Exploring the impact of individualism and uncertainty avoidance in Web-based electronic learning: An empirical analysis in European higher education

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ARTICLE INFO
Article history:
Received 13 June 2007
Received in revised form 31 October 2008
Accepted 3 November 2008

Keywords:
Higher education
Electronic learning
Culture
Individualism
Uncertainty avoidance
Technology acceptance model (TAM)
Flow

ABSTRACT
Our research specifically focuses on the effects of the national cultural background of educators on the acceptance and usage of ICT, particularly the Web as an extensive and expanding information base that provides the ultimate in resource-rich learning. Most research has been used North Americans as subjects. For this reason, we interviewed European educators from diverse cultures; in particularly, we analysed the cultural differences and their moderating effects on acceptance-based relationships between European universities: European Nordic culture in contrast to European-Mediterranean culture.

The empirical results provided strong support for the hypotheses. Cultural differences have a significant impact on attitudes and behaviours towards using Web-based applications. The Nordic culture is driven more by instrumental factors and intrinsic enjoyment-based factors. On the other hand, the PSG-Mediterranean culture (Portugal, Spain and Greece) seems to regard the Web more as a means to a social end.

1. Introduction

The introduction of distance and Electronic Learning Technology (hereafter, e-learning) in teaching institutions is often complex and educators do not always accept the Information and Communication Technologies (hereafter, ICT) as expected. Removing trade/political barriers facilitates e-learning around the world, but there are significant cultural barriers to the use of Internet-based resources and computer technologies (Collins, 1999). The Internet may be a global technology but users work in local/national contexts (Li & Kirkup, 2007). In this regard, Galanouli, Murphy, and Gardner (2004) comment that resisting change is a state of mind for many educators and one of the most difficult barriers for effective ICT integration (see also Barak (2007)).

Recent studies have shown that “the successful implementation of educational technologies depends largely on the attitudes of educators, who eventually determine how they are used” (Albarini, 2006). Indeed, understanding the intrinsic and extrinsic dimensions, and including moderating factors (specifically, the cultural dimensions) that influence educators’ attitudes towards ICT and adoption in higher education is, therefore, a focal point of interest but is under-researched in recent educational studies of information-accessing behaviour (see for instance, Chang and Lim (2002)). As Li and Kirkup (2007) propose, “how far culture influences people’s perception of the Internet and their use of it, (…) needs further research”.

The theoretical basis for this study stems from the research by Davis (1989): the Technology acceptance model (TAM). However, original TAM variables – use, intention of use, usefulness and ease of use – cannot fully reflect educators’ motives, requiring a search for additional intrinsic motivational factors, such as flow state (Martínez-Torres et al., 2006). As Venkatesh (2000) notes, there is a significant and growing body of research regarding the importance of the role of intrinsic motives in technology use (see for instance, Davis, Bagozzi, and Warshaw (1992); Finneran and Zhang (2005) and Sanchez-Franco and Roldan (2005) for a review).

Furthermore, moderating factors may also account for both the limited explanatory power and the inconsistencies between studies. Recent studies identify cultural values as one of the influential factors on adoption of ICT (Bagchi, Cerveny, Hart, & Peterson, 2003; Johns, Smith, & Strand 2003; Sørnes, Stephens, Sætre, & Browning, 2004). Specifically, our research has a specific focus on the effects of the...
national cultural background of educators on the acceptance and usage of ICT, particularly the Web (WebCT, Blackboard, Web Course in a Box [WCB], Top Class, etc.).

Finally, the study was carried out within universities in Europe. Unfortunately, most research has been used North Americans as subjects. The social and cultural characteristics of European universities could thus be studied further as distinct from, or perhaps in contrast to, North American or Japanese institutions (Liebenau & Smithson, 1991). Although physical distances are limited in Europe, cultural distances are significant.

2. Theory development and research hypotheses

2.1. Technology acceptance model (TAM) and flow

In line with the reasoning applied in the theory of reasoned action (TRA see Ajzen and Fishbein (1980); Fishbein and Ajzen (1975)) and TAM (Davis 1989; Davis, Bagozzi, & Warshaw, 1989), there is a direct and positive effect of attitudes towards usage and usage intention on actual usage (see Lee, Kozar, and Larsen (2003), for a review). Furthermore, perceived usefulness and ease of use are hypothesised and empirically supported as fundamental beliefs of users’ attitudes towards using a given ICT. Particularly,

- Perceived usefulness, an extrinsic source of motivation, defined as the degree to which users believe that a particular ICT would enhance their job performance, influences ICT usage indirectly through attitude and directly through intent. Perceived usefulness is a relevant determinant of behavioural intention (or behaviour), noting that users willingly use a system that has a critically useful functionality.
- Perceived ease of use, a second source of motivation, defined as the degree to which a person believes that using a particular ICT would be free from effort, influences ICT attitude towards using it, and has an inverse relationship with the perceived complexity of use of the technology. A system that is difficult to use is less likely to be perceived as useful.

Based on the above research, we assume the following hypotheses (see Fig. 1):

- H1: Attitude towards usage will positively influence intention to use Web-based technologies.
- H2: Perceived usefulness will positively influence intention to use Web-based technologies.
- H3: Perceived usefulness will positively influence attitude towards usage.
- H4: Perceived ease of use will positively influence attitude towards usage.
- H5: Perceived ease of use will positively influence perceived usefulness.

However, not everyone agrees that these two beliefs perceived usefulness and ease of use are sufficient. There is now a significant body of theoretical and empirical research regarding the importance of the role of intrinsic motivation in understanding facets of behaviour (Davis et al., 1992; Finneran & Zhang, 2005; Sanchez-Franco & Roldán, 2005; Venkatesh, 2000). In fact, the extrinsic goal of the online activity could be partly complemented by intrinsic motives to use the Internet-based learning resources. In this context, one of the positive psychological states related to intrinsic factors is flow.

Flow is defined as “the holistic sensation that people feel when they act with total involvement” (Csikszentmihalyi, 1975, 1990). People become absorbed in their activity: their awareness is narrowed to the activity itself; they lose self-consciousness, and they feel in control of their environment. For instance, users experience flow while deeply involved in games or when using tools such as statistical processors, e-mail packages or Web-based technology (Ghani & Deshpande, 1994; Trevino & Webster, 1992).

Flow could, then, be characterised as an intrinsically enjoyable experience; “the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated” (Davis et al., 1992). In fact,
enjoyment is one of the dimensions of cognitive-absorption (similar to flow; see Agarwal and Karahanna (2000)) with the highest loading score.

Research has also shown that the perceived intrinsic enjoyment has a strong relationship with TAM. On the one hand, flow has a positive effect on attitudes towards use (Sanchez-Franco & Roldan, 2005); and the intention to use (Venkatesh, 1999). On the other hand, the correlation between perceived ease of use and enjoyment is well accepted: ICT that are perceived as easier to use are more likely to be perceived as enjoyable (Igbaria, Parasuraman, & Baroudi, 1996; Teo, Lim, & Lai, 1999).

Based on the above research, we assume the following hypotheses (see Fig. 1):

- **H6**: Flow will positively influence attitude towards usage.
- **H7**: Perceived ease of use will positively influence flow.
- **H8**: Flow will positively influence intention to use Web-based technologies.

In the next sections, we clarify the moderating culture-based effects on this expanded Technology acceptance model.

### 2.2. Culture

From an academic perspective, the effects of culture on ICT acceptance have been studied by research based principally on Hofstede’s (1980) cultural script. This cultural script is the most influential culture theory among social-science research, with strong empirical support.

Specifically, Hofstede defines culture as “the collective programming of the mind which distinguishes the members of one group from another”; and proposes a series of traditional dimensions that distinguish between work-related values: individualism–collectivism, power distance, uncertainty avoidance, and masculinity–femininity. These value dimensions, which distinguish national value systems, would affect individuals and organisations; central tendencies in a nation are replicated in their institutions through the behaviour or practices of individuals.

It is not the aim of this study; however, to examine the whole range of cultural dimensions influencing ICT adoption. Instead, it focuses on individualism and uncertainty avoidance. On the one hand, individualism is the dimension most commonly used by researchers to understand the differences between two or more given cultures (Cohen & Avrahami, 2006). Educators from an individualistic culture could use WebCT because of its potential usefulness for performing learning tasks, but not because of the perceived social pressure. On the other hand, cultures have different attitudes towards uncertain or unknown matters. Educators in countries with high uncertainty avoidance scores will thus be more risk-adverse and will dislike the lack of physical contact with online learners. Uncertainty avoidance has the most direct bearing on preference for and use of communications media (Yeniyurt & Townsend, 2003).

Furthermore, individualism, at least at a cultural level, is the opposite of the acceptance of hierarchy and of ascribed social inequality; that is, an individualistic culture tends to be a low power distance culture (Gouveia & Ros, 2000; Schwartz, 1994). Therefore, to avoid conceptual overlaps, we propose that the power distance index is dropped from explicit consideration here. Finally, Bagchi et al. (2003) argued that “IT promotes more cooperation at work, better quality of life and these values are espoused in nations with low MF (masculinity/femininity) index”. However, as they comment, “it could be argued equally well that in a country with high masculinity there would also be a positive attitude toward implementing ICT if these technologies improve performance, increase the chance of success and support competition, which are all key factors of a masculine culture”. These authors felt that achievement orientation (the masculinity/femininity dimension) has at least at the conceptual level – a mixed impact on the use of technology (see also Johns et al. (2003)). In this research we propose that the masculinity/femininity dimensions are also dropped from explicit consideration.

In short, our research will include the individualism and uncertainty avoidance dimensions.

### 2.3. The moderating effects of cultural dimensions on TAM and flow

#### 2.3.1. Individualism/collectivism

Individualism/collectivism focuses on the degree to which a society reinforces individual or collective achievement and interpersonal relationships, respectively. In an individualistic culture, people seem to be more innovative and trusting in exchange relationships with external parties; and value personal time, freedom, challenge, and such extrinsic motivators as material rewards. Individualism reflects the extent to which people emphasise their own goals over those of their clan or group (Hofstede, 1980). Culture then, has a high score for individualism if there are favourable responses to items such as: “Have challenging work to do – work from which you can get a personal sense of accomplishment” (Gouveia & Ros, 2000). That is, perceived usefulness and intrinsic enjoyment.

Firstly, adapted from Anandarajan, Simmers, and Igbaria (2000), in terms of ICT acceptance, educators from an individualistic culture may use ICT because of their potential usefulness for performing tasks, but not because of any perceived social pressure from supervisors or their peers. Individualistic educators will try the Web-based technology, even if they do not have a positive attitude towards using it, because it may enhance productivity (usefulness). It is expected that perceived usefulness of the Web may, therefore, exert a much greater influence on determining the intention to use the Web among individualistic users.

Conversely, the core element of collectivism is the assumption that groups bind and mutually obligate individuals. Accordingly, since collectivistic societies thus have a more positive association with whatever is rooted in tradition, the notion of incorporating an innovative teaching method such as the Web might not be initially well received by the collectivistic educators. As Gouveia and Ros (2000) suggest, power distance shows a pattern of correlations almost opposite to Hofstede’s individualism; therefore, “the assessment that social inequalities are legitimate, is a convergent dimension with the assessment of maintaining the status quo and traditional order”. Collectivistic users would, therefore, tend to underestimate the usefulness of the Web as a critical influence on intention to use it.

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1. Hofstede and Bond (1988) found an additional dimension, which is particularly relevant to Asian culture – confucian dynamism (often referred to as long/short-term orientation).
Based on the above research, we propose the following hypothesis (see Fig. 1):

- **H2.a**: Perceived usefulness will positively influence intention to use Web-based technologies more forcefully for individualistic educators than for collectivistic educators.

Secondly, as TAM demonstrates, perceived ease of use influences individual attitudes through two mechanisms: instrumentality and self-efficacy. Web-based learning applications that are easy to understand and use will be associated with being able to save effort and irritation (perceived usefulness) and also to promote perceived enjoyment (flow) (Igbaria et al., 1996; Bandura’s self-efficacy theory; Bandura, 1977). On the one hand, when individualistic users engage in instrumental behaviour, they are motivated to perform their activities in an efficient, focused and timely manner with a minimum of irritation (adapted from Babin, William, and Griffinn (1994)). On the other hand, individualistic users do not want to be distracted from their tasks, and intrinsic enjoyment could, then, provide the inner reward necessary to achieve one-pointedness of mind and cognitive-absorption (Csikszentmihalyi, 2000). Precisely, perceived ease of use would amplify the flow experiences (Trevino & Webster, 1992). Therefore, perceived ease of use, as a direct antecedent facilitating task-performance and intrinsic enjoyment is likely to be given a stronger weighting by individualistic educators.

Based on the above research, we propose the following hypotheses (see Fig. 1):

- **H5.a**: Perceived ease of use will positively influence perceived usefulness more forcefully for individualistic educators than for collectivistic educators.
- **H8.a**: Perceived ease of use will positively influence flow more forcefully for individualistic educators than for collectivistic educators.

### 2.3.2. Uncertainty avoidance

Hofstede (1991) defines the uncertainty avoidance index as “the extent to which the members of a culture feel threatened by uncertain or unknown situations”. In a high uncertainty avoidance culture, educators are more likely to avoid accepting ICT because of the uncertainty and ambiguity involved.

Research has found that cultural uncertainty avoidance has a negative impact on users’ innovativeness (Steenkamp, Hofstede, & Wedel, 1999). An uncertainty avoidance society tends to hold lower perceptions of self-efficacy and is more concerned about the risks associated with ICT, and feels anxiety, fewer optimal experiences, when faced with unfamiliar risks, deviant ideas, or conflicts (Hofstede, 1980).

Uncertainty avoidance societies, more Web risk-averse and with a lower self-efficacy will not engage in behaviours without previously adjusting their attitudes. To explain, attitudes towards using Web-based learning applications will, therefore, be a relevant mediator between perceptions and intention to use them. Moreover, uncertainty avoidance societies will tend to take time to act until they acquire enough knowledge and information (perceived usefulness and ease of use) to resolve unclear and unstructured situations (comprehensive processors; Meyers-Levy, 1989). Conversely, in a culture with low uncertainty avoidance, individuals could be selective processors, who often rely on a sub-set of readily available and salient cues in place of detailed message elaboration.

Based on the above research, we propose the following hypotheses (see Fig. 1).

- **H1.a**: Attitude towards usage will positively influence intention to use Web-based technologies more forcefully for uncertainty avoidance educators than for weak uncertainty avoidance educators.
- **H3.a**: Perceived usefulness will positively influence attitude towards usage more forcefully for uncertainty avoidance educators than for weak uncertainty avoidance educators.
- **H4.a**: Perceived ease of use will positively influence attitude towards usage more forcefully for uncertainty avoidance educators than for weak uncertainty avoidance educators.

Finally, playfulness involves creativity as well as unstructured experimentation with ICT-based tasks; weak uncertainty avoidance, weak power distance, and high individualism positively relate to creativity. Members in low uncertainty avoidance countries thus tend to feel more comfortable in unfamiliar situations when encountering innovative and creative ideas and behaviour with no rules. Therefore, it could be argued that educators from moderate to low uncertainty avoidance cultures would be motivated to perceive ICT use as intrinsically enjoyable (Anandarajan, Simmers, & Igbaria, 2000); and would tend to overestimate flow as a critical influence on attitude and intention.

Based on the above research, we propose the following hypotheses (see Fig. 1):

- **H6.a**: Flow will positively influence attitude towards usage more forcefully for weak uncertainty avoidance educators than for uncertainty avoidance educators.
- **H7.a**: Flow will positively influence intention towards usage more forcefully for weak uncertainty avoidance educators than for uncertainty avoidance educators.

### 3. Method

#### 3.1. Population

In 2003, the differences in accessing the Internet between the various European countries were still very significant. Specifically, the regional “technology gap” between the Nordic countries and the Southern European region becomes apparent when looking from country to country at Households with Internet connection and Individuals accessing the Internet in the three months prior to the survey (see Fig. 2A).

Authors such as Bagchi et al. (2003); Johns et al. (2003) and Veiga, Floyd, and Dechant (2001) conclude that the significant variation in Internet diffusion (see Fig. 2A), implementation and acceptance between countries could be attributed to national culture, as described by Hofstede’s cultural model. The general tendency of a decrease in Internet usage from the north to the south, as well as a positive correlation
to individualism and a negative correlation to uncertainty avoidance is evident in the majority of the highly developed countries of western Europe (Hermeking, 2005). The Nordic countries are an interesting counterpoint to ICT adoption (acceptance and use motives) in the PSG-Mediterranean culture. The Mediterranean countries (here, Portugal, Spain and Greece, except Italy) demonstrate Hofstede's dimensions quite differently from the Nordic culture (in this study, Finland, Norway, Sweden and Denmark) (see Fig. 2B).

3.2. Sample

We validated our theoretical model through a non-probabilistic sampling and self-selection. The data were collected from a sample of online questionnaires filled out by university professors from two homogeneous populations (Nordic and Mediterranean countries). Selected professors were invited by e-mail to participate. The data collection process was designed to list the questions in a random order for each participant, avoiding potential systematic biases in the data and other cognitive consistency patterns.

The professors were identified from the staff directories of public e-mails from their universities and were all in the social-science field. The non-Nordic and non-Mediterranean professors (e.g., invited professors) were identified by their nationalities, and removed from the sample. We also eliminated the respondents who had omitted data from any of the survey's items. The exclusion of invalid questionnaires resulted in two samples: the Nordic-culture sample \( (n = 304) \) and the PSG-Mediterranean culture sample \( (m = 376) \).

We chose to focus on two homogeneous populations (Nordic and Mediterranean, and from social-science fields). There are several specific advantages to surveying homogeneous samples

1. Firstly, the research reduces the moderating influences of third-constructs.
2. Secondly, following Calder, Lynn, and Tybout (1981), representative sampling of subjects is not necessary when conducting theoretical user research. Also, sampling a barely homogeneous group of subjects inflates the error in statistical tests and reduces the likelihood of detecting systematic violations of a theory when it is false.
Thirdly, the Web-design suggestions range from changes in pedagogy and perspective, to make the Internet (WebCT, Blackboard, Web Course in a Box [WCB], Top Class, etc.) a tool of collaboration between pairs or homogenous groups of users rather than barely homogeneous individuals or representative population samples.

In this respect, the Mann–Whitney $U$ test found no significant differences in age between the two samples; the computed $Z$ value does not exceed 1.645 ($p = 0.349$). Nor was any significant difference found for gender, employing Fisher’s exact test (0.349 > 0.05). This means that the distribution of these variables for each cultural sample was almost the same.

Finally, Hofstede denies changes of national culture and argues for the continuing relevance of the culture scores derived from his data, which were collected four decades ago (specifically, in 1967 and 1973). Nevertheless, through our ad hoc measurement of Hofstede’s dimensions, employing Hofstede’s scales (Hofstede values survey module, 1994) we obtained similar results to the original scores. Table 1 demonstrates that significant cultural differences were found between the two samples (Nordic/PSG-Mediterranean) in cultural dimensions: individualism (31/83) and uncertainty avoidance (81/44).

3.3. Scales

The instrument was developed first by reviewing the literature in order to identify measures for each construct (Davis (1989); Davis et al. (1989); Davis et al. (1992) – intention, usefulness and ease of use; Taylor and Todd (1995) – attitude; Venkatesh and Davis (2000) – intrinsic enjoyment; Hofstede values survey module, 1994 – culture).

Our survey instrument was pre-tested for content analysis. We administered a questionnaire to professors at universities to modify our initially proposed items or to suggest additional items. We dropped ATTIT4 (‘‘using the Web would be pleasant”) because of the theoretical reflective relationship with intrinsic attitudinal motives (enjoyment). The scales were measured using a five-point scale, ranging from ‘‘strongly disagree’’ to ‘‘strongly agree’’.

3.4. Data analysis

The proposed model and hypothesis testing was conducted using partial least squares (PLS) version 3.00 build 1058. PLS places minimal restrictions on measurement scales, sample size, and residual distributions. We used PLS technique because this tool is primarily intended for predictive analysis, in which the problems are complex, and theoretical knowledge is scarce (see also Chin, Marcolin, and Newsted (2003), for a review).

4. Results

A PLS model is analysed and interpreted in two stages: the assessment of the reliability and validity of the measurement model, and the assessment of the structural model.

4.1. Measurement model

The test of the measurement model includes estimation of the reliability coefficients, as well as the examination of the convergent and discriminated validities of the research instruments.

Individual reflective item reliability is assessed by examining the loadings of the items with their respective construct, which can be interpreted in the same manner as the loadings in a Principal Component Analysis. A rule of thumb employed in research is to accept items higher than 0.7, which implies that there is more shared variance between the construct and its measure than error variance. Individual reflective item reliabilities, in terms of standardised loadings, were over the acceptable cut-off level of 0.7.

For the reflective measures, construct reliability is assessed using composite reliability ($\rho_c$). Rather than using Cronbach’s alpha, which represents a lower bound estimate of internal consistency due to its assumption of equal weightings of items, a better estimate can be
gained using the composite reliability formula. The composite reliabilities for the multiple reflective indicators are well over the recommended acceptable 0.7 level (Nunnally, 1978). We also checked the significance of the loadings with a resampling procedure (500 sub-samples) for obtaining \( t \)-statistic values: they all are significant (see Table 2).

Convergent and discriminated validities are assessed by assuming that the square root of the average variance extracted (AVE) by a construct from its indicators should be at least 0.7 (AVE > 0.5); and should be greater than that construct’s correlation with other constructs, respectively (Fornell & Larcker, 1981). All latent constructs satisfy these conditions: the square root of the AVEs is at least 0.7 and is much larger than all other cross-correlations for both samples. We thus maintain the convergent and discriminant validity of the multi-item constructs of the models (see Tables 2 and 3).

4.2. Structural model

The PLS structural model and hypotheses were assessed by examining the path coefficients \( (\beta) \), and \( R^2 \) and \( Q^2 \) values (see Tables 4–6). Bootstrapping (with 500 sub-samples) was also performed to test the statistical significance of each path coefficient using \( t \)-tests. Fig. 3 represents the path coefficients \( (\beta) \) and the \( R^2 \) values, which allows a better understanding of the structural model.

Firstly, in both samples the structural model appears to have an appropriate predictive power for the dependent variable “intention”, given that variance explained, or \( R^2 \) values, exceed the required amount of 0.10, excepting \( R^2 \)-flow PSG-Mediterranean sample (Falk & Miller, 1992). Another measure that supports these positive results is the \( Q^2 \) test of predictive relevance for the endogenous constructs (Geisser, 1975; Stone, 1974). A \( Q^2 > 0 \) implies that the model has predictive relevance, whereas a \( Q^2 < 0 \) suggests that the model lacks predictive relevance. In general, the results summarised in Table 5 confirm that the structural model has satisfactory predictive relevance for the endogenous variables: usefulness, flow, attitude and intention.

| Table 2 | Individual item reliability–individual item loadings. Construct reliability and convergent validity coefficients. |
|---|---|---|---|
| Construct/indicators | The Nordic sample | | The PSG-Mediterranean sample |
| | Loadings | \( \rho_c \) AVE | Loadings | \( \rho_c \) AVE |
| **Usefulness** | | | |
| USEFUL1 | 0.87614* | 0.96325 | 0.83989 | 0.77883* | 0.93327 | 0.73719 |
| USEFUL2 | 0.93486* | 0.91725* | 0.92986* | 0.92298* | 0.84522* | 0.90628* | 0.89358* | 0.86323* |
| Ease of use | | | | |
| EASE1 | 0.77683* | 0.93613 | 0.71055 | 0.82167* | 0.93124 | 0.69391 |
| EASE2 | 0.81868* | 0.89010* | 0.77000* | 0.90651 | 0.81348* | 0.74524* | 0.84579* | 0.92840* |
| EASE3 | 0.91725* | 0.92986* | 0.92298* | 0.84522* | 0.90628* | 0.89358* | 0.86323* |
| EASE4 | 0.92986* | 0.92298* | 0.84522* | 0.90628* | 0.89358* | 0.86323* |
| EASE5 | 0.92298* | 0.84522* | 0.90628* | 0.86323* |
| EASE6 | 0.85906* | 0.92840* |
| **Attitude** | | | | |
| ATTIT1 | 0.94000* | 0.95744 | 0.88237 | 0.89549* | 0.92726 | 0.80951 |
| ATTIT2 | 0.92216* | 0.90953* | 0.89549* | 0.92726 | 0.80951 |
| ATTIT3 | 0.95557* | 0.90953* | 0.89549* | 0.92726 | 0.80951 |
| **Flow** | | | | |
| FLOW1 | 0.85476* | 0.98508 | 0.72036 | 0.98639* | 0.98553 | 0.97149 |
| FLOW2 | 0.80426* | 0.98508 | 0.72036 | 0.98639* |
| FLOW3 | 0.89781* | 0.98508 | 0.72036 | 0.98639* |

\* p < 0.001 (based on \( t \)-test).

| Table 3 | Discriminant validity coefficients. |
|---|---|---|---|---|
| Attitude | Ease of use | Flow | Intention | Usefulness |
| The Nordic sample | | | | |
| Attitude | 0.93934 | | | |
| Ease of use | 0.30553 | 0.84294 | | |
| Flow | 0.44394 | 0.47832 | 0.85313 | |
| Intention | 0.42176 | 0.53334 | 0.47314 | 0.84874 |
| Usefulness | 0.56703 | 0.64537 | 0.49243 | 0.55619 | 0.91645 |
| The PSG-Mediterranean sample | | | | |
| Attitude | 0.89972 | | | |
| Ease of use | 0.46200 | 0.83301 | | |
| Flow | 0.25852 | 0.21205 | 0.82064 | |
| Intention | 0.58902 | 0.38591 | 0.12732 | 0.98564 |
| Usefulness | 0.58574 | 0.38775 | 0.10345 | 0.50675 | 0.85859 |

\* Diagonal elements (bold) are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs.
Secondly, hypotheses on intensity differences between both types of culture (H1.a) could be tested by statistically comparing corresponding path coefficients in both samples. This statistical comparison was carried out using the procedure implemented by Keil et al. (2000) (see Equations 1(A) and (B)). The results are described in Table 6, largely supporting most of the hypotheses put forward. However, since the study is a cross-sectional survey, it is problematic to draw causal inferences, and thus we have avoided asserting causality in our comments. Also, according to the approach followed by the PLS technique – soft modelling – the concept of causation must be replaced by the concept of predictability (Falk & Miller, 1992).

Equations 1

(A) t-Statistic with \( m + n - 2 \) degrees of freedom

\[
t = \frac{\beta_{\text{Nordic}} - \beta_{\text{Mediterranean}}}{\text{Sp} \times \sqrt{\frac{1}{n} + \frac{1}{m}}}
\]

(B) Pooled estimator for the variance (Sp)

\[
\text{Sp} = \sqrt{\frac{(n - 1)^2}{(n + m - 2)} \times \text{SE}^2_{\text{Nordic}} + \frac{(m - 1)^2}{(m + n - 2)} \times \text{SE}^2_{\text{Mediterranean}}}
\]

SE: standard error of path.

In general, the specified Hypotheses have been supported, with the exception of H4 and H8 (partially supported) and H3.a (not supported) (see Fig. 3). This study thus reveals that the acceptance of Web-based learning technology can essentially be predicted by TAM and flow state.
First, perceived attitude towards use has significant direct effects on intention to use, thus supporting H1. Attitude towards using the Web is, therefore, a relevant mediator between motives and intention to use. Also, H1.a posits that the attitude to use would have a stronger effect in the PSG-Mediterranean culture than in the Nordic culture. The result supports H1.a.

Second, as expected, both H2 and H3 are strongly supported; the role of perceived usefulness in influencing intention to use, H2, and attitude towards usage, H3, is particularly significant in both cultures under investigation. The relationship (usefulness → intention to use Web link) was greater in the Nordic culture than in the PSG-Mediterranean culture, supporting H2.a. However, according to H3.a, the hypothesised intensity difference was not found, thus not supporting H3.a (see Section 5 for an explanation).

Third, the relationship: ease of use → attitude (H4) is significant in both samples; however, perceived ease of use has a negative direct effect on attitude towards use in the Nordic sample (see Section 5 for an explanation). The path coefficient H4.a is also statistically different between the Nordic culture and the PSG-Mediterranean culture. The hypothesised intensity difference was thus found, supporting H4.a, which posits greater influences in the PSG-Mediterranean culture than in the Nordic culture.

Fourth, there is a positive discernible relationship: ease of use → usefulness (H5), supporting the cited hypothesis in both samples. The intensity difference hypothesised, H5.a (ease of use → usefulness) is found between Nordic culture and PSG-Mediterranean culture. The relationship H7 (ease of use → flow link) was also lesser in the PSG-Mediterranean culture than in the Nordic culture, thus supporting H7.a.

Finally, the results show that flow has significant direct effects on attitude (H6). Furthermore, the intensity difference is found between Nordic culture and PSG-Mediterranean culture, supporting H6.a. On the other hand, according to H8, flow is expected to have a positive relationship on intention to use. The results show that flow has no significant direct effect on intention to use in the PSG-Mediterranean sample. Conversely, the hypothesised intensity was found, thus supporting H8.a.

5. Conclusion

The theoretical proposals within this paper analyse the moderating effect of national culture (specifically, individualism and uncertainty avoidance dimensions) on the use of Web-based learning technologies. The measurement model is valid, with adequate convergent and discriminant validity with respect to the measurements of all the constructs. All path coefficients in the structural model are also statistically significant, excepting H8 (PSG-Mediterranean sample). The results of the investigation also indicate an essential relationship between educators’ culture and their intentions to use the technology. Differences between cultures in the ways in which they approach and interact with the ICT were highly relevant to understanding how analysed educators accept them.

Firstly, perceived ease of use – as a direct influence facilitating task-performance and flow – is weighted more strongly by individualistic and weak uncertainty avoidance educators (such as Nordic educators). Furthermore, perceived usefulness exerts a more powerful influence on determining the intention to use the Web, because Web-based learning tools may enhance productivity. Beliefs about usefulness are, therefore, based on the extent to which ICT are seen to enhance the task-performance of individuals, even if they do not have a positive attitude towards using ICT. Likewise, individualistic educators from moderate to low uncertainty avoidance cultures are motivated to perceive ICT use as intrinsically enjoyable. Members of a weak uncertainty avoidance culture might be more broad-minded, with little need for social approval, and more accepting of innovative ideas.

Secondly, the high perceived risk associated with the ICT usage traditionally reduces uncertainty avoidance societies’ perceptions of their self-efficacy in using the technology; its perceived usefulness; and ease of use. Conversely, this low evaluation of perceptions within uncertainty avoidance societies should increase their salience in determining attitudes towards using the ICT; in other words, uncertainty avoidance societies may not be willing to accept a difficult and irritating interface. However, the hypothesised intensity difference, according to usefulness, H3.a was not found. A possible explanation lies in the eminent utilitarian content of Web-based learning applications. Both cultures formed by educators believe that Web-based learning tools are a good thing to apply in a subjective sense, and they will, then, value ICT highly, beyond obtaining immediate rewards from the organisation.
Finally, perceived ease of use has a negative direct effect on attitude towards usage in the Nordic sample. A possible explanation lies in boredom: for more confident educators Web-based applications must be designed to be stimulating and to increase interest. In fact, when the challenges are significantly lower than the individual’s skill-level, boredom may well result.

6. Discussion and implications

The Web offers unprecedented opportunities for worldwide access to learning resources; specifically, the Web and associated technologies have provided a new playground with new rules and tools to deliver instruction and create novel approaches to learning. However, since the Web is a new medium (for educators and learners alike) for course delivery and learning, it is not well known which mediating factors in the online environment contribute more to its acceptance and use.

Culture in particular, is one of the most relevant aspects of a user’s personal and social context. Over the years, research has suggested that attitude formation is influenced by the objective characteristics of the ICT, the extent of use, and individual and social users’ differences. Studies continue to report that educators are not always rational in selecting and using media and technologies, but attitudes towards and the use of media and technologies would be influenced by culture, norms, social contexts, or salient others. In this regard, we conclude from our research and discussion that cultural differences are therefore potentially critical to our understanding of Web-based learning applications acceptance and use; and play an important moderating role in determining how educators make their decisions about adopting and using them. As Hermeking (2005) suggests, “a culturally well designed website may be defined as communicating the right information at the right place with the right layout in the right manner and in the right time, according to the culture of each of its users”.

This study, therefore, has implications for both practice and theory. It shows that cultural variables are relevant to ICT acceptance and usage. Cultural aspects need to be taken into account when developing online applications that are specifically intended for use by a global audience.

- Individualistic and weak uncertainty avoidance scripts (Nordic educators) should thus focus on the following user interface and design elements: work tasks and roles, with quick results for limited tasks (aspects culturally related to goal-directed activities) – usefulness; and, on the other hand, navigation-oriented towards control and attention gained through games and competitions – flow.
- Furthermore, in an attempt to develop positive attitudes towards the Web within collectivistic and high uncertainty avoidance cultures (Mediterranean educators), designers might suggest and introduce courses and programmes to gain more experience and self-efficacy and, in turn, more optimal experiences (flow); and the creation of technical support programmes. For example, flow may well be an important consideration in the design of future Web-based technologies: they must stimulate greater concentration, arousal and self-efficacy. The e-learning sector should look more closely at its relationship quality policies. These policies would specifically promote the progressive reduction of technological anxiety among uncertainty avoidance societies.

In strong uncertainty avoidance societies, educators should be encouraged to anticipate the future and create institutions that establish and reinforce security and stability, and avoid or manage risk. Educators from these societies culturally attempt to reduce personal risk, while at the same time being more likely to resist innovative and creative ideas and conform to the rules. The extent to which this occurs might negatively influence the willingness to use ICT. Universities should, then, attempt to generate trust, not only for the sake of their competence, but also to create goodwill in their management of the educators’ affairs, demonstrating a determined willingness to understand and comprehend their needs and, above all, to be a company capable of establishing and maintaining mutual commitments. Research in European countries by Steenkamp et al. (1999) revealed that, among other dimensions, uncertainty avoidance scores exert a strong cultural influence on users’ innovativeness in general. An important implication, therefore, has to do with educator’s perceptions of trustworthiness, based specifically on online design. For instance, PSG-Mediterranean universities should prioritise support for the control perceived by educators (self-efficacy) and the availability of clear rules and management procedures, as well as any necessary legal aspects that reduce the levels of uncertainty in their relationship with Web-based learning applications. ICT that are easy to understand and use (perceived ease of use) can thus be associated with being able to save effort and avoid anxiety. We suggest the creation of technical support sections, which combine the teaching-based service with precise, simple, and understandable technical information, avoiding the use of jargon (clarity and courtesy). Furthermore, the implications of the technical support services could be summed up as: ease of access (% of calls/e-mails attended to, ease of contact, average waiting time of calls, etc.); speed and efficiency (% of queries answered on the first call/e-mail, average operator time – live chat communicator, etc.); and courtesy (interest shown by the operator, or the treatment received). Therefore, the study has an implication for diffusion theory, or adoption of the Internet: our findings may be taken as an operational basis for more intensive cultural adaptations of the Web-based learning technologies. Our proposals justify the inclusion of moderating cultural variables. These suggestions range from changes in pedagogy and perspective, to make the computer (and its online applications) a collaborative tool; and giving collectivistic cultures a context within the online experience. Therefore, these differences could certainly be controlled and rendered reasonable by the appropriate use of training sessions.

As with any research, our study has certain limitations. Our findings represent only preliminary tendencies. First, one of the main reasons for this is the high degree of complexity and contingency of influences on website design, beyond cultural values and communication styles. Second, Hofstede’s method could, therefore, be a significantly useful framework used in Internet design. However, critics question the applicability of the dimensions to all cultures, emphasising that “one can conjecture that other types of samples might yield different dimensions and order of nations” (Schwartz, 1994; Soares, Farhangmehr, & Shoham, 2007). Researchers most frequently question Hofstede’s methodology and sample. Beyond age-based critiques, they also criticise Hofstede’s dimensions for being data-driven and having insufficient theoretical basis. Straub, Loch, Evaristo, Karahanna, and Strite (2002) argue that individuals may or may not identify with the national culture and can show a different cultural orientation, even though they are in the same country. The social identity theory provides a complementary research perspective to the theoretical framework for IS researchers studying at an individual level.