

# A posteriori segmentation of elderly internet users: Applying PLS-POS.

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## **1. Introduction**

One of the pillars of marketing strategy is the adequate segmentation of consumers, both offline and online. Within a market characterised by heterogeneity, creating groups of consumers with homogeneous behaviours is the basis for developing specific strategies for each of them. In most cases, segmentation starts from the choice of some segmentation variable, be it demographic, geographic, psychographic, or lifestyle. In those cases, given that the segmentation criterion has been previously chosen, these are a priori segmentation techniques. However, the development of software (Sarstedt & Cheah, 2019) has allowed a greater development of a posteriori segmentation techniques, also called Latent Classes, based on unobserved heterogeneity (Matthews, Sarstedt, Hair, & Ringle, 2016; Sarstedt et al., 2019). This type of segmentation has also been applied in SEM models, using tools such as FIMIX-PLS (Matthews et al., 2016) or POS-PLS (Becker, Rai, Ringle, & Völckner, 2013).

Unobserved heterogeneity occurs when there are significant differences in model relationships between groups of data and the sources of these differences cannot be traced back to any observable characteristics such as gender, age or income (Matthews et al., 2016). Recently, such techniques have been used in various contexts, such as online games (Ramírez-Correa, Rondán-Cataluña, & Arenas-Gaitán, 2018), Internet search engines (Palos-Sanchez, Martin-Velicia, & Saura, 2018) or in international strategic alliances (Ratzmann, Gudergan, & Bouncken, 2016).

In the case of older adults, there is the stereotype of the elderly far removed from online technologies and services (Mostaghel, 2016), it being understood that this market is

homogeneous. For this reason, in this work we tackle the analysis of the unobserved heterogeneity among the elderly when they adopt electronic services.

Besides, the choice of the "senior" population in this paper is due to the fact that the European population and western countries in general are suffering a marked aging process. This means an increase of the average age and a rise in the percentage of the elderly in the total population. Eurostat (2018) shows that "the EU-28's population is projected to continue to age. In the coming decades, the high number of 'baby boomers' will swell the number of elderly people". This trend has brought about a growing concern in different international organisms for the older population segment and an attempt to implement programs which favour this population's active aging (World Health Organization, 2015). The elderly's ICT use can be a facilitating instrument of active aging, enabling a greater level of social integration to be achieved. In this sense, Internet banking is one the Internet services most used by the elderly in Europe (Eurostat, 2019). Thus, for EU-28 countries in 2018, 44% of 55-64 year olds and 30% of 65-74 year olds have used Internet banking, although these percentages are lower than for other age ranges (i.e., 72% for 25-34 year olds; 66% for those 35-44; 56% for the users who are between 45 and 54 years old. Banks need to understand the new type of relation that the Internet can generate with the elderly and understand the heterogeneity in this population group regarding how they accept and use this service.

The generic aim of this work is to analyse how the process of adoption and use of IB differs according to different people. To address the general goal, we have created three operational objectives. The first is to try and establish a study framework of IB adoption and use. To do so, we base ourselves on the theoretical framework provided by the Unified Theory of Acceptation and Use of Technology (UTAUT) (Venkatesh et al., 2003). However, the application of structural equation models, such as PLS (Partial Least Squares), offers general results for the sample, concealing the particularities

which can appear in important segments. Therefore, as a second operational objective we tackle the heterogeneity of the behaviour of the population chosen. To do so, we seek latent groups, taking the UTAUT model as a basis. To achieve this, we apply a latent class segmentation tool based on structural models called PLS-POS (Partial Least Squares-Prediction-Oriented Segmentation). Finally, as a third operational objective, we will analyse the characteristics of the resulting segments. Thus, we will take the results provided by a multi-group analysis (MGA-PLS) of the segments obtained, as well as variance and chi-squared analyses regarding other variables relative to people's self-perception. This study will be conducted in the context of older adults, due to the circumstances surrounding that population group: population aging, concern for active aging, and less frequent use of IB than other population groups.

To achieve the aims proposed, the work is structured as follows. Firstly, we analyse the relevant literature concerning the acceptance of technology, focusing on the context of the elderly and related to IB. We also go deeply into the different segmentations carried out with respect to technology. As a result, we propose a research model. Secondly, we give indications about the methodology used in the empirical work. Thirdly, we put forward the main results obtained. We finish with the discussion of the results and point out the main conclusions.

## **2. Literature Review**

### ***2.1. The UTAUT model and Internet banking***

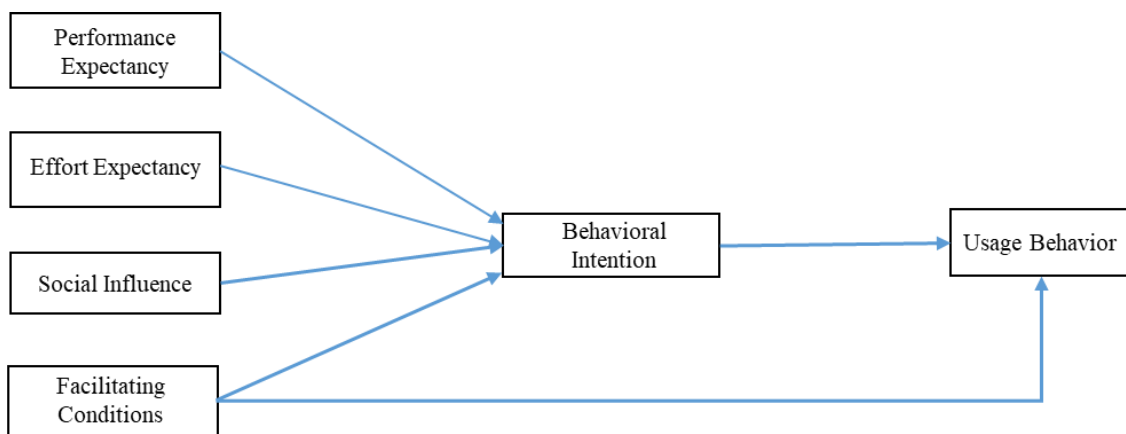
The UTAUT model (Venkatesh et al., 2003) integrates different models and previous theories which have been proposed to analyse the acceptance of the user of a technology, such as the Theory of Planned Behavior, the model of PC use, the Diffusion of Innovation Theory, the Technology Acceptance Model or Social Cognitive Theory. The determinants of the UTAUT model are: *Performance Expectancy* (PE), which is defined as the degree to which using a technology will offer consumers

benefits when performing certain activities; *Effort Expectancy* (EE), which measures the degree of ease associated with the use of the technology; *Social Influence* (SI), which is the extent to which consumers perceive that others- friends, family- believe that they should use a technology; the *Facilitating Conditions* (FC), which gather consumers' perceptions that resources and support are available to perform a behaviour; and the *Behaviour Intention* (BI) and the *Use* (USE). The UTAUT model (Figure 1) proposes that the PE, the EE and the SI affect the BI, while this and the FC determine the effective use of a new technology (Venkatesh et al., 2003).

The UTAUT's value lies in its identifying which are the main determinants of the adoption. It also enables the inclusion and consideration of the effect of different moderators that affect the influence of the model's key constructs. Moreover, the UTAUT model has been empirically tested and has been demonstrated as superior to other, alternative models (Venkatesh et al., 2003; Venkatesh & Zhang, 2010). Although Venkatesh et al. (2012) found that the majority of the studies with UTAUT only used a subset of the relations initially proposed in the model.

FIGURE 1

**UTAUT Model; Unified Theory of Acceptation and Use of Technology**



Applying the model to different countries, Al-Qeisi (2009) uses the UTAUT model with e-banking users in the United Kingdom and Jordan, discovering that multidimensional

concept website quality perceptions have the greatest effect on the use, followed by PE. SI had no impact on use and there is no gender moderator effect. However, education and income were moderators of the relationship only for the United Kingdom users' model. Yuen et al. (2010) add four variables to the UTAUT model: perceived credibility, self-efficacy, attitude and anxiety and tested it in three countries (the United States, Australia and Malaysia). The results show that attitude towards using IB is the most important factor followed by PE, whereas perceived credibility is relevant only in the developed countries. For e-banking users in the three countries analysed, FC, SI and self-efficacy have no significant influence on use. Im et al. (2011) compare results obtained in the United States and Korea. They conclude that the UTAUT model is adequate in both countries, although there are differences in the effect of EE on BI and this on use behaviour. FC do not show differences between countries and SI has not a significant effect on either of the two samples.

Applying the UTAUT model in non-Anglo-Saxon countries, Mbokoh (2016), in Ghana, includes the construct perceived credibility in his study. The relationships established by the UTAUT are significantly fulfilled, except for the influence of FC. Tarhini et al. (2016) add two constructs- perceived credibility and task-technology fit - to the model applied in the Lebanon. The results obtained indicate that although the relationships are fulfilled and explain a high percentage of behaviour intention variance (61%), PE being the strongest antecedent, the EE effect was insignificant. Regarding IB use, BI and FC explain 64% of its variance. Sánchez-Torres et al. (2018) analyse e-banking in Colombia, including two variables: consumer trust and government support. Trust, PE and EE have a positive impact on the use of financial websites, while government support is not significant.

Some works study mobile banking by applying the UTAUT. Bhatiasevi (2016) in Thailand, adding perceived credibility, perceived cost and perceived convenience. The

results show that all the proposed model variables have a positive effect on mobile banking use. There was not an influence of FC and financial costs. In Jordan, Alalwan et al. (2017) add trust, extending the UTAUT model. The results mainly show that BI is significantly and positively influenced by PE, EE, hedonic motivation, price value and trust. Syed et al. (2019), in Pakistan, show that all the variables have a significant positive effect on intention except SI.

The review of the literature allows us to observe the differences between the results obtained when applying the UTAUT model for IB acceptance and use. It is possible that these discrepancies are due to the fact that the results offered are obtained on total samples, accepting the homogeneity in individuals with respect to their behaviour of IB adoption. In spite of the UTAUT models' virtues, we have not found research whose aim is to identify segments of people regarding IB behaviour. This is why we review the literature below to understand the different segments identified in IB use.

## ***2.2. Segments in the use of Internet banking***

A research topic about IB is the analysis of customers, highlighting the study of the criteria used for their segmentation. . . In the last years, Patisotis et al. (2012), in Greece, analyse the adoption of IB via sociodemographic variables and perceptions of the service related with its use, developing different profiles of adopters and non-adopters. Yousafzai & Yani-de-Soriano (2012), in United Kingdom, find that technology readiness, age and gender moderate the beliefs-intention relationship. So, the relationship between usefulness and behaviour was stronger for younger males with high levels of optimism and innovativeness. However, the strongest relationship appears between ease of use and behaviour for older females with a high level of discomfort. Nerme et al. (2013) show different segments of e-banking users depending on the confidence and the perceived lack of information in Sweden. Age allows differentiating between three groups (18-25; 26-65; and above 66 years old). Rajaobelina

et al. (2013) classify online banking customers in Canada according to trust, satisfaction, and commitment, and they identify profiles according to age and sex. Fonseca (2014), applying latent class model finds that there are three segments of IB users in the EU 27, with Portugal, Greece, Cyprus and Spain in the cluster with the lowest use of e-banking. In Portugal, two e-banking user segments were identified as a function of risk. Chawla & Joshi (2017), in India, identify different profiles according to the demographic characteristics, the mobile banking services used, and the attitude and intentions towards mobile banking.. Age was found to significantly influence technology adoption and usage. Wang et al. (2017) study the impact of service personalisation on consumer reaction to e-banking services in China. Based on the UTAUT model, they examine the interaction effect of personalisation and technology compatibility on customer e-banking service usage. The results indicate that personalisation leads to increased PE and decreased EE, which affects the willingness to continue using e-banking services.

### ***2.3. Elderly, ICT and segments***

In spite of the stereotype of the elderly being cut off from technologies (Laukkanen et al., 2007), some authors (Sudbury & Simcock, 2009a; Hong et al., 2013) demonstrate that this group presents a high heterogeneity as to the use of technological innovations. Vuori and Holmlund-Rytkönen (2005) note two groups of elderly with respect to Internet use according to the life-cycle model. Reisenwitz and Iyer (2007) establish two age groups within the *baby-boomers*, finding that their cognitive age explained the differences in their behaviour. Niemelä-Nyrhinen (2007) points out the segment of the *baby boomers* as those elderly who most enjoy new experiences and for whom interacting with technology does not produce anxiety. Reisenwitz et al. (2007) observe that a greater tendency to nostalgia in some elderly explains less use of, access to and comfort with the Internet and a lower level of online shopping. Sudbury and Simcock

(2009b) identify the segment of the *positive pioneers* with those elderly who carry out more activities, have more social relations, are present in the Internet and for whom it especially matters what others think about them. Hong et al. (2013) consider the cognitive age as the factor which enables segmenting the elderly regarding the acceptance of information technologies.

Certain investigations segment the elderly as to ICT-based applications or services. Thus, Pesonen et al. (2015) propose three different segments of older tourists according to the online tourist services, called *adventurous experimenters*, *meticulous researchers* and *fumbling observers*. Peral-Peral et al. (2015) find different segments regarding social networks and IB called *e-elderly*, *e-users for convenience*, *hooked to the networks*, *fearful of technology* and *using the Internet with the family*. As to the adoption of cell-phone technology, Vicente and Lopes (2016) identify three sectors denominated *apathetic*, *social and hedonist*, and *occupied and active*, according to the attitudes, the use of the cell phone and the sociodemographic variables of older people. As regards online shopping, Villarejo-Ramos et al. (2016) note three segments of the elderly in line with their access to and use of the Internet and their sociodemographic characteristics, called *Internet-connected non-online shoppers*, *online shoppers* and *not connected to the Internet*.

To sum up, numerous studies point out the heterogeneity of the group of older people, detecting different segments according to their behaviour and acceptance of a technology.

Therefore, we propose, as a theoretical framework, to go deeply into the reality of the acceptance and use of IB services based on the UTAUT model, in the context of elderly finding different segments. Specifically, we propose three research questions in this study. These are related with the three operational objectives enunciated in the Introduction section.:



RQ1: How the UTAUT model can be used to analyse *the acceptance and use of Internet banking, among the elderly?*

RQ2: Are there different *segments concerning the process of acceptance and use of Internet banking, among the elderly?*

RQ3: Are there any characteristics that identify the individuals of the different segments?

### **3. Methodology**

#### **3.1. Sample**

The sample used in this work comes from students enrolled in a “Classroom Experience” of a university in the south of Spain. This Classroom’s aim is to give an opportunity to people over 50 years old who wish to access education and general culture. It has become a forum of rapprochement and socio-cultural activity which enables community development. The data were collected during the 2014-2015 course year via a survey done during class time. The questionnaire was previously reviewed by seven voluntary students to eliminate possible ambiguities.

A total of 474 questionnaires was obtained. These were refined, removing those not correctly filled out. There were then 415 valid questionnaires. The study of the sample’s sociodemographic variables indicated that 62.5% were women, the average age was 63.6 years old and 57% of the respondents were married. The main level of studies was secondary education (54.2%), followed by university education (36.1%). The social class was mainly middle class (80.2%) and 78.4% of the sample were retired. 57.1% indicated that they used Internet banking.

#### **3.2. Measurement Scales**

The scales of the UTAUT model’s constructs are adapted from Venkatesh et al. (2003). As well as the sociodemographic questions, we asked about their cognitive age, using Barak et al.’s (2011) scale. This is a scale expressed in decades, which gathers four dimensions where people indicate the age that they feel that they are, the age which they believe they appear to be, the age that the actions which they carry out reveals and the

age that their interests show. Finally, we used Meuter et al.'s (2003) scale to gather audacity or venturesomeness and self-confidence, both concepts measured via a 7-point Likert scale.

### **3.3. Statistical Tools**

We have used statistical techniques to attain the aims proposed. Firstly, we have employed PLS to analyse the reliability and validity of the measurement scales and value the structural model (Chin, 2010; Hair et al., 2012). Specifically, we have utilized the SmartPLS 3e software packet (Ringle et al. 2015). Secondly, we have used this same software packet to analyse the older adults' heterogeneity in their use of Internet banking. We have carried out a latent class segmentation with the PLS-POS tool. The basis of this latent class detection tool is a PLS structural model. This technique enables calculating simultaneously the parameters and segments of belonging of the observations (Becker et al., 2013). Thirdly, we have addressed the differences in the behaviours of each of the resulting segments. To do so, we have applied a Multigroup Analysis (MGA-PLS). Lastly, to better explain the characteristics of the segments extracted via PLS-POS, we have carried out a Variance Analysis (ANOVA) concerning the variables which gather the older adults' self-perceptions.

## **4. Results**

The analysis of a structural equations model - here PLS - has two steps: firstly, the analysis of the reliability and validity of the measurements is dealt with, and secondly the proposed structural model is valued.

To analyse the model's reliability and validity we have followed the recommendations which appear in the literature (Fornell & Larcker, 1981; Henseler et al., 2016). In the case of the reflective variables we ensure, firstly, the item's individual reliability. To do so, we examine the factorial loadings on their own latent variables. These loadings must be over the 0.7 proposed in the literature. Secondly, we analyse the reliability of the constructs using the Composite Reliability and Cronbach's alpha indicators. Our

indicators are over the 0.7 threshold in all the cases. We have also confirmed the convergent validity by analysing the Average Variance Extracted (AVE). All the indicators offer levels above the proposed 0.5. In the case of the formative variable (Use Behavior), we have analysed the weights and the collinearity levels via the Variance Inflation Factor (VIF). In all the cases we find low levels of collinearity - less than 5, which the literature offers as a cut-off point (Hair, Hult, Ringle and Sarstedt, 2016).

On the other hand, the discriminant validity is evaluated in two ways: using Fornell and Larcker's test, where the square root of each latent variable's AVE is compared with this variable's correlations with the rest; and via the Heterotrait-Monotrait ratio (HTMT). These, together, offered levels below 0.9 (Henseler et al., 2015; 2016). Also, there is one crossing of constructs (FC and EE) with values over 0.9, to ensure the discriminant validity and, therefore, that the value is different from the unit (Henseler et al., 2015); we have carried out a bootstrapping with 5000 subsamples. The value shown varies between 0.858 and 0.943. The results indicate that considering the confidence levels, the unit is not found in the interval. That is to say, for the FC and the EE their discriminant validity is also ensured. The results of both tests allow us to confirm the discriminant validity of the latent variables used.

To apply PLS-POS we have followed the guidelines proposed by Becker et al. (2013). PLS-POS, based on a number of groups defined by the researcher, analyses groups of individuals based on their behaviour towards the dependent variable. This analysis begins by applying the PLS analysis to a single segment; that is, to the entire sample (Global). In a second analysis (POS2), the sample is divided into two groups of individuals based on their behaviour towards the dependent variable (USE). In the third analysis (POS3), the whole process is carried out again, dividing the sample into three segments. In this way, we repeat the analysis up to seven segments (POS7). In higher numbers of segments, the results offered such small sizes of segments that it was not

possible to continue with the statistical calculations. The choice of the most appropriate number of segments will depend on the increments of the variance explained, and on the size of the resulting segments (Ramirez-Correa et al., 2018). The results of the variance explained for each of these analyses are shown in Table1

TABLE 1  
**Extracted Variance ( $R^2$ ) by segments and POS analysis**

|                           |     | Global | POS2 | POS3 | POS4       | POS5 | POS6 | POS7 |
|---------------------------|-----|--------|------|------|------------|------|------|------|
| Segment 1                 | BI  | .54    | .84  | .61  | .63        | .60  | .57  | .74  |
|                           | USE | .52    | .99  | .48  | .85        | .89  | .94  | .96  |
| Segment 2                 | BI  |        | .51  | .47  | .16        | .65  | .77  | .82  |
|                           | USE |        | .59  | .93  | .97        | .97  | .82  | .99  |
| Segment 3                 | BI  |        |      | .82  | .67        | .52  | .69  | .76  |
|                           | USE |        |      | .79  | .98        | .89  | .99  | .72  |
| Segment 4                 | BI  |        |      |      | .75        | .78  | .62  | .71  |
|                           | USE |        |      |      | .66        | .77  | .92  | .89  |
| Segment 5                 | BI  |        |      |      |            | .71  | .70  | .48  |
|                           | USE |        |      |      |            | .71  | .81  | .99  |
| Segment 6                 | BI  |        |      |      |            |      | .85  | .86  |
|                           | USE |        |      |      |            |      | .96  | .99  |
| Segment 7                 | BI  |        |      |      |            |      |      | .52  |
|                           | USE |        |      |      |            |      |      | .98  |
| <b>R<sup>2</sup> Mean</b> |     | .53    | .58  | .65  | <b>.72</b> | .74  | .79  | .78  |

In this case, we have obtained four segments of older adult users of IB. Although the average variance explained increased with a greater number of segments, the resulting segments were too small to be considered significant. Specifically, our results offer four segments of similar size. Segment 1 has 100 individuals (24.1% of the sample), Segment 2 includes 112 individuals (27.1% of the sample), Segment 3 is the largest with 117 individuals (28.2% of the sample), and Segment 4 is the smallest with 86 individuals, representing 20.7% of the sample.

After analysing the reliability and validity of the measurement model and carrying out the PLS-POS analysis, we have addressed the valuation of the structural model. To do so, we analyse the values of the coefficient paths and the variance explained of the endogenous variables ( $R^2$ ). The coefficient paths indicate the intensity of the relation

between the dependent and independent variables. We have used a resampling technique called bootstrapping to calculate the reliability of the coefficient paths in the hypothesized relations. We have also calculated the SRMR indicator for the complete sample. SRMR is a measure of the model's global fit, especially appropriate for PLS. In our case, we obtained a value of 0.034, which ensures the model's fit as it offers levels below the proposed 0.08 (Henseler et al., 2015). Later, we carried out a Multigroup Analysis (MGA-PLS) to compare the differences in the model between the four resulting segments of the PLS-POS analysis.

Table 2 provides the results of the PLS analysis. The path values of each of the relationships collected in the UTAUT model appear, both for the global sample and for each of the subsamples. The results that offer significant relationships between the variables are shown in bold.

TABLE 2  
Path Coefficients

|           | Global     |            | Segment 1  |            | Segment 2  |            | Segment 3  |            | Segment 4  |            |
|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
|           | Path       | p-Va       | Path       | p-Va       | Path       | p-Va       | Path       | p-Va       | Path       | p-Va       |
| BI -> USE | <b>.64</b> | <b>.00</b> | <b>.92</b> | <b>.00</b> | <b>.74</b> | <b>.00</b> | -.13       | .21        | <b>.90</b> | <b>.00</b> |
| EE -> BI  | <b>.29</b> | <b>.00</b> | .21        | .06        | -.12       | .40        | <b>.47</b> | <b>.00</b> | <b>.64</b> | <b>.00</b> |
| FC -> BI  | .05        | .39        | -.17       | .06        | .06        | .50        | <b>.38</b> | <b>.00</b> | .06        | .60        |
| FC -> USE | <b>.12</b> | <b>.00</b> | -.03       | .45        | -.04       | .62        | <b>.88</b> | <b>.00</b> | -.02       | .67        |
| PE -> BI  | <b>.39</b> | <b>.00</b> | <b>.78</b> | <b>.00</b> | <b>.73</b> | <b>.00</b> | -.06       | .44        | .01        | .88        |
| SI -> BI  | <b>.08</b> | <b>.03</b> | .03        | .56        | .06        | .43        | .00        | .89        | <b>.18</b> | <b>.00</b> |

From Table 2 we can obtain a first image that exists between the different segments. To ensure that this is true, we have developed a Multigroup Analysis (PLS-MGA) where the results of each segment are compared with each of them. To carry out this analysis, we have performed a non-parametric test (Table 3). Parametric analysis was also applied to confirm these differences. The results are very similar and confirm that there are important differences between the segments.

TABLE 3\*  
Multigroup Analysis. PLS-MGA Non-parametric test

|  | Diff (S1 - S2) |        | Diff (S1 - S3) |        | Diff (S1 - S4) |        | Diff (S2 - S3) |        | Diff (S2 - S4) |        | Diff (S3 - S4) |        |
|--|----------------|--------|----------------|--------|----------------|--------|----------------|--------|----------------|--------|----------------|--------|
|  | Path           | p-Val. | Path           | p-Val. | Path           | p-Val. | Path           | p-Val. | Path           | p-Val. | Path           | p-Val. |
|  |                |        |                |        |                |        |                |        |                |        |                |        |

|           |            |            |             |             |            |            |            |             |            |             |             |             |
|-----------|------------|------------|-------------|-------------|------------|------------|------------|-------------|------------|-------------|-------------|-------------|
| BI -> USE | <b>.17</b> | <b>.00</b> | <b>1.05</b> | <b>.00</b>  | .01        | .35        | <b>.87</b> | <b>.00</b>  | <b>.15</b> | <b>.98</b>  | <b>1.03</b> | <b>1.00</b> |
| EE -> BI  | <b>.33</b> | <b>.03</b> | .26         | .91         | <b>.43</b> | <b>.98</b> | <b>.59</b> | <b>.99</b>  | <b>.76</b> | <b>1.00</b> | .16         | .79         |
| FC -> BI  | <b>.24</b> | <b>.96</b> | <b>.56</b>  | <b>1.00</b> | .24        | .94        | <b>.31</b> | <b>.97</b>  | .00        | .49         | <b>.31</b>  | <b>.04</b>  |
| FC -> USE | .01        | .45        | <b>.91</b>  | <b>1.00</b> | .00        | .53        | <b>.92</b> | <b>1.00</b> | .01        | .55         | <b>.91</b>  | <b>.00</b>  |
| PE -> BI  | .05        | .31        | <b>.85</b>  | <b>.00</b>  | <b>.77</b> | <b>.00</b> | <b>.80</b> | <b>.00</b>  | <b>.71</b> | <b>.00</b>  | .08         | .73         |
| SI -> BI  | .02        | .59        | .03         | .37         | .14        | .94        | .05        | .29         | .12        | .87         | <b>.17</b>  | <b>.97</b>  |

\* The differences which result statistically significant are indicated in bold.  $p < .05$  signifies that the value of the first group analysed is significantly greater than that of the second group.  $p > .950$  signifies that the value of the second group analysed is significantly greater than that of the first group.

Finally, to characterize the four resulting segments we have analysed the elderly's self-perceptions concerning technology and in relation to their real and cognitive age. We took as latent variables the factors extracted from these constructs via a factorial analysis. Later, to seek differences between the segments with respect to these new variables, we carried out an analysis of the variance (ANOVA). We found differences between the segments for the variables: Venturesomeness, Intention of use, and Self-confidence. No segment differences were found for either Cognitive Age or Real Age. However, significant differences do appear when we use the difference between both ages as a variable. The results were confirmed with non-parametric tests. A chi-squared test was done looking for an association between the segments and the sex of the respondents, their social class, being retired, and their level of studies. In all these cases the results were not significant.

A summary of the results can be found in Table 4.

TABLE 4  
Summary of significant results of each segment

| Segment | Size (%) | Dif (Cognitive-Real Age) | Self Confidence | Venturesome-ness | Intention of use of Internet banking | BI -> USE | EE -> BI | FC -> BI | FC -> USE | PE -> BI | SI -> BI |
|---------|----------|--------------------------|-----------------|------------------|--------------------------------------|-----------|----------|----------|-----------|----------|----------|
| S1      | 24.1     | Medium                   | Medium          | Medium           | Medium                               | .92       |          |          |           | .78      |          |

|    |      |        |        |      |        |     |     |     |     |     |     |
|----|------|--------|--------|------|--------|-----|-----|-----|-----|-----|-----|
| S2 | 27   | High   | High   | High | Low    | .74 |     |     |     | .73 |     |
| S3 | 28.2 | Medium | Medium | High | High   |     | .47 | .38 | .88 |     |     |
| S4 | 20.7 | Low    | Low    | Low  | Medium | .90 | .64 |     |     |     | .18 |

## 5. Discussion

The first operational objective (enunciated as RQ1) of this paper was to analyse the process of adoption and use of IB and the results show that UTAUT model is appropriate for the sample. All the relations of Venkatesh et al.'s (2003) classic model are fulfilled, except the relation between facilitating conditions and behaviour intention. Venkatesh et al. (2003) show that the support infrastructure is a key concept within the facilitating conditions and its effects can be captured by the effort expectancy. Therefore, if the EE is not presented in the model, it should be expected that the FC will be predictive of the BI, however if the EE is present, like in our study, the FC becomes non-significant for the BI.

However, UTAUT model does not permit detecting the particularities which can appear in different segments. Therefore, the second operational aim (enunciated as RQ2) was a search for latent groups, taking as a basis the model provided by the UTAUT and using latent class' tools, in this case PLS-POS. In this sense, we have found four significant market segments of similar sizes. It is important to point out the important improvement of the variance explained when considering the segments obtained. That is to say, in Table 2, when calculating the model with the complete sample (Global), the explained variance of the USE –the main dependent variable - is 0.524. When we calculate for each segment, the explained variance of the USE rises significantly (Seg1:0.850; Seg2: 0.978; Seg3: 0.981; Seg4: 0.662). In mean terms of USE and BI, the variance explained goes from 0.532 to 0.723. On the other hand, the MGA-PLS analysis indicates differentiated behaviours between these distinct segments.

Having obtained the segments, the third operational objective (enunciated as RQ3) means to characterize the resulting groups via the sociodemographic characteristics and other variables related to the people's self-perceptions. The results reflect that the sociodemographic variables used are not useful to differentiate between the behaviours of the segments. Notwithstanding, the variables with a greater psychological profile do explain the differences between the segments. In elderly context and about ICT adoption, Kim (2013) proposes that a lack of help or support, feelings of frustration and anxiety, a lack of compatibility with their lifestyle, a lack of perceived benefits, the difficulty of learning, a lack of experience or negative previous experiences, all powerfully influence the decisions of the elderly about adopting a technology. Nikou (2015), in his analysis of the adoption of health and well-being applications in cell phones, points out that physical and functional challenges are not enough to explain the adoption of this technology and suggests that other factors, such as those that are sociological and psychological, explicate the dynamic of the elderly in the acceptance of mobile technology.

Next, we present the four segments obtained, the differences in their behaviours with respect to IB and their characteristics.

*Segment 1. If it's useful for me, I'll try to use it.* The performance expectancies act as an antecedent to the behaviour intention, which powerfully influences use. These people have a higher behaviour intention than the average. The difference between ages is the smallest among the four groups. It turns out to be a group with low self-confidence but with a higher venturesomeness than the average.

*Segment 2. If it's useful for me, I'll try to use it because I'm capable of doing so.* The same as in segment 1, the main antecedent of use is the behaviour intention and the performance expectancies come from this. It is the group which has the most self-confidence, and reflects the degree to which the future users believe that they are



sufficiently capable of successfully using a specific technology (Dabholkar & Bagozzi, 2002; Walker & Johnson, 2006). This is one on the main internal determinants of the intention to use it. The people of this segment are also venturesome. Also, this class present the greatest difference between the chronological age and the cognitive age, probably because they feel “*young at heart*”, as Hong et al. (2013) denominate one of their segments. Perceived utility or performance expectancies play an important role in the adoption of the technology. This segment presents a statistically significant different behaviour (Table 4) with respect to the relation between behaviour intention and use and the relation between effort expectancy and behaviour intention. However, it is the segment with the least behaviour intention.

*Segment 3. If it's easy and I've all the means, I'll try to use it.* The effort expectancies and the facilitating conditions act as antecedents of the intention of using IB. Nevertheless, for this segment there is not a relation between the intention and the use of IB. The facilitating conditions are key, in a differentiated manner, and more intensely than in the other segments. The difference between the real age and the cognitive age is higher than the average. This is the most venturesome segment. The results of Sudbury and Simcock (2009b) indicate that an audacious character enables differentiating among the elderly. Thus, the segment that they call “*positive pioneers*” presents high levels of audacity: these people like to try new things, they like to be the first to do them and share this information. This group is, as well, that which has the greatest behaviour intention. Likewise, this segment presents significant differences with respect to the other three segments (Table 4) in the relations between behaviour intention and use, taking a negative and non-significant path value. Also, these people have the greatest values for the path coefficients in the relations between facilitating conditions and behaviour intention and use.

*Segment 4. I'll try to use it because it seems easy and everyone tells me to try it.* The antecedents of behaviour intention are the effort expectancies and, secondly, social influences. The relation between behaviour intention and use is the strongest among the four segments. This group is characterised by lower levels of self-confidence and venturesomeness. The difference between the chronological age and the cognitive age is the least. The same as in our case, Hong et al. (2013) find that for those elderly whose real age and cognitive age are similar, only the ease of use and subjective norms are determinants in the adoption of technology.

## **6. Conclusion and limitations**

This research focuses on analysing the heterogeneity that exists in the IB acceptance behaviour among the different user segments, proposing a methodology that enables providing different solutions to the needs and circumstances found in the latent classes, depending on their psychological characteristics. The contribution and value of this work lies in the fact that this segmentation has been carried out in the population of the elderly. The digital inclusion of the elderly is an important issue in the modern society, due to the ageing of the population in the most developed countries and the importance that the acceptance of ICT has in solving the digital divide.

### **6.1. Theoretical Contributions**

From the academic point of view, this paper offers contributions to the prior literature demonstrating that technology adoption model effects differ according to the segments of IB users. Although there is an extensive literature on the use of IB, we have nevertheless found a clear lack of researches that based in widely accepted model as UTAUT, analyse the heterogeneity of users' behaviours. Besides, and being markedly methodological, we underscore the segmentation carried out. Most segmentation-based

works use *a priori* techniques, however we have used segmentation *a posteriori* techniques. Starting out from the structural model, a specific number of segments is reached which behave in a differentiated manner, without presupposing variables that explain these segments or their behaviours (Becker et al., 2013). Finally, we have defined the segments in function of a set of psychological characteristics that manage to explain the heterogeneous behaviour of the segment found better than the sociodemographic characteristics.

On the other hand, we consider that the context in which we have carried out the work is a remarkable challenge because there are not many works that exclusively deal with the elderly's acceptance and use of technologies, and even less so if we refer to IB services or that use with the UTAUT model. Also, there is a socially shared stereotype which sees the elderly as inexpert and cut off from technology. However, we believe that this is an unfair view that conceals a broad diversity of behaviours as has been proved for the different segments found, and which invalidates the single view of the elderly regarding technologies.

In our case, we obtain four different groups of the elderly, with differentiated use and acceptance behaviours regarding IB, according to the UTAUT model, and discover the main drivers of its use. The classes are characterised by other elements which are not included in the original model and that enable a better profiling of the characteristics of the differentiated groups.

## **6.2. Practical Contributions**

Regarding older adults, we suggest the following. Thus, it should be analysed which are the barriers that they consider affect the use of IB - this often has to do with a general rejection of the Internet. Likewise, the benefit of IB for the elderly must be emphasised, such as not having to go to bank offices and put up with lines. An important aspect to suggest is a simplification of the web pages, making them friendlier. Their design must

be more clear, visible and surfable, all of which makes it easy for the elderly to use them. Another suggestion would be to segment the market of the elderly, which would permit financial institutions to focus on each group's needs and preferences. In this sense, and as a result of this empirical investigation, we discover different determinants. Thus, to encourage the use of IB for the first segment- *If it's useful for me, I'll try to use it* , it is necessary to clearly communicate the advantages that are obtained with its use. This can be done is via advertising campaigns of information aimed specifically at older adults. For the second segment- *If it's useful for me, I'll try to use it because I'm capable of doing so*- the most important matter is to transmit to them that its use is easy and that they are capable of using it, for instance beginning with carrying out simple banking operations, such as checking balances. This contributes to increasing their self-confidence. With respect to the third segment- *If it's easy and I've all the means, I'll try to use it*- it should be emphasised that the use of IB is not different from other applications which they use and that they can count on all the help that they need, for example via online formation, FAQ and through the office staff. Finally, for the fourth segment- *I'll try to use it because it seems easy and everyone tells me to try it*-, the support of their family and friends is fundamental. In this sense, advertising campaigns which foster the autonomy of the elderly, with the help of their family members, could offer a stimulating image for this segment.

Finally, from the social point of view, this paper contributes to understanding the technological adoption processes for the elderly, in IB in particular. This is an interesting contribution in an increasingly ageing society, in which achieving the e-inclusion of the elderly and their active ageing are priority goals to be achieved.

### **6.3. Limitations**

Our work has some limitations. The sample used comes from the "Classroom Experience" of a public university, which can be understood as an action in the heart of

active aging. The choice of this population of university elderly can be justified by its use in previous works related to ICT use (Martínez et al., 2011). Although the sample can be biased by this, we find differences in the behaviour of the elderly regarding IB. To broaden the sample to other contexts would possibly discover elderly who are more cut off from ICT and, specifically, from IB. Even so, we believe that the heterogeneity which the use of a more diverse sample of the elderly would reveal (rural environments, lower levels of education, less concern for ICT in general, and so forth) would probably be greater.

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