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Personal Learning Environments Acceptance Model: The Role of Need for Cognition, e-Learning Satisfaction and Students' Perceptions

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ABSTRACT

As long as students use Web 2.0 tools extensively for social purposes, there is an opportunity to improve students' engagement in Higher Education by using these tools for academic purposes under a Personal Learning Environment approach (PLE 2.0). The success of these attempts depends upon the reactions and acceptance of users towards e-learning using Web 2.0. This paper aims to analyse the factors (e-learning satisfaction and students' perceptions, among others) that determine the intention of use of a PLE 2.0 initiative. The study in addition analyses the moderating role of the Need for Cognition (NFC) in the model. The results indicate that the model proposed has a high explanatory power of the intention to use a PLE 2.0 and gives support to the moderating role of NFC. The study discusses how this analysis can help to improve course designs by teachers.

Keywords

Learning experience, Personal learning environment, Learning satisfaction, Need for cognition, Open education

Introduction

Information and Communication Technologies (ICTs), particularly Internet and mobile technologies, have been widely adopted by young generations for social purposes in Western countries, for instance, the USA (Pew Research Center, 2010) and Spain (AIMC, 2013). The so-called Web 2.0 or Social Web services play a paramount role in this adoption since they have surpassed the technical and economic barriers to create, share and distribute digital contents through a broad variety of devices (from smartphones to tablets and video-consoles).

The educational sector has reacted to these socio-technical changes by experimenting in the application of ICTs in education (Lee, 2010), resulting in an increased adoption of e-Learning platforms and, less frequently, Web 2.0 services. These services are claimed to be effective in connecting people and resources, facilitating interaction, fostering collaboration and active participation and aiding opportunities for critical thinking, among others (Romero-Frías & Arquero, 2013; Ajjan & Hartshorne, 2008; Mason, 2006; Selwyn, 2007). The open and distributed nature of most of these services expedites environments for informal and emergent learning. Nevertheless, the complex scenario created requires the teachers' creativity and flexibility to incorporate these novelties into formal settings.

Platforms specifically designed for e-Learning, such as Moodle or Blackboard, are more focused on institutional course design or instructor needs; whereas Personal Learning Environment (PLE) is an approach to integrate a consciously different sort of practices and resources (i.e., commonly used Web 2.0 services) to solve personal learning needs. It represents a more flexible approach focused on students' needs (Attwell, 2007). From this idea, an educational experiment was designed to help students to develop their PLEs by using a set of tools and services that cover basic functions in their learning process. However, in order to evaluate the potential success of any educational design based on novel technologies, it is necessary to understand the users' attitudes and their level of acceptance of this kind of technology for learning (Teo, 2010).

The Technology Acceptance Model (TAM, Davis, Bagozzi & Warshaw, 1989) has been widely used in education to evaluate Learning Management Systems (LMS) - technological systems that are generally based on closed environments specifically designed for learning. However, our PLE approach established on general use 2.0 tools represents a significant difference since it is designed to help students to develop autonomous and sustainable learning resources based on open interactions and personal needs. To our knowledge, there is no analysis about technology acceptance in this sort of open environments.

Therefore, this study aims to develop an extended TAM model for a PLE experience, integrating variables that could improve the predictive power of the model in this kind of experiences -learning satisfaction (Del Barrio, Romero-Frías & Arquero, 2013) and the perceived impact of the experience on key dimensions of the students' learning process- and take intrinsic human factors into account (Sanchez-Franco, 2010), such as the students' need for cognition (NFC; Cacioppo & Petty, 1982). We refer to this theoretical model design to open digital environments as Learning 2.0 system acceptance. By doing so, we intend to understand the factors that determine PLE acceptance in order to improve the design of this sort of proposals.

Theoretical background

According to the previous introduction, our theoretical background is focused on: (1) Personal Learning Environments and the Web 2.0 technologies, (2) the TAM model in education and (3) our extension of the model.

Educational literature: Personal learning environments and the Web 2.0 technologies

The pedagogical approach adopted in this educational experience is based on social constructivism (Brown & Adler, 2008; Sturm et al., 2009) and operationalised through Personal learning environments (PLE) (Attwell, 2007; Häkkinen & Hämäläinen, 2012; Rajagopal et al., 2012; Tu et al., 2012; Wilson et al., 2009). PLE represents a more flexible approach to use digital technology in education because it focuses on the students' personal needs instead of institutional course designs or instructor needs, as generally occurs in Learning Management Systems (LMS), such as Moodle or Blackboard.

PLE is not established on a specific platform but on a set of functions that can be achieved through different tools according to user preferences. The development of a PLE using Web 2.0 is an extension of the social use that a majority of students already apply. Using these tools for learning allows students to experience the real world online and develop a set of services and competences that could be useful for personal and professional purposes and, remarkably, for lifelong learning (Romero-Frías & Arquero, 2013). Many studies have reported a positive impact of using 2.0 services in education (i.e., Richardson, 2009; Solomon & Schrum, 2007; Redecker et al., 2010), for example, in developing essential skills such as selecting relevant information, critically interpreting and analysing the socio-cultural context, working collaboratively and sharing knowledge.

This evidence indicates that an appropriate combination of 2.0 technologies and educational designs can provide a positive impact in developing key competences in education. However, which variables determine the acceptance of technology is still a question that has not been addressed in open and social contexts, such as those afforded by Web 2.0 services in a PLE approach. The next section refers to this question.

Technology acceptance model and education

Numerous studies have analysed the use and acceptance of technology in education since the publication in 1989 of the seminal work by Davis, Bagozzi and Warshaw, who proposed a Technology Acceptance Model where the variables Perceived Usefulness (PU) and Perceived Ease of Use (PEU) were used to predict ICTs acceptance.

PU captures the extent to which a potential adopter views the target technology as offering better value over alternative methods of carrying out the same task (Liu et al., 2009). PEU refers to the degree to which a potential adopter conceives the usage of the target technology to be relatively free of effort (Davis, Bagozzi & Warshaw, 1989).

As Park (2009) indicates, knowing the factors that influence students' intentions and beliefs about e-learning could help academic managers to design better scenarios that favour the adoption of this type of learning approach (Grandon, Alshare & Kwan, 2005). In a context of massive open e-learning proposals (i.e., MOOCs), even policymakers could benefit from this research in order to avoid one-size-fits-all policies. The application of the TAM

in education has been shown to have good predictive validity (Sanchez-Franco, 2010) and there is a consistent body of research applying TAM, particularly to learning management systems (i.e., Martins & Kellermanns, 2004; Pituch & Lee, 2006; Liu, Liao & Pratt, 2009; Arteaga & Duarte, 2010; Sanchez-Franco 2010). There is no research, as far as we know, based on open general-use Web 2.0 tools integrated within the concept of PLE, although this approach is very extended in formal and informal learning.

Some papers using TAM in educational settings included additional variables to increase their predictive power: functionality, interactivity and response (Pituch and Lee, 2006); technical support (Ngai, Poon & Chang, 2007; Arteaga & Duarte, 2010); computer self-efficacy (Arteaga & Duarte, 2010); media richness (Liu, Liao & Pratt, 2009); flow (Liu, Liao & Pratt, 2009; Sanchez-Franco, 2010). Also, Lee at al. (2003) combined a TAM with Social Network Analysis to show that the students' initial expectation affected the perceptions of and use of the system, but also that one student's attitude change was influenced by other students' changes.

Proposed extended TAM

Given the high satisfaction attained by users using Web 2.0 for social purposes, user satisfaction within a learning 2.0 context could help improving the TAM. Satisfaction is a key variable in explaining the usage of ICT (Doll & Torkzadeh, 1988; Hayashi, et al., 2004; Lin, Wu & Tsai, 2005), considered as a mediator in the processing of online information (Casaló, Flavián, & Guinalíu, 2008; Castañeda, Rodríguez & Luque, 2009).

In education the *learning satisfaction* concept can be defined as a student's overall positive assessment of his or her learning experience (Keller, 1983). PU and PEU are found to be antecedents of learning satisfaction (Hui et al., 2008; Martin-Michiellot & Mendelsohn, 2000; Sun et al., 2008) and there is also a significant relationship between learning satisfaction and the intention to use e-Learning (Roca, Chiub & Martínez, 2006; Liaw & Huang, 2011). All these studies, supported by the recent study by Del Barrio, Romero-Frías and Arquero (2013) suggest that the use of learning satisfaction (eSAT) as a mediator in the TAM is more predictive than as an external variable.

Furthermore, *Students' perceptions* about the *attributes* and *quality* of the course could be considered to have an impact on the PU of the whole system (Lee, 2006). Martins and Kellermanns (2004) suggest that when students perceive that using the system will have implications for their performance in a class, they will be likely to perceive the system as being useful. They will then show greater acceptance. It can thus be hypothesised that the *awareness of the capabilities* of the e-learning tool will be positively related to the students' PU. Liaw, Huang and Chen (2007) highlighted the role of students' perceptions on key aspects of the e-learning environment, such as effectiveness (defined as the impact on skills development) or active learning, on the attitudes towards its use. Similarly, the results by Selim (2007) point out that the improvements in collaborative and active aspects of e-learning are critical factors for success. Arquero and Romero-Frías (2013) reported a perceived positive impact of using Web 2.0 tools for educational purposes on content learning, skills development, and collaborative and active aspects of the process.

The literature on Psychology and Consumer Behaviour has revealed the convenience of considering intrinsic factors in explaining human reactions to any system. In this case, the Need for Cognition (NFC) is particularly relevant as a moderating variable, as the PLE approach depends on personal needs. NFC, as a concept, was introduced in 1955 by Cohen, Scotland and Wolfe, and describes the need to structure relevant situations in meaningful and integrated ways. Cacioppo and Petty (1982) used NFC in an investigation of differences among individuals in their tendency to engage in and enjoy thinking.

NFC has been extensively studied in a variety of social contexts (Cacioppo et al., 1996). On the one hand, High NFC individuals (*cognisers*) are characterised by their tendency to seek, acquire, think about, and reflect back on information to make sense of stimuli and events. These processes lead to the generating of a more stable cognitive change. On the other hand, low NFC individuals (cognitive misers) are more likely to rely on others, secondary stimuli or social comparison processes to make sense of information (Cacioppo et al., 1996, Evans, Kirby & Fabrigar, 2003). This leads to a more temporary, unstable or unpredictable cognitive change. Zhang and Buda (1999) pointed out that, in some way, cognitive efforts by students depend on their NFC.

Given that educational researchers are interested in how students learn and process information (Evans, Kirby & Fabrigar, 2003), some studies have used NFC in relation to learning systems (Evans, Kirby & Fabrigar, 2003; Chen

& Wu, 2012; Turner & Croucher, 2013; Kai-Wen, 2011). However, to our knowledge, no previous research has analysed the moderating role of NFC in the acceptance of Personal Learning Environments based on Web 2.0 services. Given that these services provide, on the one hand, autonomy to look for new information and, on the other hand, a social environment to interact and communicate with others, we consider that NFC is a relevant variable to understand how the technology acceptance works in this context.

According to the classical literature about TAM and the aforementioned additional variables, we propose a PLE 2.0 Acceptance Model (PLE 2.0 AM) (Figure 1) that integrates:

- eSAT as a mediating variable between perceived usability (PU & PEU) and Attitude Towards Use (ATU) and Behavioural Intention to Use of the learning 2.0 system (BIU),
- perceptions of students as external variables, and
- NFC as a moderating variable of the whole extended model proposed.

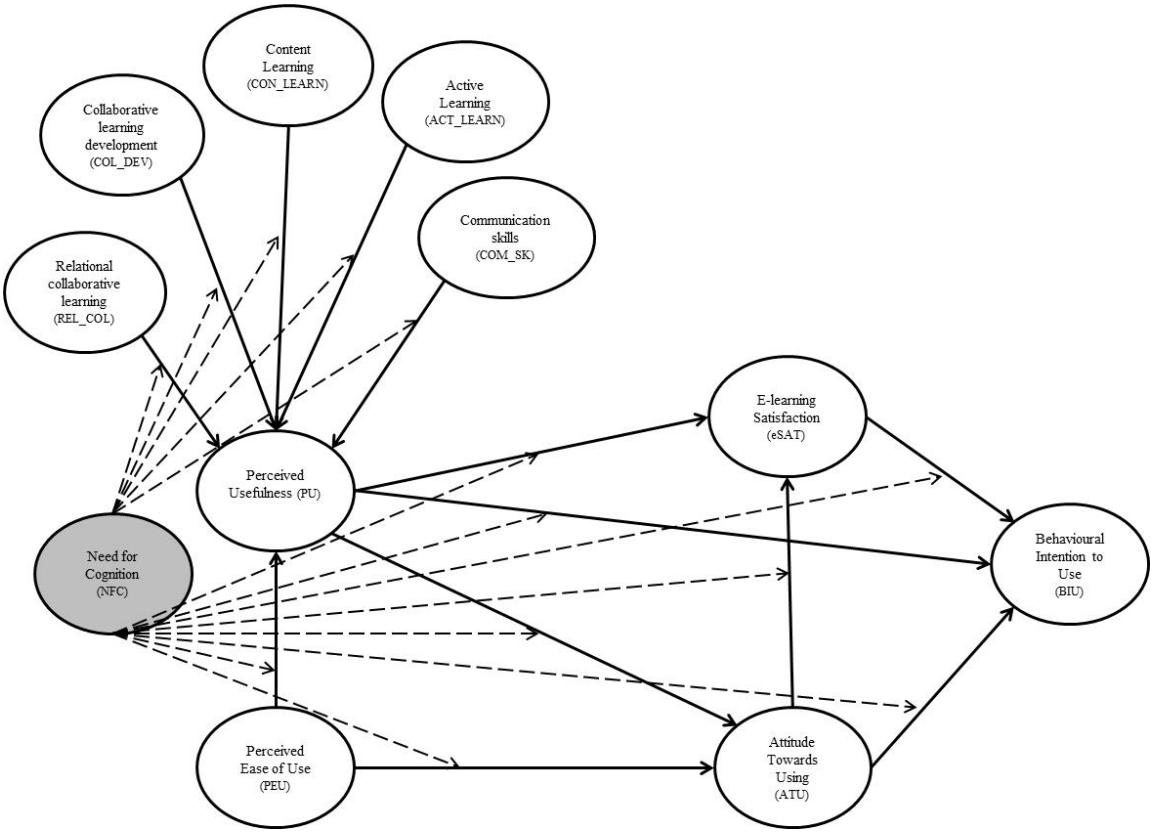

Figure 1. PLE 2.0 acceptance model proposed

Methodology

Educational experience

As previously mentioned the educational design is based on the idea of the *personal learning environment* (PLE 2.0), whose aim is to help students to develop academic and professional uses of services (such as blogs, wikis, Social networks, etc.) that are generally employed for social purposes. By doing so, they could gain autonomy in their learning process and improve their competences for lifelong learning.

The services that integrate the PLE 2.0 experience included:

- A private Facebook group. Created to communicate and coordinate activities in the course in order to build a learning community where informal learning could emerge besides the contents of the course.

- A Twitter hashtag. Agreed on to share information and foster informal relations between the students and the teacher.
- A personal blog. Created to publish posts with the students' critical opinions about the different topics in the course (30% of the final grade).
- Descuadrando.com (wiki platform). An open encyclopaedia about business where students created academic and professional style entries (20% grade).

Students could use their own profiles if they already had a presence in the different types of tools.
In addition to the former activities, the students had to do a final exam (50% grade).

Sample and data collection

The sample is composed of 203 students enrolled in a course on International Accounting (Business and Administration Degree) at the University of Granada (Spain). The composition of the sample, by gender is 31% male and 69% female. The students' age range is from 20 to 43 years old (mean 23).

The data were gathered through a web-based questionnaire at the end of the course. Students were asked to provide sincere answers and confidentiality was assured. The inexistence of correct-incorrect responses was also highlighted, as was the fact that the data would only be used for research purposes.

Measures

Similarly to previous studies, TAM variables are measured by adapting to widely-used scales in educational settings. Thus, the Perceived Usefulness (PU) and Perceived Ease of Use (PEU) scales (3 and 4 items, respectively) were adapted from the Koufaris, Kambil and LaBarbera (2002) reduced versions of the original scales from Venkatesh and Davis (1996). The Attitude Towards Using (ATU) scale (3 items) was adapted from Chen, Gillenson and Sherrell (2002). The classic scale (4 items) by Zeithaml, Berry and Parasuraman (1996) was used to measure Behavioural Intention of Use (BIU). e-Learning Satisfaction (eSAT) was measured by using 2 items scale proposed by Szymanski and Hise (2000). This measure had been used extensively in previous studies (Szymanski & Henard, 2001; Evanschitzky et al., 2004; Jayawardhena, 2004). Finally, the Need for Cognition (NFC) was measured using the 5 items scale proposed by Del Barrio (2000); a reduced version of the larger original scales proposed by Cacioppo and Petty (1982) and Cacioppo, Petty and Kao (1984).

All previous variables were measured on a seven-point Likert scale, ranging from (1) strongly disagree to (7) strongly agree.

The students' experience perceptions were measured through a questionnaire derived from the Assessment of University Teaching Activities Questionnaire (AUTAQ), developed by the Learning & Teaching Institute (ICE) of the University of Seville in order to evaluate key aspects of educational innovations. Although previously used, the first published version is found in Villar (1999). As Villar and Alegre (2006) highlight, the AUTAQ was designed to appraise students' perceptions of their classroom environment and its design was guided by relationship, personal growth, and curriculum change dimensions for conceptualising university quality assurance. These questionnaires has been used to measure the impact perceived by students in evaluations of educational innovations (i.e., Arquero, Jiménez & Joyce, 2004; Lobo, Escobar & Arquero, 2009) and particularly in educational experiences using Web 2.0 tools (Arquero & Romero-Frías, 2013).

Results

The first step was to classify the respondents by their NFC score (mean of the items comprising the scale; Cronbach's alpha = .727). Using the distribution of the NFC score, the students were assigned to three groups, excluding the central interval group for comparison purposes. The descriptive information of the resulting groups is shown in Table 1.

Table 1. Students groups according to NFC

Groups	*N*	Mean	Standard deviation	*t*-test sig.
Low-NFC	82	2.7951	0.39249	.000
High-NFC	73	4.1644	0.36567	

In general terms, the experience was positively valued by students in all the aspects included in Table 2, irrespective of their NFC level. The impact is particularly high in the improvement in the collaborative dimensions of learning (solving doubts with other students, sharing interests and ideas, etc.). There is a significant difference between groups (t = -2.28, p < .05) indicating that high NFC students perceived a greater improvement in communication skills than low NFC students.

Table 2. Perceived impact of students' experience

	Groups	Mean	Standard deviation
Active Learning	Low-NFC	3.53	0.927
	High-NFC	3.67	0.958
Collaborative learning development	Low-NFC	4.22	0.683
	High-NFC	4.29	0.536
Relational collaborative learning	Low-NFC	3.54	0.849
	High-NFC	3.74	0.843
Communication skills	Low-NFC	3.49	0.826
	High-NFC	3.79	0.816
Content Learning	Low-NFC	3.54	0.849
	High-NFC	3.74	0.843

Note. All the means are significantly higher than 3 (indifference) at 1% (*t*-test).

Students were also asked about the perceived ease of use of specific tools (ranging from *1, not easy at all* to *5, very easy*). The rating was Facebook group (4.6), blog (3.82) and wiki (3.27), with no significant differences between groups. When asked about the potential usefulness of these tools for their professional careers and lifelong learning (1, *not useful at all – 5, very useful*), the results were very consistent: Facebook group (3.69), blog (3.68) and wiki (3.65).

In order to test the theoretical model proposed, Partial Least Squares (PLS) path modelling was used (Chin, 1998a) by implementing a multigroup analysis (high-NFC versus low-NFC). PLS has been used extensively as a data analysis method in the literature. It is particularly indicated for "predictive" purposes and theory development (Anderson & Gerbin, 1998) and when the sample size is reduced (Chin, 1998a).

PLS was the most appropriate analytic method given the characteristics of the study: (1) the model in Figure 1 is formed of 10 latent variables measured through 27 observed variables, and (2) the sample is made up of 73 and 82 students, in the high and low NFC groups, respectively. The software package used was SmartPLS 2.0 (Ringle, Wende & Will, 2005).

Table 3 shows the adequate psychometric properties of the scales. After bootstrapping, all the loadings were significant (p < .05) and the values of composite reliability (CR) and average variance extracted (AVE) were above the acceptable cut-off level (0.8 and 0.5, respectively). Finally, discriminant validity was tested for each group, by implementing the method suggested by Fornell and Larcker (1981).

Table 3. Analysis of the psychometric properties of the scales (outer model)

Latent variables	Indicators	Loadings		CR		AVE	
		High NFC	Low NFC	High NFC	Low NFC	High NFC	Low NFC
Relational collaborative learning	REL_COL1	.898	.908	.907	.926	.829	.863
	REL_COL2	.923	.950				
Collaborative learning development	COL_DEV1	.803	.847	.797	.866	.569	.684
	COL_DEV2	.807	.785				
	COL_DEV3	.642	.547				

Content Learning	CON_LEARN1	.810	.871	.888	.906	.726	.763
	CON_LEARN2	.845	.890				
	CON_LEARN3	.899	.859				
Active Learning	ACT_LEARN1	.915	.918	.891	.922	.804	.856
	ACT_LEARN2	.879	.932				
Communication skills	COM_SK1	.916	.860	.906	.893	.829	.809
	COM_SK2	.905	.935				
Perceived Usefulness	PU1	.783	.868	.881	.905	.712	.760
	PU2	.907	.865				
	PU3	.837	.883				
Perceived Ease of Use (PEU)	PEU1	.810	.842	.934	.927	.797	.762
	PEU2	.914	.916				
	PEU3	.900	.850				
	PEU4	.941	.882				
e-Learning Satisfaction	eSAT1	.909	.913	.912	.909	.838	.833
	eSAT2	.922	.913				
Attitude Towards Using (ATU)	ATU1	.918	.925	.852	.892	.744	.804
	ATU2	.802	.868				
Behavioural Intention of Use (BIU)	BIU1	.878	.919	.917	.944	.75	.809
	BIU2	.893	.901				
	BIU3	.852	.920				
	BIU4	.806	.857				

Figure 2 shows the results of estimating the structural model (*inner model*) for both groups, after applying bootstrapping. To test for group differences we applied PLS-MGA approach (Henseler, Ringle & Sinkovics, 2009), as this method accounts for the distribution-free assumption of the data (see Table 4).

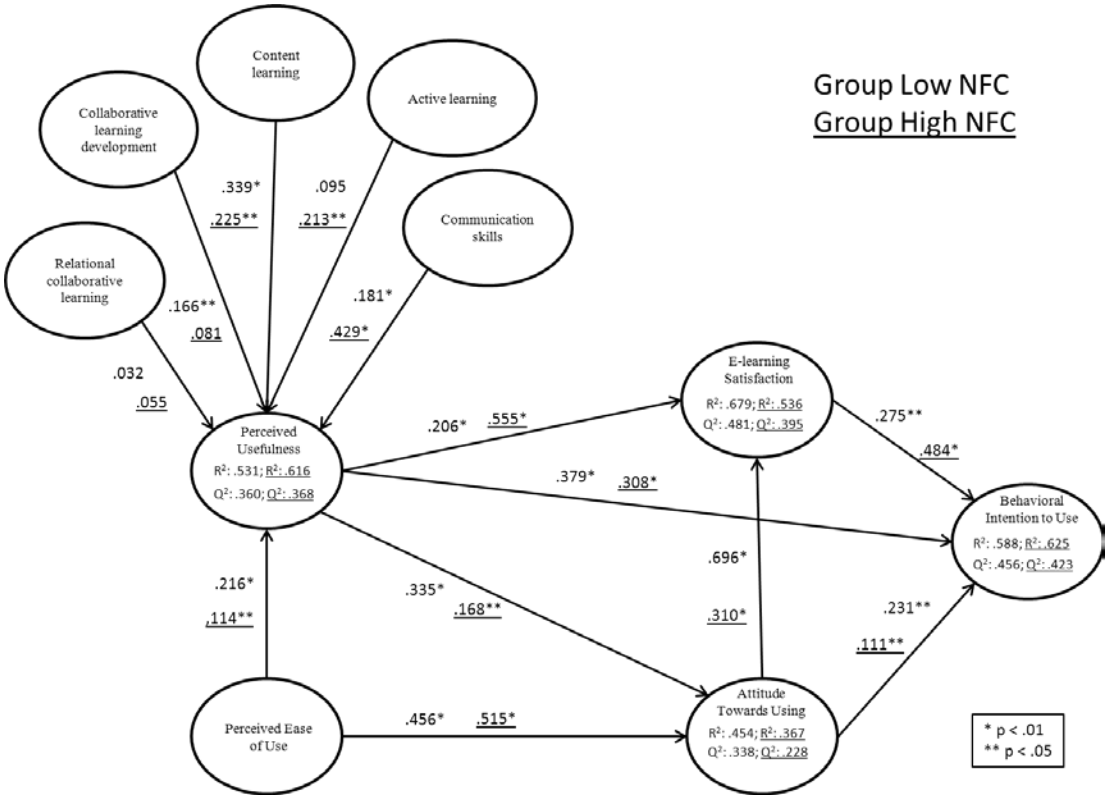

Figure 2. Estimated structural model – inner model (standardised solution)

Table 4. Multigroup invariance analysis results (PLS-MGA)

	High-NFC	Low-NFC	*p*-value
REL_COL→ PU	.055	.032	.267
COL_DEV→ PU	.081	.166	.274
CON-LEARN→ PU	.225	.339	.252
ACT_LEARN→ PU	.213	.095	.268
COM_SK→ PU	.429	.181	.036
PEU→PU	.114	.216	.217
PEU→ATU	.515	.456	.334
PU→eSAT	.555	.206	.001
PU→ATU	.168	.335	.155
PU→BIU	.308	.397	.305
ATU→eSAT	.310	.696	.001
eSAT→BIU	.484	.275	.115
ATU→BIU	.111	.231	.783

Regarding the impact of students' learning experiences on PU, only perceived impact of content learning ($\beta_{CON\_LEARN\rightarrow PU\_HNFC}$ = .225; $\beta_{CON\_LEARN\rightarrow PU\_LNFC}$ = .339) and improvement in communication skills ($\beta_{COM\_SK\rightarrow PU\_HNFC}$ = .429; $\beta_{COM\_SK\rightarrow PU\_LNFC}$ = .181) present a significant and positive influence on PU for both groups. However, it is worth noting that the perceived improvement in communication skills is significantly greater for High NFC students (p = .035). No difference exists between both groups regarding content learning.

The effect of relational collaborative learning on PU is not significant for any of the groups ($\beta_{REL\_COL\rightarrow PU\_HNFC}$ = .055; $\beta_{REL\_COL\rightarrow PU\_LNFC}$ = .032).

Collaborative learning development only has a significant positive effect on PU for Low NFC students ($\beta_{COL\_DEV\rightarrow PU\_HNFC}$ = .081; $\beta_{COL\_DEV\rightarrow PU\_LNFC}$ = .166), whereas Active learning only has a significant positive effect for High NFC ($\beta_{ACT\_LEARN\rightarrow UP\_HNFC}$ = .213; $\beta_{ACT\_LEARN\rightarrow UP\_LNFC}$ = .095).

To sum up, we highlight that the main antecedent of Perceived Usefulness of the Learning 2.0 methodology is content learning for Low NFC students and the communication experience for High NFC students.

Regarding the mediating role of eSAT, the results in Table 4 are indicative of the significant moderating role of NFC between BIU and the PU variables.

The satisfaction of students with the Learning 2.0 model proposed is positively influenced by their perceptions about the usefulness of the system ($\beta_{PU\rightarrow eSAT\_HNFC}$ = .555; $\beta_{PU\rightarrow eSAT\_LNFC}$ = .206). This relation is remarkably higher for the High NFC students (p < .05). On the contrary, the effect of Attitude towards Use (ATU) of PLE 2.0 on eSAT was significantly higher (p > .05) for Low NFC Students ($\beta_{ATU\rightarrow eSAT\_HNFC}$ = .310; $\beta_{ATU\rightarrow eSAT\_LNFC}$ = .696).
Secondly, the Attitude towards Use (ATU) of PLE 2.0 is more dependent on PEU than on PU for both groups. The effect of PEU on ATU is more intense for High NFC students than for Low NFC students ($\beta_{PEU\rightarrow ATU\_HNFC}$ = .515; $\beta_{PEU\rightarrow ATU\_LNFC}$ = .456). Regarding the relation PU→ATU, the stronger effect corresponds to the Low NFC group ($\beta_{UP\rightarrow ATU\_HNFC}$ = .168; $\beta_{UP\rightarrow ATU\_LNFC}$ = .335). However, these differences are not significant (p > .05).

Finally, the intention of use (BIU) of the PLE 2.0 proposal is significant and determined positively by PU, eSAT and ATU. The most important variable explaining BIU is eSAT ($\beta_{eSAT\rightarrow BIU\_HNFC}$ = .484; $\beta_{PU\rightarrow BIU\_HNFC}$ = .308; $\beta_{ATU\rightarrow BIU\_HNFC}$ = .111) for High NFC students and PU ($\beta_{PU\rightarrow BIU\_LNFC}$ = .379; $\beta_{eSAT\rightarrow BIU\_LNFC}$ = .275; $\beta_{ATU\rightarrow BIU\_LNFC}$ = .231); for Low NFC students, although the differences are not significant (p > .05).

Table 5 presents the standardised total effects (direct and indirect) on BIU. For High-NFC students, the most relevant variable explaining BIU is PU (.620) followed by eSAT (.484) and PeU presents the lowest effect. For Low-NFC students the most relevant variable explaining BIU is PU (.577), followed by ATU (.422), PEU (.317), and, finally, eSAT (.274).

Table 5. Standardised total effects on BIU

	High-NFC	Low-NFC
PU→BIU	.620	.577
PEU→BIU	.205	.317
eSAT→BIU	.484	.274
ATU→BIU	.260	.422

To conclude the analysis of the results, the explicative and predictive power of the model was tested using the percentage of variance explained of the dependent constructs (R^2) and predictive relevance (Stone-Geisser-Q2) through a blindfolding procedure (Chin, 1998b). According to Hair et al., (2011) the percentages of variance explained of the five dependent variables in the model and the predictive relevance were adequate (Figure 2).

Discussion, implications and future research

The aim of this study was to develop an extended TAM model for an open PLE experience. The results suggest that the theoretical model proposed in this study has adequate predictive power to understand the future intention of use of a PLE based on Web 2.0 tools. The pedagogical approach adopted is innovative because it is not based on a closed virtual learning environment (such as those of most LMS) but on a personal and open approach that is intended to adapt the available technological tools to the particular needs and goals of each student for autonomous and lifelong learning (Attwell, 2007; Wilson et al., 2009).

The causal relationships between the constructs postulated by the structural model are well supported. The mediating role of Satisfaction between Perceived Usefulness and Attitude towards the system was confirmed in an educational context, supporting the evidence found in other settings (i.e., Szymanski & Hise, 2000; Casaló, Flavián & Guinalíu, 2008). The effect of the perceived impact of the experience in some key dimensions of learning (Collaborative learning, Content Learning, Active Learning, Communication skills) on PU is significant and positive in most cases. There are two aspects that impact on PU more significantly for both groups: improvement in content learning and development of communication skills; however, the most valued impact was collaborative learning development. These results suggest that further exploration is needed concerning the factors that students take into account to form their perceptions of the PU for these experiences. A better knowledge of the impact of these factors on the intention to use a PLE 2.0 can help teachers to underline the importance of some characteristics in the first weeks of the course in order to improve educational performance.

Regarding the impact of intrinsic human factors in the acceptance of this experience, the results support the moderating role of students' Need for Cognition. For High-NFC students, the acceptance depends mainly on the perceived usefulness and satisfaction towards the system; whereas, for Low-NFC students, the Perceived Ease of Use plays a more relevant role. Furthermore, the impact of eSAT is also moderated by NFC. This has a more relevant role for High-NFC students.

The moderating effect of NFC has several implications. The intention to use IT-related educational innovations could be affected by specific students' characteristics, having an impact in the institutionalisation and the transferability of these innovations. This highlights the need for further research to understand which characteristics play a relevant role in acceptance and which actions could be implemented to avoid undesired effects.

Students' NFC profiles could be measured at the beginning of the course, in order to plan actions focusing on the relevant variables. For groups composed of High NFC students (for whom learning satisfaction and usefulness are more relevant), it is possible to propose more complex activities and tools as long as they generate satisfaction and are perceived as useful. For low NFC students training activities and support could be relevant to improve their engagement.

The relevant role of the perceived ease of use (key for Low NFC students, but also important for High NFC students) supports the idea that the adoption of technology in education is facilitated when the tools proposed were already used by students for other purposes and were perceived as accessible. Although the use of tools which are not specifically designed for education in this PLE 2.0 experience requires more creativity and diminishes the instructor's control, it is noteworthy that some of these tools were already used on a daily basis (78.4% of students

use Facebook every day) and are considered by students to have a high potential (3.7 out of 5) for their future professional careers and lifelong learning. In contrast, LMS usage is restricted to formal education settings (Mott, 2010). Therefore, through the PLE 2.0 approach we are contributing to the development of a more sustainable learning environment for students. This is in line with the objectives set by the European Union (2006).

The results are considered exploratory. Students participating in this study were enrolled in an elective subject at the last courses of a business degree. Further research should be done with larger samples including different degrees, compulsory subjects and entry level students.

Future research should look at objective performance measures and not only at students' perceptions in order to discover if there is an improvement after using technology depending on the NFC level. Also, following some studies (i.e., Gu, Zhu & Guo 2013), we would like to compare differences between teachers and students in using these learning methodologies. Finally, the application of Technology Acceptance Models to Massive Open Online Courses (MOOC) could contribute critically to the adoption of these initiatives worldwide, as long as MOOCs are a reference in terms of open education becoming part of the PLE of students and professionals.

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