefore unique? In such cases, to learn how to use the application is not more important than just using it. The priority is thus to achieve the goal. For instance, in the previous example of buying a train ticket to take a train about to depart, the time the interaction requires is critical. Achieving the goal, i.e., getting the ticket, becomes the most important, while learning during the interaction, which may not be repeated in the future ("does not have any ambition to master the system and may prefer to be led by the hand to accomplish...", Turoff, 1997), becomes secondary. This may happen in other scenarios, for example, on a once in a lifetime holiday, there is no expectation to re-use transport infrastructure, but every necessity to minimize transaction time. Impression formation is still critical in such a context, so a poor user experience resulting in a missed transport connection can have long-lasting consequences.

6. Synthesis: need for a new characterisation of the occasional user

The literature review presented in this paper provided a chronological evolution of inexperienced and infrequent users, valuable for the comparative definition of the OU and research on new future user classifications. Among other factors analysed, inexperience and infrequency have been emphasised above all. For instance, when *inexperienced* users approach a new system, it is key to connect the functionalities of the system to the pre-existing models of things the user is familiar with, and this may be achieved through truly representative metaphors (Carroll and Thomas, 1982). One lesson learned is that the inexperienced user's mental model (Norman, 1983) would evolve from one based on *pre-computer* concepts to another, explanatory and functionally predictive, through training and familiarity with the system (Cuff, 1980). The other lesson is that in the case of the occasional use, the absence of ensured prospective sessions eliminates the possibility of mental model evolution through traditional learning methods such as trial and error. The UID should not rely on another sessions (previous or future), steering the user towards the achievement of the goal that they want to accomplish in the current session.

There have been also noted interconnections between the analysed factors and the established 3-category user classification (i.e., *novice*, *intermediate* and *expert*). For Cooper (2007), the *frequency* of use determined to what category user gravitates, tending over time towards the *intermediate*.

Frequency of use has been also pointed out by Nielsen, who declared that the intermittent use relies on learning from previous sessions, placing this user between *novice* and *expert*, outside the line of thought used by other authors. More importantly, usability may have a direct impact on the frequency of use, being able either to turn an occasional user into a one-time user if badly designed, or an infrequent user into a frequent user if the design was appropriate (Reed, 2013). In addition, infrequency of use has also an influence on the *ambition of mastering* the system, as described Turoff: "[a user who] does not have any ambition to master the system and may prefer to be led by the hand to accomplish what they need to do." (Turoff, 1997).

All these definitions build up on different degrees of terms related to the user and system use: *frequency*, *experience* and *ambition of mastery*. However, it demonstrates the lack of consensus when informally referring to these terms to define what is infrequent, irregular or occasional. What truly defines the *occasional user* is the absence of previous knowledge and uncertainty of prospective use. Thus, this category of user is placed outside the traditional learning curve (see Fig. 2). The OU is a point *outside that curve*, which dissociates current and potential future uses. This highlights the problem of its inclusion in the established 3-category user classification.

7. The Occasional User: characteristics and definition parameters

The OU is a type of user without sufficient computer knowledge of a concrete system's interface, and whose main priority is to use the system and achieve their goals without cost in terms of time or effort. In addition, prospective use of the same interface by a user is unknown and generally not ensured. For that, spending time on learning how to use the interface is time wasted as user ignores the possibility of using the interface again in the future and therefore lacks the willingness to master the system. In addition, in certain cases learning the interface beforehand may not be practical because of its context of use, such as an airport passport authentication system. The key points of OU interaction are guidance during the process and assistance in case of error, without requiring from the user a previous knowledge to use the interface.

7.1. Specific variables for OU definition

As stated in previous sections, two variables associated with knowledge and time are critical to define the OU*:* 1) *knowledge of the interface* and 2) *prospective use.*

The former, *knowledge of the interface*, identifies the prior experience the user has with the interface. In the case of occasional use the value is *insufficient for optimal interaction*. This means that whether the user has had an encounter with the same or analogous technology, the time elapsed since the last interaction, the difficulties they experience while learning and, in many cases, their absence of motivation, make it unwise to rely on the user's memory recall or implicit visual recognition as the sole mechanisms to learn how to use the interface. It is recommended to consider that the user, then, faces an unknown interface.

The other variable, *prospective use*, is an explicit reference to the probability of the use of the same system by the same user in the near future. Because for an OU the likelihood of using the same interface in the future cannot be inferred with a fair level of probability, this constrains the probability to be always less than 1. Essentially, the OU does not know at the time of interaction if they will use the system ever again in the near future.

7.2. Differences among other user categories

The attempt to include this type of user in the established 3-category user classifications is not successful. This user does not comply with the most seemingly category, *novice*, because their future use of the UI is uncertain. This places the OU outside the traditional learning curve (Fig. 2) associated to *novice*, *intermediate* and *expert*. Something analogous occurs when comparing it to other less widely known categories, such as *one-time user* and *first-time user*. There is a substantial difference between them and the OU. In the case of the *one-time user,* there is the certainty that the use will be the first and the last (that is why she/he has been labelled *one-time user*) of the interface. Therefore, the probability of the prospective use is known and it is equal "0". On the contrary, for a *first-time user,* the probability of prospective use is also known but equals to "1", because it is certain that the user is going to use the interface again in the near future (that is why she/he has been labelled as *first-time user*). In the case of the OU, those certainties do not exist. A priori, the probability of prospective use is unknown and always less than "1". This means that the OU can become a *one-time user* if knowing, a posteriori, that they will not use the interface ever again; or they can become a *first-time user* if they know, a posteriori, that they will repeat the use of the interface in the near future, in which case, she/he would be labelled as a *novice*; or keep being an OU if the probability of prospective use continues to be unknown and always less than "1" (and with insufficient knowledge about the interface). Therefore, in term of the frequency of use, it is the certainty of the probability of prospective use that defines (and distinguishes) OU, *one-time user* and *first-time user*. Thus, the uncertainty of prospective use makes present the problem of the correct inclusion of the described type of user in any of the traditional user categories.

The implications of such new categorisation should be included in all stages of the design of a system whose potential spectrum of users may include those that rely neither on previous knowledge nor future use, and, in addition, determines the selection of the most appropriate interaction style for this type of user.

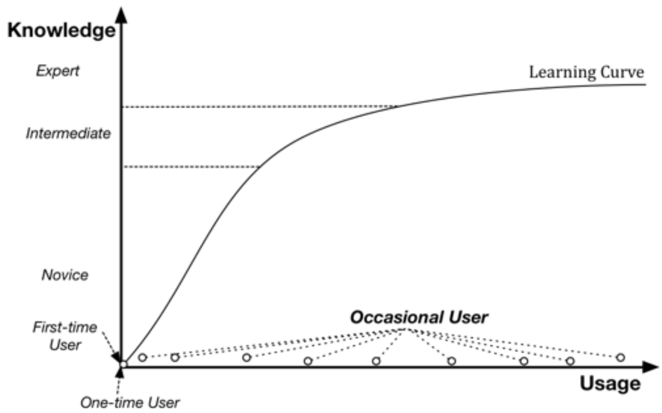

Fig. 2 The OU is placed outside the traditional learning curve of the 3-category established user classification. The OU is represented by a point outside that curve.

7.3. Tool to categorise a user as an OU: the decision tree

The OU decision tree is a useful tool for UI designers that allow them to categorise potential users of their applications as OU. The process of categorisation is formed by checking the values corresponding to the definition variables that characterised the OU (see Fig. 3), *probability of prospective use* of the interface and *knowledge about the interface*.

These values should be initialised and checked *a priori*, this means, before system interface use. The first check asks about the user's knowledge of the interface. If it is sufficient, then the user will not be categorised as an OU because they will know how to use the interface. If it is insufficient, then a second check asks about the probability of prospective use. In the case when the probability is known and equal '0', the user is categorised as one-time user. The same interface design guidelines for OU could be potentially applied to one-time user, although more research is required. In the case that the probability of prospective use is known and equal '1', the user is categorised as first-time user. Only when the probability is less than '1' and its explicit value unknown, then the user is categorised as OU.

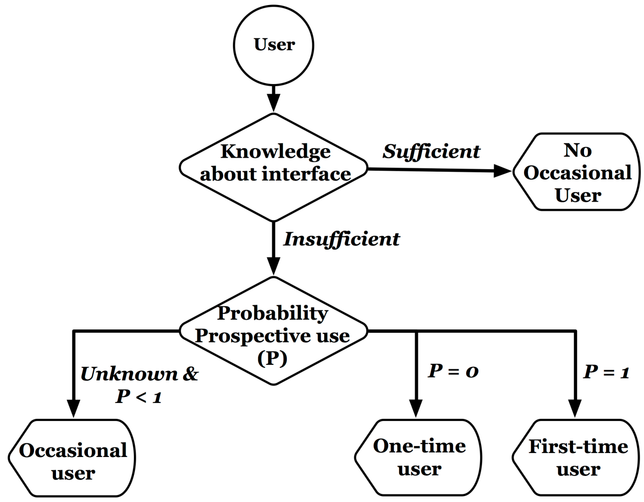

Fig. 3 The OU decision tree to categorise potential users of their applications as OU.

7.4. Characteristic examples of OU

To highlight the importance of this type of user, the six examples described below show scenarios where a large percentage of users could be classified as occasional.

- In several UK airports there is, at the time of writing, an alternative way of authentication of the passenger who arrive from abroad via an Automatic Passport Authentication process. The machine requires a user (passenger) to open the passport on the page where the personal information and photograph is present with a specific orientation necessary for the system to work. However, there is a double difficulty implied in the process. Firstly, it is not obvious which page contains the specific information among the various pages a passport has. Secondly, the correct orientation of the passport to be scanned is not intuitive because in most of the cases the photograph's page has to be faced down but reversely oriented from the perspective of the user. This is a typical example of SST where the inexperienced user is required to know in advance how to operate the singular interface. The OU would have to be able to accomplish the task without necessarily being knowledgeable about authentication mechanisms and airport scanners.

- The furniture company IKEA offers their customers a web application to virtually design a kitchen step by step: the *IKEA Home Planner 3D tool* (Ikea Home Planner, 2014). Users (customers) specify physical dimensions, shape and arrange the layout by placing doors and windows on the walls. Users have the opportunity to choose among diverse items (products) and also decorate the space. Once finished, they can print out the kitchen design and product list associated at home and/or save them to the IKEA server. They can also request expert advice at the store about the kitchen design created. According to the company, this application "has a user-friendly interface, designed for non-experienced kitchen planners". The OU would virtually design their kitchen with the help of an effective guidance following the steps of the task without being an expert in kitchen design and without the desire to repeat the use to master the system.

- Many amusement parks have a large amount of visitors every year. Disneyland Paris is a French amusement park that offers a free mobile application (Disneyland Paris official app, 2015) that provides access time to the park, hotel availability and spectacles show times. Once in the park, the app allows users (visitors) to locate and find their car in the parking, as well as to know the exact locations and distances of attractions, shows, restaurants, queue waiting times, customising alerts and own itineraries in the park. Many of these visitors could be OU, and would be able to get around the park and interact with the attractions without being acquainted with how amusement parks work and are arranged.

- Each year, the Spanish Tax Agency provides a free software desktop application to fill in the mandatory annual tax payment declaration by each person over the age of 18. This program, named *PADRE (Programa de Ayuda a la Declaración de la REnta*) (PADRE program, 2014), theoretically allows the taxpayer to make their tax declaration directly from home without having to queue at the offices and send the information via the Internet. In this context, an OU would be a user who wants to do the tax declaration without being an expert in the task domain (e.g., without having to know all the terminology and technicalities associated with tax declaration) and without having experience in how to use such interface (e.g., where the form fields are to be filled, where the help is). The OU should be able to accomplish the task thanks to effective guidance and useful help, and be able to understand and communicate the outcome to whom it is pertinent (e.g., Tax Office, personal accountant, relatives) without having to become literate in tax declaration.

- The Louvre art museum in Paris (Louvre audio guide, 2015) as most of the major museums of the world (the British Museum, the American Museum of Natural History, the State Hermitage, etc.) archaeological sites (Chichen Itza, Machu Picchu, etc.) and others touristic places offer mobile apps for audio-guiding, providing useful information for its visitors. Many of them probably are once-in-a-life-time visitors and, therefore, those may benefit from the design for OU.

- Other examples of OU would be those users who have to use an application or web page to buy tickets for events that occur every several years, such as the *Olympic games*, or once in a lifetime, such as the *Millennium celebration*.

8. Implications of OU and recommendations for User Interface Design

The characterisation of the OU and, in particular the value of the two variables that define it, have direct implications for the UID and interaction for this type of user. There are several factors from the OU definition that may be taken into account in UID, such as uncertainty of use, forgetfulness and designing for an occasional use. Several principles and recommendations are outlined, followed by a summary of two studies that support them described at the end of this section.

8.1. Uncertainty of use and other factors

The uncertainty of use refers to the difficulty for a designer to be certain about the prospective use of their system. So, the possibility of occasional use of a system would ideally be included during the design process to prevent unattended occasional uses. Other factors that may influence the prospective use of a system are, among others, forgetfulness, motivation and context of use. Forgetfulness refers to the case that even if a designer is certain about the prospective use of their system, still there is the question whether user's sessions are close enough in time to stop users forgetting what was learned. This means that user learning of a system across time does not have to necessarily be always incremental, but may be decremented. It similarly applies to user's motivation for learning how to use a system. Even in the case of an ensured prospective use, the implication of learning is not always clear if the user is not motivated to do so. Finally the context of use denotes the conditions of the environment that may or may not invite or facilitate the learning of a system even when the prospective use is ensured.

8.2. Recommendations and principles for designing for an occasional use

The following recommendations and principles are based on empirical studies made by the authors (masked_ref_2, 2015; masked_ref_1, 2013) that are summarised in the section 8.3, and other recommendations gathered from the user classification review (e.g., Turoff, 1997; Eason, 1976):

- ***Learnability***: Mechanisms of learning functionalities of the interface, by retention, or by repetition, are extremely limited because possible future interactions are not accounted. Instead of relying on the user to learn how to use the system, it is recommended to show the user how to achieve their goals (see *Goalability* below).
- ***Goalability***: refers to the importance of the achievement of user's goal/s, which is the ultimate reason that justifies why the OU is using the UI. Steering the user towards the achievement of their goal is a priority, minimising both the ambiguity and error probability.
- ***Elapsed Time*****:** the time user spends on using the interface to achieve their goal/s, or, in other case, to receive a helpful outcome from the system. Possible increments in time spent should be only allowed to facilitate the interaction, goal achievement or assistance.
- ***Guidance and Assistance*****:** where possible, efficient mechanisms of guidance through the interaction should be provided. This aspect is addressed to compensate the deficiency in the learnability mechanisms previously described.
- ***Recoverability and Error handling*****:** an effective help system in case of error or impossibility to achieve a goal should be provided. This aspect is related directly with user's feedback, and will have an influence on the notion the user takes from the interaction process.

These guidelines address the fact that the UID for the OU should not expect any prospective use nor require prior knowledge of the interface. OU's expertise requirement should be excluded among the preconditions of the development of interfaces for OU, who are typically unaware of the low level details of the system (e.g., software version, customisable *look and feel*). The potential benefit of designing for these users is that users with a wide range of expertise can potentially use the UI without decreasing effectiveness, efficiency and satisfaction (masked_ref_2, 2015; masked_ref_1, 2013). The OU inherent characteristics of memory and learning require an interaction designed with agile mechanisms that make UI use cognitively inexpensive.

8.3. Summary of the studies that support the proposed principles and recommendation

We present below two studies that showed the occasional use of different applications: a purchase application in the first study and a kitchen design application in the second. They include a comparative analysis between two different UIs, one UI developed by this manuscript's authors following the guidelines and principles for OUs described in the section above, and the other UI of a commercial version developed by a third party.

8.3.1 Study 1 Occasional use of two purchase applications on a portable device

The first study (masked_ref_2013) consisted of the development of a UI prototype with the aims of simplifying user decision making (*principle 1*: Learnability), guiding the user, and assisting with the use of the interface (*principle 4*: Guidance and Assistance). The UI was built with a recoverability mechanism with specific steps that allowed participants to amend their decisions (*principle 5*: Recoverability and Error handling). A binary decision-making path led to user's goal (*principle 2*: Goalability), being accomplished in reasonable amount of time for the task related (*principle 3*: Elapsed time). The prototype was tested on a digital transaction that users occasionally performed, measuring time and goal accomplishment (to test the verifiability of principles 2 and 3). The device chosen was a portable device (tablet) and the input channel was the touch. Target users were older users, with little or no experience of using touch devices and little or none with other technological devices such as computers.

The test consisted of doing a transaction using the developed interface compared to doing the same transaction using another UI with an equivalent functionality: to purchase an item using the same tablet device. Each user made two transactions, one on each of the different applications, with a counterbalanced design. This evaluation was carried out in Dundee (UK) at elderly users home and in Malaga (Spain), at a health centre and adult learning centre. In total, the number of participants tested equalled 11 older users (average age 71 years). The participants' interactions with the device were recorded with a video camera. All the operations, questions and answers during and after the interaction were also recorded. After both transactions, participants answered a qualitative questionnaire referring to their overall experience, particular issues and recommendations about both applications.

The results of the evaluation of the transnational older user testing using touch interface on tablet devices addressed the suitability of the interface for occasional digital transactions, such as buying a train ticket (UK) or purchasing a book (Spain). The application was inspired by the website equivalents (a railway website in UK, see Fig. 4.a, and an online bookshop store in Spain) and later built using the principles and guidelines recommended for the OU (see Fig. 4.b for the train ticket UI version).

Fig. 4 Screenshot of the interfaces for the train ticket transaction. (a) On the left, the web interface. (b) On the right, the equivalent UI built according to the recommendations given for designing for an OU.

The new UI version increased the number of steps a user had to accomplished (from 7 compulsory to 14 in the case of the train ticket purchase, see Fig. 5) when using the built UI when compared to its website equivalent. Despite this fact, the total transaction time was more than three times faster with the developed UI when compared to its website counterpart, using the same portable device for both transactions (an average of 10.1 minutes, SD = 0.68, compared with an average of 3 minutes, SD = 0.5, in the built interface for the book purchase). The questionnaire answers led to the conclusion that the developed interface was the one preferred when having to choose one of the two UIs to make the purchase. It seemed that in spite of the increase in the number of steps, the approach of the built UI regarding simplicity of the decision-making process had a positive direct influence on user satisfaction. Additionally, the way in which participants could amend their choices were learned and used intuitively. In conclusion, the features observed as most valuable for the participants were simplicity, clarity, guidance and error minimization presented in the UI. Simplicity: in the effortless of decision-making process exhibited in each step, with a minimum cognitive load attached. Clarity: in the display of only indispensable elements needed to accomplish the transaction, including large buttons, legible font and concise messages. Guidance: in the succinct instructions given by an agent in each step, placed in a wide and visible region inside the interaction area. Error minimization: by restricting the possible options a user has in each step, without affecting the effectiveness of the goal accomplishment and, therefore, their satisfaction. Thus, the study showed a consistent interface for users without technology experience, that lessen unpredicted changes during its use to maximize stability and productivity during the occasional use of the UI.

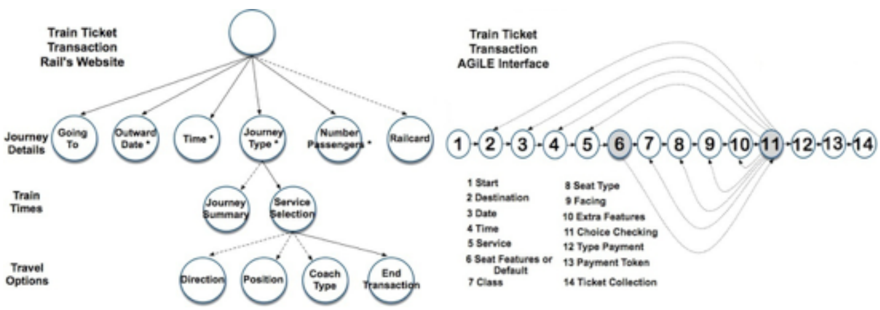

Fig. 5 (a) Task Tree representing the tasks in the rail website with 12 tasks. (b) Task tree of the same digital transaction in the built UI, with 14 tasks.

8.3.2 Study 2: Occasional use of two kitchen design applications

The second study (Carrillo & Falgueras, 2015) included two different interfaces for a desktop application (Fig. 6). Both interfaces offered the same functionality allowing participants to perform similar tasks: one UI with a direct manipulation (DM) interface (inspired by the IKEA Kitchen Planner (2014)), and the other with a guided interface (GI); the latter based on an design that took into account the principles and recommendations previously described for the OU in section 8.2. The aim of the GI was to guide participants comprehensibly (*principle 4*: Guidance and Assistance). Hierarchically organised objectives and sub-objectives were presented one by one (*principle 2*: Goalability). Participants had, in certain steps, the alternative to return to previous ones via a cancellation procedure (*principle 5*: Recoverability and Error handling). Participants were shown *what to do* and *how to do it* without requiring a previous knowledge to use the interface (*principle 1*: Learnability).

20 participants (18 categorised as occasional users and 2 as expert users) took part in the study. The participants labelled 'occasional' did not have sufficient knowledge of the interface nor were they certain of using the interface ever again. The participants labelled 'expert' were professionals in the task domain, working on a daily basis with similar software as the DM interface version used in this study although technically more complex. All participants had to perform a task related with designing a kitchen by performing three subtasks: designing, furnishing and modifying.

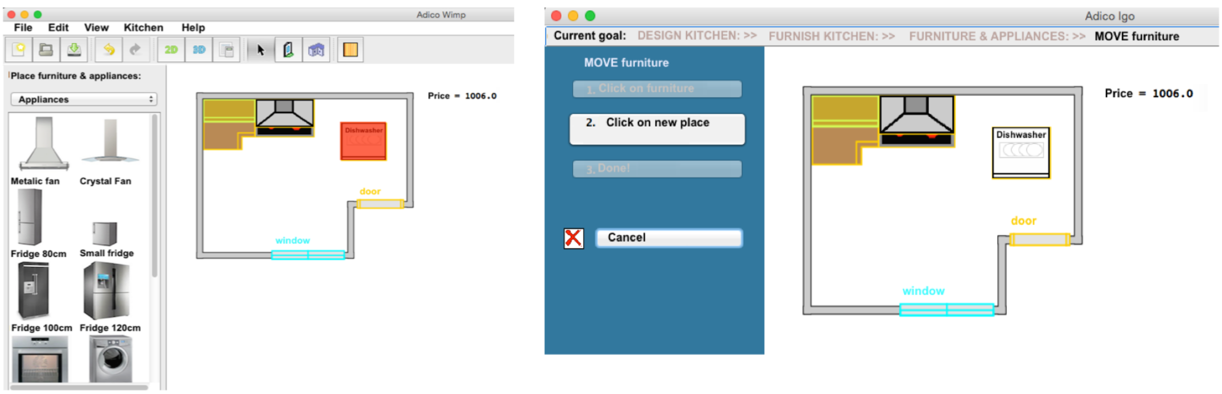

Fig. 6 Screenshots of the tested interfaces. On the left, the *DM interface*. On the right, the equivalent *Guided interface*.

A *within-subjects* study with a *counterbalanced* design was carried out, where each participant was asked to sequentially use both interfaces, alternating the order of use among participants to mitigate the potential transfer of learning effects between the two UIs. The whole process of interaction was recorded for further re-examination with a computer screen and voice recording software. The empirical data collected was *performance time* (T_1, T_2, T_3 and T_T) measured in seconds and number of *incidences*, categorised by their severity (*small*, *moderate* but non-blocking, and *severe* or blocking). The corresponding mean and standard deviation of the results are summarised in Table 3.

Table 3 Mean and standard deviation of the *performance time* (T_1, T_2, T_3 and T_T) and the *number of incidences*

	Times (in seconds)								# of Incidences					
	T_1		T_2		T_3		T_T		Slight		Moderate		Severe	
	DM	GI	DM	GI	DM	GI	DM	GI	DM	GI	DM	GI	DM	GI
Mean	**360**	**242**	**363**	**276**	**436**	**214**	**1160**	**732**	**0.55**	**0.05**	**1.55**	**0.15**	**0.6**	**0.05**
Standard Deviation	236	124	276	110	219	99	605	288	0.69	0.22	0.94	0.37	0.99	0.22

Participants filled out a *post-test questionnaire* with 6 usability questions (the same for both types of interfaces) after they finished the test with each UI. All Q_i questions, except Q_4, are presented with numerical scales ranging from 1 (the most negative) to 5 or 7 (the most positive), see Table 4. The average answer scores are shown in Fig. 7.

Table 4 The questions (Q_1-Q_6) of *the post-test questionnaire* and the scales used for the answers

Q_1	[1..7]	"Do you consider that the application has helped you in knowing *what to do* in each step?"
Q_2	[1..7]	"Do you consider that the application has helped you in knowing *how* to do it (what you needed to do)"
Q_3	[1..5]	"Would you have welcomed or needed any other system of *help*?"
Q_4	multiple choice	"What types of *periodicity* of use do you consider the application appropriate for? (Multiple choice: just once, occasionally, once a month, daily)"
Q_5	[1..5]	"Would you *use* a similar application for the design of your new kitchen?"
Q_6	[1..7]	"To sum up, grade how *easy to use* is the application"

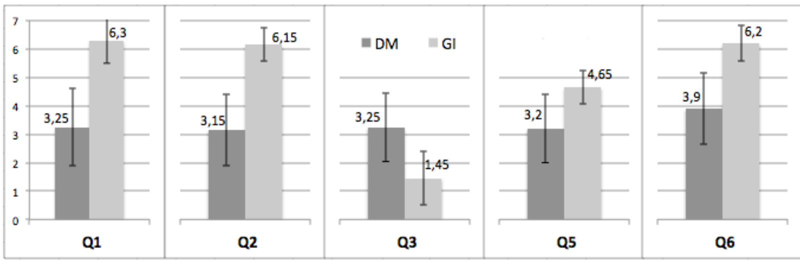

Fig. 7 Mean and standard deviation of the *post-test questionnaire* answers.

Finally, participants filled in a *comparative questionnaire* with eight questions (C_i) concerning their experience with both interfaces. Table 5 shows the wording of the questions and the corresponding user preferences (in percentages). It can be seen that participants, including the two kitchen design professionals who were used to complex DM interfaces, preferred the guided interface.

Table 5 Comparative questions (C_i) and percentage of answers.

C_1: "With which interface is it easier to know *what* to do in each step?"	100% GI	
C_2: "With which interface is it easier to know *how* to do it"	100% GI	
C_3: "Which interface should include *more help* systems?"		100% DM
C_4: "Which interface is *easier to use* and requires *less training*?"	100% GI	
C_5: "Which interface allows you to work *faster*?"	95% GI	5% DM
C_6: "Which interface would you recommend for an *occasional use by a computer professional*?"	90% GI	10% DM
C_7: "Which interface would you recommend for a *professional daily use*?"	75% GI	25% DM
C_8: "Which interface would you *choose* for furnishing your kitchen?"	100% GI	

To verify the significance of the results a non-parametric *Wilcoxon paired-sample test* (Wilcoxon, 1945) with *repeated-measures design* with two conditions (participants used both types of interfaces) was performed. The corresponding *one-tailed tests* for T_1, T_3 and T_T was significant ($p< .01$) in favour of GI, this is, participants spent longer time using DM than using GI. The difference in the number of incidence type was significant ($p < .05$) in favour of GI, as shown by the result of the *directional Wilcoxon tests* for *slight*, *moderate* and *severe incidences*. That is, there was a greater and significant number of incidences when using DM than when using GI. Only the result for T_2 (e.g., a task consisting of repetitive operations) revealed that there were not significant time differences between GI and DM (p=0.29; two-tailed).

Regarding the statistical analysis of the answers to the questionnaire (Q_i), the corresponding *directional tests* exhibited significant differences ($p < .01$) in the scores and rating in favour of the GI. The answers to Q_6 showed that a majority of participants considered that the DM interface was only appropriate for frequent use (but not for one-time or occasional use). More importantly, almost all users, experts included, considered that the GI was appropriate for occasional but also for frequent use.

9. Conclusions and Future Work

This paper has described one type of user that UI designers employ when designing systems, the *average user*. It has been questioned whether this type truly reflects the current wide spectrum of users and whether it is ultimately useful for the design of interactive systems with heterogeneous categories of end-users. Subsequently, a review of traditional classifications of users was done to explore the variables on which established categorisations were based to ascertain whether they covered the whole spectrum of current users. Because of the permanent change in the context where the technology is used and the constant evolution of user profiles, those commonly accepted classifications have been revisited with a target update to accommodate new trends and user profiles. This work has proposed then a revision of user classifications, newly characterising the *Occasional User*, a user category consistent with the new trends, technologies and interaction scenarios. The variables that define the OU, *knowledge of the interface* and *prospective use*, define a user category orthogonal with the established ones placed outside the traditional learning curve of *novice*, *intermediate* and *expert*. The main characteristics of the OU have been studied, presenting their implications for UID and providing principles and recommendations supported by empirical data for UI designers and HCI community.

The lessons learned from the OU are directly applicable to UIs where the use of the system depends on circumstances beyond the designer's control. For example, whether the decision made by a first-time customer concerning repeating the use of a Self-Service Checkout depends on the outcome of their encounter. In commerce scenarios such as this, where the success of a business depends on maximising the probability that the customer is going to return, the OU has the potential to become a regular user/customer. However, in case of an error, they may stop the process and complain about the experience. They may become a problematic customer if they are not attended correctly and their problems are not solved. Bottlenecks and problems caused by suboptimal interactions may change opinions about organisations. The OU is a type of user necessary to address these issues and apply user-centred design (UCD) approach that understands the interaction with technology as universal, accessible and transparent for the user, independently of the technological era that users are in.

The increasing number of mobile devices and expansion of new context of use (e.g., indoor, outdoor, public space) is multiplying the number of potential users who want or need to use the technology but do not have an extensive knowledge of computer/technology concepts and, in other cases, do not want to master those systems. Designing interfaces for this type of users is a challenge because traditional mechanisms of learning (e.g., user memory recall or implicit visual recognition) are not normally applicable under these circumstances. However, alternative and elaborated ways of guiding the user to accomplish their goal can be implemented (e.g., Martinez, Carrillo, Scott-Brown & Falgueras; Carrillo & Falgueras, 2015). An additional benefit of the OU perspective is that this type of interface can inclusively gather other types of users requirements. Those users, for instance, who feel comfortable with the idea of not having to remember how to operate the interface. Instead, relieving the user from having to memorise specific functionalities and understand foreign task domain concepts can be achieved through guidance along the interaction.

There is an intentional omission of the article 'the' in the title of this paper because the authors understand that the term 'occasional' is imprecise by definition and, therefore, difficult to successfully define and completely embrace its range of values. This paper has presented a reflective and contemporary characterisation of what an OU is, as a consequence of the observed need for inclusively informing UID for such category of users. However, the definition is open to include more concepts, and nuances of the inherently diffuse conceptual interpretation of the *occasional* term. To our knowledge, this is an attempt to characterise a user category that seems set to grow over time.

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