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# UNIFIED THEORY OF ACCEPTANCE AND USE FOR WEBSITES USED BY STUDENTS IN HIGHER EDUCATION

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**ABSTRACT**

A unified framework for researching technology acceptance, the Unified Theory of Acceptance and Use of Technology (UTAUT), was previously proposed and validated. The aim of this article is to explore the application UTAUT to websites used by students in higher education. Both prescribed websites and user-selected sites were studied using a non-experimental research design and questionnaire-based measures. The results support direct and moderated effects of technology-acceptance variables on acceptance outcomes in the research model, supporting UTAUT. As predicted, the research model—based on UTAUT—was more successful in explaining the acceptance of a prescribed library site than that of a prescribed virtual learning environment. The model was also successfully applied to user-selected websites. User-selected sites were especially intrinsically motivating. The effect of *intrinsic motivation* on *performance expectancy*, mediated by *effort expectancy,* was confirmed. The results demonstrate the broad scope of applicability of UTAUT and motivate its recommended wider use.

## INTRODUCTION

The delivery of higher education and other types of education increasingly relies on web-based systems for information and communication (Ngai, Poon, & Chan, 2007). These systems include Virtual Learning Environments (VLEs), such




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as Blackboard™ and WebCT™, and library information systems—especially academic-library websites. Because intranet and externally accessible websites increasingly become the interface to information for learning materials and communication, usability[1] becomes of paramount importance for progression and retention of students (van Schaik & Ling, 2005). However, usability is not sufficient and large potential gains in effectiveness and performance will not be realized if users are not willing to *use* information systems in general (Davis, 1993) and educational websites in particular; therefore, acceptance[2] is crucial.

## Theory of Acceptance

Since the late 1980s, various models of technology acceptance have been developed and tested. In 2003, Venkatesh, Morris, Davis, and Davis published a landmark paper, the scientific significance of which cannot be overestimated and arguably the most important paper since Davis's Technology Acceptance Model was first published (Davis, Bagozzi, & Warshaw, 1989). The authors reviewed and identified eight main competing theoretical models. They integrated these models in a unified model called the Unified Theory of Acceptance and Use of Technology (UTAUT) and then validated the new model. According to this model, *performance expectancy,*[3] *effort expectancy* and *social influence* have a positive effect on *behavioral intention*. The effect of the predictors of *behavioral intention* is subject to moderator effects from gender, age, experience and voluntariness of use. *Behavioral intention* and *facilitating conditions* have a positive effect on *user behavior*. The research model adopted in the current study incorporates the relationships between technology-acceptance variables described above and is depicted in Figure 1.

The role of mode of use and motivation will now be discussed in relation to technology acceptance. Mode of use is the mental state of a user in relation to a product or system (Hassenzahl, 2003; Hassenzahl & Ullrich, 2007). According to Hassenzahl (2003, pp. 39-40),

> Usage always consists of behavioral goals and actions to fulfill these goals. In goal mode goal fulfillment is in the fore. The current goal has a certain importance and determines all actions. The product is therefore just "a means to an end." . . . In action mode the action is in the fore. The current action determines goals "on the fly"; the goals are "volatile." Using the product can be an "end in itself." Effectiveness and efficiency do not play an important role. Individuals describe themselves as "playful" and "spontaneous."

[1] "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction" (McNamara & Kirakowski, 2006, p. 28).

[2] Technology acceptance can be defined as the demonstrated behavior or willingness by a user to employ information technology for the tasks it is designed to support.

[3] The main model components are presented in Table 1.

Table 1. Main Components of the Unified Theory of Acceptance and Use of Technology

| | |
|---|---|
| Performance expectancy | Extent to which a user believes a system use will help achieving gains in task performance |
| Effort expectancy | Extent to which the user believes that the system will be easy to use |
| Social influence | Extent to which the user believes that important others believe he or she should use the system |
| Behavioral intention | User's intention to use the system |
| Facilitating conditions | Extent to which the user believes that an organizational and technical infrastructure exists to support system use |
| User behavior | User's rate of system use |

The concept of mode of use is related to motivation. Two types of motivation (intrinsic and extrinsic) are distinguished. *Intrinsic motivation* can be defined as performing an activity for inherent satisfaction rather than for an instrumental consequence, but *extrinsic motivation* can be defined as performing an activity in order to achieve some instrumental outcome (Sun & Zhang, 2008). In the context of technology acceptance, *perceived enjoyment* is considered as *intrinsic motivation* (Davis, Bagozzi, & Warshaw, 1992). Because of its focus on actions rather than goals and seeing the product as an end in itself, Perceived Enjoyment will dominate during system use in action mode.

Although Davis et al. (1992), among others, identified the importance of *intrinsic motivation* (the inherent satisfaction derived from system use) as having a strong influence on *behavioral intention*, Venkatesh et al. (2003) dismiss the inclusion of *intrinsic motivation* in UTAUT because its effects on acceptance outcomes are mediated by UTAUT variables. However, as Sun and Zhang (2008) argue conceptually and demonstrate empirically for search engines, *intrinsic motivation* defined as perceived enjoyment is an antecedent of *performance expectancy*, mediated by *effort expectancy*, and thereby ultimately indirectly influences acceptance outcomes. A reason for including perceived enjoyment in Study 2 of the research presented in this article is to confirm the role of *intrinsic motivation* across different websites.

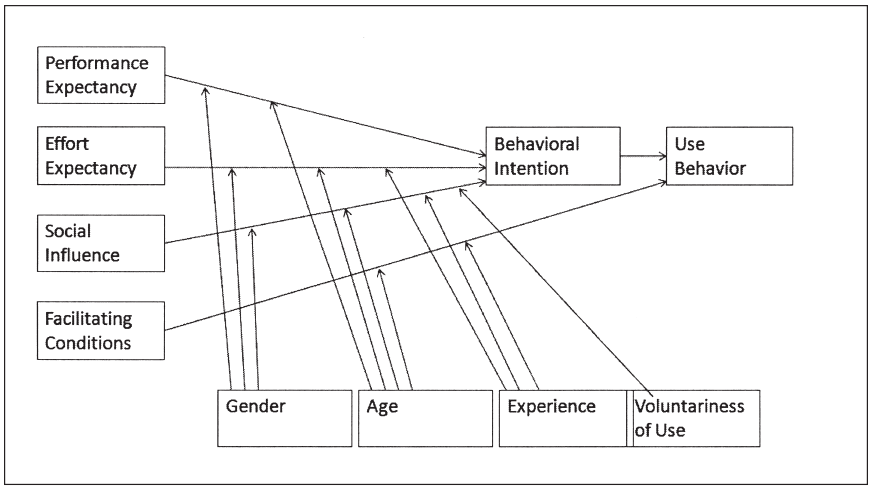



Figure 1. Research model.

## Acceptance Modeling in Education

Theories of technology acceptance have been applied to the World Wide Web in general (e.g., Sánchez-Franco, 2006; Page-Thomas, 2006) and to various types of web-based information system, including students' use of educational systems (Carswell & Venkatesh, 2002; Lee, Cheung, & Chen, 2005; Ngai et al., 2007; Pituch & Lee, 2006; Roca, Chiu, & Martínez, 2006; Saadé & Bahli, 2005; Saadé & Kira, 2007; Selim, 2003; Thong, Hong, & Tam, 2002). Although there is limited research applying UTAUT to study the acceptance of web-based systems in higher education (but see van Raaij & Schepers, 2008), based on UTAUT as well as the theory of technology acceptance more generally and the nature of web-based systems, some predictions can be made. First, increasingly VLEs are a dominant feature of study programs because almost all information and communication for individual modules is delivered through a VLE on a daily basis. The functionality of a VLE is relatively straightforward to understand, that is—although its use requires basic computer skills—it does not require specific academic skills. On the other hand, the use of library sites is not necessary in every aspect of study programs, even though they are important for academic study work. Furthermore, effective use of the functionality of these sites requires some specific library knowledge over and above basic computer skills. Therefore, the use of a VLE will be perceived as an absolute necessity (mandatory use) and consequently it is predicted that the level of acceptance outcomes (*behavioral intention* and *user behavior*) of a VLE will be higher—with (almost) universal use among its users—than that of a library site. The latter

will meet with a lower level of acceptance and more variability, which allows for more influence of acceptance predictors, such as *performance expectancy*, *effort expectancy,* and *social influence* on acceptance outcomes.

Second, ceteris paribus, it is more likely that computer users would find a website chosen more pleasant to use than another site whose use is prescribed; that is, user-selected websites are more likely to be intrinsically motivating. This is even more likely if a site is used in action mode, where use of the site is an end in itself rather than a means toward an end (as in goal mode).

## Current Studies

The aim of the current article is to use the Unified Theory of Acceptance and Use of Technology (UTAUT) for the first time to explore the acceptance of websites used by students in higher education and to investigate the role of *intrinsic motivation.* Specifically, the research set out to test:

a. the relations among technology-acceptance variables predicted by the UTAUT model (Venkatesh et al., 2003) and Davis et al. (1992); and
b. the following hypotheses based on the specific predictions made above.

Hypothesis 1: the level of acceptance of a virtual learning environment is higher and its variability of acceptance is less than those of a library site; because acceptance outcomes of a VLE have less variability, acceptance predictors explain less variability in acceptance outcomes for a VLE than for a library site.

Hypothesis 2: *intrinsic motivation* is higher for a user-selected site than for a prescribed website.

Hypothesis 3: *intrinsic motivation* is higher for a site used in action mode than for a site used in goal mode.

Hypothesis 4: the effect of *intrinsic motivation* on *performance expectancy* is mediated by *effort expectancy*.

Two studies were conducted using a VLE, a library site and other, user-selected, websites, both testing the research model. Study 1 addressed Hypothesis 1, and Study 2 addresses Hypotheses 2, 3, and 4.

# STUDY 1

## Method

### *Design*

A non-experimental design was used, based on the research model (see Figure 1). Dependent variables (acceptance outcomes) were *behavioral intention* and *user behavior* (measured as self-reported time, in hours, per week spent using

a website, outside the experiment). Independent variables (technology-acceptance variables) included *performance expectancy, effort expectancy, social influence* (for the first dependent variable), *facilitating conditions,* and *behavioral intention* (for the second dependent variable). Moderator variables were experience and voluntariness of use (Venkatesh et al., 2003).[4]

### *Participants*

There were 118 undergraduate psychology students (92 female and 26 male) from Teesside University. They took part as a course requirement. Mean age was 22.61 (*SD* = 5.24). All had used the World Wide Web and mean experience of using the Web was 7.18 years (*SD* = 2.84).

### *Materials and Procedure*

A bespoke experimental program written in Visual Basic 6.0 was used to present the home page of two sites (see Figure 2) and questionnaire items for participants to rate both sites in terms of their acceptance. One site was the university's VLE (Blackboard, http://www.blackboard.com/) and the other was the university's library website, both in the academic year 2005-2006.[5] Students had used both sites as part of their academic studies.

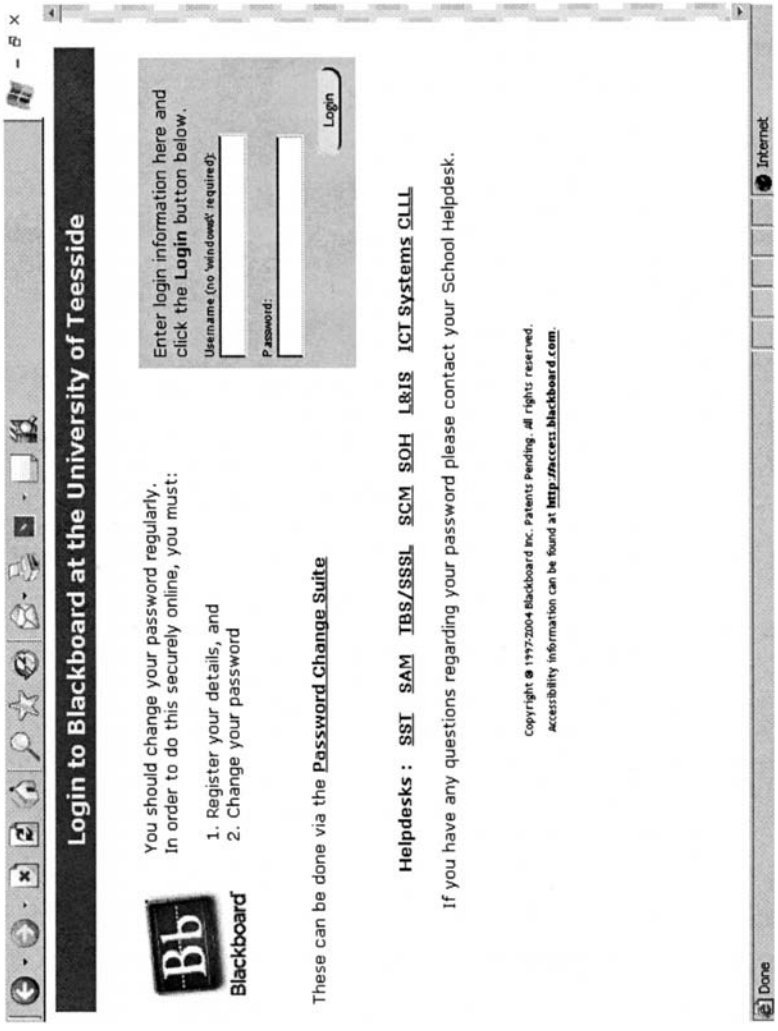
All items were adopted from Venkatesh et al. (2003) and used 7-point Likert scales with endpoints "Strongly disagree" and "Strongly agree" and adapted for the purpose of the current research where necessary. The item set included four items for *performance expectancy,* three for *effort expectancy,* two for *social influence,* two for *facilitating conditions,* and three for *behavioral intention* (see Appendix). Participants took part in groups of 15 to 20 in a computer lab. Instructions explained to participants that they would be asked about their experience of using two existing websites run by the university. They were then individually shown the home page of a website (VLE or library site) and subsequently completed the questionnaire items using the experimental program; the procedure was repeated for the second website. The order of sites was counterbalanced.

## Results

In order to establish psychometric properties of the set of items, factor analysis, and reliability analysis were conducted. *T* tests were used to test Hypothesis 1

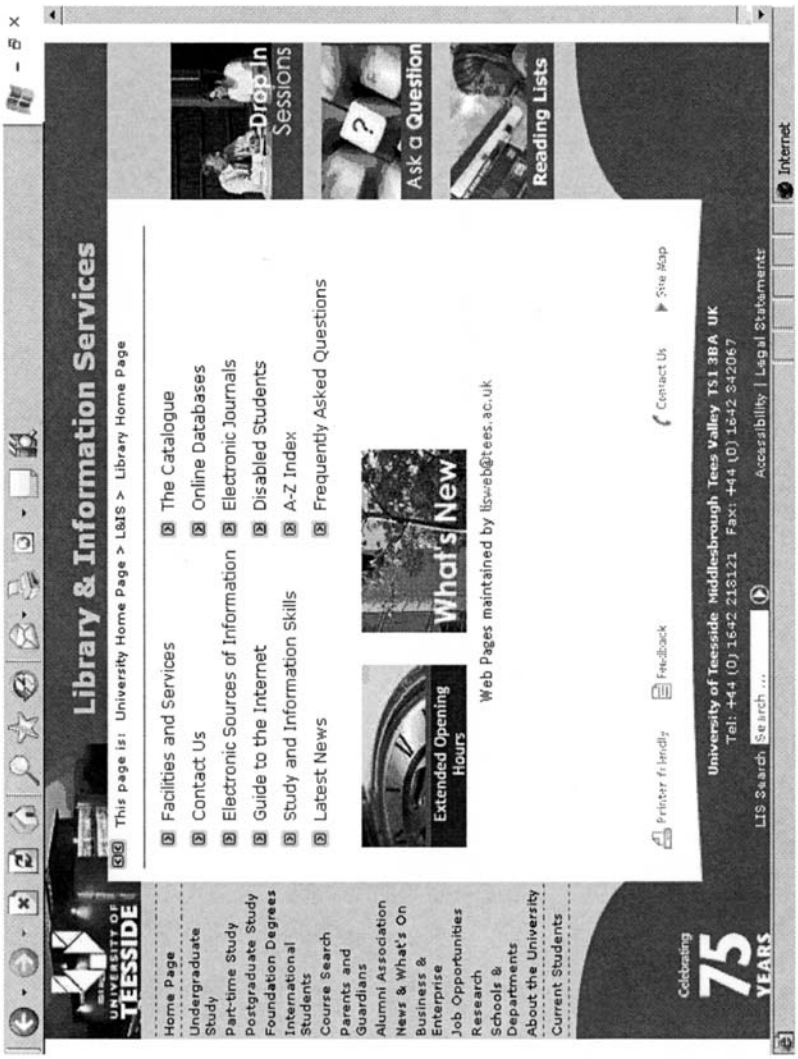
[4] Excluded moderators were gender, because an unequal split in the data, and age, because of a restricted demographic range in the data.

[5] Mean experience was 1.72 years (*SD* = 0.92) for the VLE and 1.70 years (*SD* = 0.76) for the library site.




(a)

Figure 2. Home pages used in Study 1. (a) Home page of VLE. (b) Home page of library site.




(b)

Figure 2. (Cont'd.)

and multiple regression analysis to test the research model. Cohen's (1988) conventions for effect sizes were used.

### *Psychometrics*

For both websites, principal component analysis with direct oblimin rotation produced a five-factor solution. For the VLE, 82% of variance was extracted and 85% for the library site. The factors were *performance expectancy* (absolute size of loadings of factor-specific items ranging from .74 to .92), *behavioral intention* (factor-specific loadings: .81 to .94), *social influence* (factor-specific loadings: .86 to .94), *effort expectancy* (factor-specific loadings: .77 to .96), and *facilitating conditions* (factor-specific loadings: .78 to .93).

All scales were reliable for both sites, with Cronbach's coefficient alpha > .70 (see Table 2). In order to reduce skew and kurtosis, *user behavior* was logarithmically transformed and the transformed variable was used in all analyses. Correlations among *performance expectancy* and *effort expectancy*, and between antecedents of acceptance (*performance expectancy social influence, effort expectancy*, and *facilitating conditions*) and acceptance outcomes (*behavioral intention* and *user behavior*) provide evidence for validity. From the pattern of correlations, the association between the dependent variables and the independent variables appeared to be stronger for the library site than for the VLE.

### *Differences in Acceptance Outcomes between Sites*

Related to Hypothesis 1, mean acceptance outcomes were significantly higher for the VLE than for the library site: for *behavioral intention,* $t(117) = 5.89$, $p < .001$, $r = .48$ (large effect size); and *user behavior,* $t(117) = 2.37$, $p < .05$, $r = .21$ (small to medium effect size; see also Table 2). The variance for the library site was significantly greater than that for the VLE: for *behavioral intention,* $F(117, 117) = 3.37$, $p < .001$; and for (logarithmically transformed) *user behavior,* $F(117, 117) = 1.75$, $p < .01$.

### *Testing the Research Model*

The research model (see Figure 1) with the effects of the focal variables *performance expectancy, effort expectancy, social influence*, and *facilitating conditions* as well as moderation by experience and voluntariness, was tested. Excluded were the moderators age, because of a restricted demographic range, and gender, because of an unequal split.

*VLE*—With a medium effect size, the model for *behavioral intention* was significant with *social influence* as a significant predictor. There were no significant predictors of *user behavior*. The finding that model for *user behavior* was not significant is consistent with the conjecture that the necessity of using a VLE for study in higher education is the overriding factor for its acceptance.

Table 2. Reliability, Descriptives, and Correlations (Study 1)

| | PE | EE | SI | FC | BI | lnUse[a] | rlUse[b] | Use |
|---|---|---|---|---|---|---|---|---|
| A. Virtual Learning Environment (VLE) | | | | | | | | |
| EE | .49*** | | | | | | | |
| SI | .35*** | .19* | | | | | | |
| FC | .24** | .39*** | .41*** | | | | | |
| BI | .09 | .22* | .06 | .25** | | | | |
| lnUse | .05 | .04 | .10 | .10 | −.04 | | | |
| Mean | 6.10 | 6.27 | 4.69 | 5.69 | 6.66 | 1.46 | 5.29 | 4.54 |
| *SD* | 1.01 | 0.82 | 1.51 | 1.20 | 0.75 | 0.63 | 2.88 | 5.72 |
| ICR | 0.90 | 0.88 | 0.83 | 0.74 | 0.82 | NA | NA | NA |
| B. Library website | | | | | | | | |
| EE | .49*** | | | | | | | |
| SI | .44*** | .24** | | | | | | |
| FC | .52*** | .38*** | .60*** | | | | | |
| BI | .61*** | .57*** | .35*** | .44*** | | | | |
| lnUse | .30*** | .21* | .33*** | .32*** | .37*** | | | |
| Mean | 5.34 | 5.31 | 4.18 | 4.75 | 5.94 | 1.30 | 4.67 | 4.48 |
| *SD* | 1.17 | 1.22 | 1.58 | 1.33 | 1.38 | 0.83 | 3.30 | 6.54 |
| ICR | 0.91 | 0.92 | 0.91 | 0.71 | 0.95 | NA | NA | NA |

**Note**: ICR: internal consistency reliability (Cronbach's alpha). Remaining figures are means, standard deviations, and correlations between constructs. PE: *performance expectancy;* EE: *effort expectancy;* SI: *social influence;* FC: *facilitating conditions;* BI: *behavioral intention.*

[a]Logarithmically transformed *user behavior* to reduce skew and kurtosis. [b]Logarithmically transformed *user behavior* retransformed to original scale.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 3. Hierarchical Multiple Regression Analysis (Study 1)

| Criterion | Predictors | β | $R^2$ | Explanation |
|---|---|---|---|---|
| A. Virtual Learning Environment (VLE) | | | | |
| Behavioral intention | Experience | –.05 | .14* | |
| | Voluntariness | .08 | | |
| | Performance expectancy | –.06 | | |
| | Effort expectancy | .19 | | |
| | Social influence | .20* | | |
| | SI × EXP | –.21 | | |
| | SI × VOL | –.10 | | |
| | EE × EXP | .20 | | |
| User behavior[a] | Behavioral intention | –0.04 | .02 | |
| | Experience | 0.13 | | |
| | Facilitating conditions | 0.00 | | |
| | FC × EXP | 0.05 | | |
| B. Library website | | | | |
| Behavioral intention | Experience | .01 | .51*** | |
| | Voluntariness | .09 | | |
| | Performance expectancy | .32*** | | |
| | Effort expectancy | .33*** | | |
| | Social influence | .16 | | |
| | SI × EXP | –.10 | | |
| | SI × VOL | –.07 | | |
| | EE × EXP | –.03 | | |
| User behavior[a] | Behavioral intention | 0.32** | .18*** | |
| | Experience | 0.10 | | |
| | Facilitating conditions | 0.07 | | |
| | FC × EXP | –0.14 | | |

[a]Logarithmically transformed.
*$p < .05$; **$p < .01$; ***$p < .001$.

*Library site*—With a very large effect size, the model was significant for *behavioral intention*. Significant predictors were *performance expectancy* and *effort expectancy*. Both *performance expectancy* and *effort expectancy* have been well-established predictors of *behavioral intention* since the inception of the Technology Acceptance Model (Davis et al., 1989). The effects of *performance expectancy* and *effort expectancy* indicate that those who find the

system more useful and easier to use—in this case for academic study—have a stronger intention to use it. With a medium effect size, the model was significant for *user behavior* and *behavioral intention* was a significant predictor, as predicted by UTAUT.

*Comparison of sites*—In a subsequent single multiple regression analysis, the influence of the predictors on *behavioral intention* across site type (VLE versus library) was directly compared, while controlling for the effect of participant (using criterion scaling; Pedhazur, 1997). Interaction terms between website type and each of the predictors (e.g., site type × *effort expectancy*, site type × *performance expectancy*, etc.) were included. The combined interaction effects were significant, showing that the effect of the predictor set differed between site types, $R^2 = .04$, $p < .05$, with more variance explained for the library site. The same analysis was conducted with *user behavior* as dependent variable. The combined interaction effects were significant, showing that the predictors' effects differed between site types, $R^2 = .07$, $p < .001$, with more variance explained for the library site. The interaction effect of *behavioral intention* with site type was significant, $sr^2 = .07$, $p < .001$, showing that this predictor was more influential for the library site.

#### *Summary of Results*

Test results provided evidence for Hypothesis 1, with higher levels of acceptance and less variability for a VLE than for a library site. Furthermore, the predictors explained more variability in acceptance outcomes for the library site; in particular, and *behavioral intention* was stronger as a predictor of *user behavior* for the library site.

## STUDY 2

### Method

#### *Design*

The same type of design and the same variables were used as in Study 1, with *intrinsic motivation* as an additional variable.

#### *Participants*

There were 121 undergraduate psychology students (96 female and 25 male) from Teesside University, who had not taken part in Study 1. They took part as a course requirement. Mean age was 23.52 (*SD* = 7.09). All had used the World Wide Web and mean experience of using the Web was 8.36 years (*SD* = 2.54).

### *Materials*

A bespoke experimental program written in Visual Basic 6.0 was used to present the home page of the library site and that of two other sites as well as questionnaire items for participants to rate each of the sites in terms of their acceptance. One site was the university's library website in the academic year 2006-2007 (see Figure 3), which students had used as part of their academic studies. The other sites (used in goal mode or used in action mode) were provided by the participants; these were sites that they had used before, with each participant selecting his or her own sites. These sites were not selected in advance of the experiment for each participant, but—after a participant had selected a site—the homepage was displayed in the experiment through the built-in web browser. The program controlled the process of selecting a site and an external search engine was integrated in the program to achieve this.

In addition to the items used in Study 1, three additional items for *intrinsic motivation* (see Appendix) from Venkatesh and Speier (2000) were employed. Venkatesh et al.'s (2003) items for measuring *facilitating conditions* were too specific so that they would not necessarily apply to the other sites that participants selected themselves (see Appendix). Therefore, the items for *facilitating conditions* were only used for the library site.

### *Procedure*

Participants took part in groups of 15 to 20 in a computer lab and instructions stated that they would be asked about their experience of using some particular websites. They were individually shown the home page of the library website and then completed the questionnaire items using the experimental program. Participants were then asked to select one site that they had used with an emphasis on achieving goals ("The next part of the experiment will ask you about a website that you use outside your university studies with an emphasis on achieving goals—where the site is just a means toward an end"). Individual participants decided themselves which sites to designate as the ones they had used in goal mode outside the experiment. This arrangement was appropriate because users could have used products (websites) differently, depending on the situation of use (Hassenzahl, 2003). After the home page of the first site appeared on screen, participants completed the questionnaire items for the site. This procedure was repeated for another site that they used with an emphasis on actions ("The next part of the experiment will ask you about ANOTHER website that you use outside your university studies with an emphasis on actions (rather than achieving goals)—where [using] the site is just an end in itself"). The experiment did not allow participants to select the same site twice.[6]

[6] Mean experience was 1.64 years ($SD$ = 1.10) for the library site, 2.78 years ($SD$ = 2.69) for Site 2, and 3.21 years ($SD$ = 2.94) for Site 3.


Figure 3. Home page (library site) used in Study2.

## Results

In order to psychometrically evaluate the set of items, factor analysis, and reliability analysis were conducted. Analysis of variance (ANOVA) and analysis of covariance (ANCOVA) were used to test Hypotheses 2 and 3, and multiple regression analysis to test the research model and Hypothesis 4.

### *Psychometrics*

For the library website, principal component analysis produced a six-factor solution with 85% of variance extracted. The factors were *performance expectancy* (absolute size of loadings of factor-specific items ranging from .73 to .85), *social influence* (factor-specific loadings: .91 to .93), *intrinsic motivation* (factor-specific loadings: .64 to .94), *behavioral intention* (factor-specific loadings: .86 to .93), *facilitating conditions* (factor-specific loadings: .89 to .90), and *effort expectancy* (factor-specific loadings: .84 to .95). For the two other types of site there was a five-factor solution, with 86% of variance extracted for Site 2 and 85% for Site 3. The same factors (except *facilitating conditions*) were found: *performance expectancy* (factor-specific loadings: .75 to .93), *social influence* (factor-specific loadings: .95 to .99), *intrinsic motivation* (factor-specific loadings: .58 to .98), *behavioral intention* (factor-specific loadings: .83 to .96), and *effort expectancy* (factor-specific loadings: .66 to .90).

All scales were reliable for all types of site, with alpha > .70 (see Table 4). Correlations among *intrinsic motivation, performance expectancy*, and *effort expectancy*, and between antecedents of acceptance and acceptance outcomes provide evidence for validity.

From the pattern of correlations a sizable association between the dependent variables and the independent variables was apparent for all types of site.

### *Differences in Motivation between Sites*

Voluntariness of use was highest for the sites used in action mode (mean = 6.50, $SD$ = 0.90), followed by that of the sites used in goal mode (mean = 6.16, $SD$ = 1.12) and the library site (mean = 5.65, $SD$ = 1.33), indicating higher voluntariness for user-selected sites. As a manipulation check, ANOVA showed a significant effect of website on voluntariness of site use, $F(2, 240) = 19.49$, $p < .001$, $\varepsilon^2 = .09$ (medium to large effect size). All the differences were significant: Site 1 (library site)—Site 2 (goal mode), $p < .01$, $r = .28$ (medium effect size); Site 1—Site 3 (action mode), $p < .001$, $r = .50$ (large effect size); and Site 2—Site 3, $p < .01$, $r = .27$ (medium effect size).

Related to Hypotheses 2 and 3, further ANOVA demonstrated a significant effect of website on *intrinsic motivation*, $F(2, 240) = 108.87$, $p < .001$, $\varepsilon^2 = .31$ (very large effect size). All the differences were significant: Site 1 (library site)—Site 2 (goal mode), $p < .001$, $r = .67$ (very large effect size); Site 1—Site 3

Table 4. Reliability, Descriptives, and Correlations (Study 2)

| | PE | EE | IM | SI | FC | BI | lnUse[a] | rlUse[b] | Use |
|---|---|---|---|---|---|---|---|---|---|
| A. Library website | | | | | | | | | |
| PE | | | | | | | | | |
| EE | .46*** | | | | | | | | |
| IM | .50*** | .58*** | | | | | | | |
| SI | .23** | .03 | .20* | | | | | | |
| FC | .43*** | .34*** | .49*** | .32*** | | | | | |
| BI | .55*** | .42*** | .40*** | .24** | .44*** | | | | |
| lnUse | .26** | .26** | .29** | .07 | .43*** | .22* | | | |
| Mean | 5.06 | 5.2 | 4.05 | 3.72 | 4.69 | 5.65 | 1.22 | 4.37 | 4.08 |
| *SD* | 1.07 | 1.14 | 1.03 | 1.34 | 1.29 | 1.42 | 0.77 | 3.16 | 8.21 |
| ICR | 0.89 | 0.92 | 0.86 | 0.84 | 0.84 | 0.93 | NA | NA | NA |
| B. Site 2, Goal mode | | | | | | | | | |
| PE | | | | | | | | | |
| EE | .59*** | | | | | | | | |
| IM | .44*** | .72*** | | | | | | | |
| SI | .33*** | .35*** | .41*** | | | | | | |
| BI | .29** | .42*** | .48*** | .24** | | | | | |
| lnUse | .38*** | .36*** | .44*** | .24** | | .31*** | | | |
| rlUse | | | | | | | | | |
| Use | | | | | | | | | |
| Mean | 5.33 | 5.67 | 5.29 | 4.44 | | 5.52 | 1.14 | 4.13 | 4.07 |
| *SD* | 1.09 | 1.08 | 1.18 | 1.47 | | 1.53 | 0.78 | 3.18 | 11.75 |
| ICR | 0.89 | 0.92 | 0.89 | 0.93 | | 0.96 | NA | NA | NA |
| C. Site 3, action mode | | | | | | | | | |
| PE | | | | | | | | | |
| EE | .46*** | | | | | | | | |
| IM | .33*** | .71*** | | | | | | | |
| SI | .36*** | .15 | .17 | | | | | | |
| BI | .48*** | .50*** | .44*** | .21* | | | | | |
| lnUse | .30*** | .30*** | .26** | .10 | | .38*** | | | |
| rlUse | | | | | | | | | |
| Use | | | | | | | | | |
| Mean | 5.67 | 5.97 | 5.81 | 4.74 | | 5.83 | 1.20 | 4.33 | 3.56 |
| *SD* | 1.11 | 1.00 | 1.10 | 1.57 | | 1.32 | 0.76 | 3.13 | 4.44 |
| ICR | 0.90 | 0.93 | 0.90 | 0.93 | | 0.90 | NA | NA | NA |

**Note**: ICR: internal consistency reliability (Cronbach's alpha). Remaining figures are means, standard deviations, and correlations between constructs. PE: *performance expectancy;* EE: *effort expectancy;* SI: *social influence;* FC: *facilitating conditions;* BI: *behavioral intention.*

[a]Logarithmically transformed *user behavior* to reduce skew and kurtosis. [b]Logarithmically transformed *user behavior* retransformed to original scale.

*$p < .05$; **$p < .01$; ***$p < .001$.

(action mode), $p < .001$, $r = .81$ (very large effect size); and Site 2—Site 3, $p < .001$, $r = .35$ (medium effect size). ANCOVA, using other technology-acceptance variables (*effort expectancy, performance expectancy,* and *social influence*) as covariates, produced the same pattern of results.

To test the specificity of the effect of website, ANOVA was also conducted on behavioral intention and *user behavior*. There was no significant effect of website on *behavioral intention,* $F(2, 240) = 1.54$, $p > .05$, and *user behavior,* $F < 1$.

### *Testing the Research Model*

The same strategy was used as in Study 1 to test the research model. Test results are presented in Table 5.

*Library site*—With a very large effect size, the model was significant for *behavioral intention*. Significant predictors were *voluntariness, performance expectancy,* and *effort expectancy*. Therefore, as in Study 1, both *performance expectancy* and *effort expectancy* were predictors of *behavioral intention*, confirming previous research (e.g., Venkatesh et al., 2003). With a medium effect size, the model was significant for *user behavior* and *facilitating conditions* was a significant predictor, as predicted by UTAUT.[7]

*Site 2—goal mode*—With a very large effect size, the model was significant for *behavioral intention*. Significant model predictors of *behavioral intention* were voluntariness, *social influence,* and the interaction of *social influence* with experience. Simple effect analysis showed that, for experience at or below the median value, the model was significant with a very large effect size, $R^2 = .47$, $p < .001$. Significant predictors were voluntariness, *effort expectancy,* and *social influence*, all $p < .01$. For experience above the median value, the model was significant with a medium effect size, $R^2 = .20$, $p < .05$, with voluntariness as a significant predictor, $p < .05$. These results confirm Venkatesh et al.'s (2003) finding that the effect of *social influence* is stronger with limited experience. With a medium effect size, the model was significant for *user behavior*, with *behavioral intention* as a predictor, confirming UTAUT's prediction.

*Site 3—action mode*—With a very large effect size, the model was significant for *behavioral intention*. Significant model predictors of *behavioral intention* were voluntariness, *performance expectancy,* and *effort expectancy*, confirming the role of the latter two in shaping acceptance outcomes according to UTAUT. With a medium effect size, the model was significant for *user behavior*, with *behavioral intention* as a predictor, confirming UTAUT's prediction.

[7] The correlation of *behavioral intention* with *user behavior* was significant, but *behavioral intention* did not explain statistically significant unique variability in *user behavior* after controlling for *facilitating conditions.*

Table 5. Hierarchical Multiple Regression (Study 2)

| Criterion | Predictors | β | $R^2$ | Explanation |
|---|---|---|---|---|
| A. Site 1, library website | | | | |
| Performance expectancy | Perceived enjoyment | .31** | .32*** | |
| | *Effort expectancy* | .31** | | |
| Behavioral intention | Experience | .01 | .46*** | |
| | Voluntariness | .36*** | | |
| | *Performance expectancy* | .30*** | | |
| | *Effort expectancy* | .18* | | |
| | *Social influence* | .10 | | |
| | SI × EXP | .03 | | |
| | SI × VOL | .09 | | |
| | EE × EXP | .01 | | |
| User behavior[a] | *Behavioral intention* | .02 | .19*** | |
| | *Experience* | .07 | | |
| | *Facilitating conditions* | .42*** | | |
| | FC × EXP | −.01 | | |
| B. Site 2, goal mode | | | | |
| Performance expectancy | Perceived enjoyment | .02 | .37*** | |
| | *Effort expectancy* | .63*** | | |
| Behavioral intention | Experience | .12 | .35*** | |
| | Voluntariness | .41*** | | |
| | *Performance expectancy* | −.03 | | |
| | *Effort expectancy* | .20 | | |
| | *Social influence* | .19* | | |
| | SI × EXP | −.21* | | |
| | SI × VOL | −.14 | | |
| | EE × EXP | −.05 | | |
| User behavior[a] | *Behavioral intention* | .33* | .11* | |

Table 5. (Cont'd.)

| Criterion | Predictors | β | $R^2$ | Explanation |
|---|---|---|---|---|
| C. Site 3, action mode | | | | |
| Performance expectancy | Perceived enjoyment | $-.01 < \beta < .00$ | .22*** | |
| | *Effort expectancy* | .47*** | | |
| Behavioral intention | Experience | .15 | .42*** | |
| | Voluntariness | .23* | | |
| | *Performance expectancy* | .24* | | |
| | *Effort expectancy* | .20* | | |
| | *Social influence* | .46 | | |
| | SI × EXP | −.06 | | |
| | SI × VOL | −.41 | | |
| | EE × EXP | −.07 | | |
| User behavior[a] | *Behavioral intention* | .38*** | .14*** | |

[a]Logarithmically transformed.
*$p < .05$; **$p < .01$; ***$p < .001$.

Analysis of *intrinsic motivation*—In relation to Hypothesis 4, as shown in Table 4, *intrinsic motivation* was a significant predictor of both *performance expectancy* and *effort expectancy* and also of *behavioral intention* and *user behavior*. As shown in Table 5, the effect of *intrinsic motivation* on *performance expectancy* was fully mediated by *effort expectancy* for Sites 2 and 3, but *effort expectancy* was a partial mediator for Site 1 (the library site). Furthermore, analysis for Site 1 demonstrated that the effect of *intrinsic motivation* on *behavioral intention* was mediated by *performance expectancy*.

### *Summary of Results*

Test results provided evidence for Hypotheses 2 and 3 with highest *intrinsic motivation* for sites voluntarily used in action mode, second-highest for sites voluntarily used in goal mode, and lowest for the prescribed site. Furthermore, significant predictors of *behavioral intention* included *performance expectancy*, *effort expectancy*, and (moderated by experience) *social influence*. Tests of Hypothesis 4 showed that the effect of *intrinsic motivation* on *performance expectancy* was fully mediated by *effort expectancy* for self-selected sites, but partially mediated for the library site.

## DISCUSSION

### Support for Research Model

Support for UTAUT was found in that, first, the technology acceptance variables *effort expectancy*, *performance expectancy,* and *social influence* were antecedents of *behavioral intention*, and, second, *behavioral intention* and *facilitating conditions* were antecedents of *user behavior*. In Study 2, the effect of *social influence* was moderated by experience for sites used in goal mode, indicating a stronger effect of *social influence* for those with less experience; experience was not a moderator for the VLE in Study 1, presumably because of the smaller range of experience than for Site 2 in Study 2. Voluntariness was not found to be moderator, possibly due to restricted range. In general, it appears that for websites used by students in higher education, the main predictors of behavioral intention (on the one hand *effort expectancy,* and *performance expectancy,* and on the other hand *social influence*) are mutually exclusive across different sites. The effect of social influence might be related to (small) groups of students using the same site for coursework in the case of a VLE. The effect of *effort expectancy* and *performance expectancy* may be stronger for sites that use individually without reference to a group of peers or other significant others. Obviously, as discussed below, there may be other factors not captured by UTAUT that could influence acceptance of sites by students in higher education.

In support of Hypothesis 1, the VLE received higher levels of acceptance and displayed less variability in acceptance outcomes explained by predictors than the library site. As web-based systems increasingly become part of students' daily activities and with the increasing integration of VLEs with other (e.g., library) systems, it is likely that the level of acceptance of all these systems will increase further, while the variability in acceptance will decrease and the influence of technology-acceptance variables on acceptance outcomes will decrease. This phenomenon can be described as *acceptance by default.* Although increased acceptance would seem desirable, increased level of use does not necessarily mean that systems are used effectively; that is, making a contribution to meeting learning outcomes by students. For example, although the use of a word processor by computer users is almost universal nowadays, because of the productivity paradox (Carroll & Rosson, 1987), many users will only use a fraction of the available functionality and not use other (more powerful) functionality that could make their use more effective. The reason for this paradox is that users are not willing to invest the time (cost) required to learn additional functions that would boost these users' effectiveness (benefit). This paradox applies in principle to the use of all types of interactive computer system, including web-based systems in higher education. Indeed, users' ability to use a library site effectively for a range of typical tasks is limited (van Schaik, Price, Porritt, & Tilley, 2003) and this is true more generally for users' capability of using

library facilities (Hull, 2000). This is also true for the use of websites in general by web users outside the higher-education sector (Nielsen, 2008). As another consequence of increased level of acceptance—but not necessarily matched by increased effectiveness of use—and decreased variability of acceptance, the possibility of influencing acceptance will reduce and sustained system use may become routinized and automatic rather than deliberate (Venkatesh, Morris, & Ackerman, 2000).

Hypotheses 2 and 3 were also supported; that is, *intrinsic motivation* was higher for user-selected sites than for a prescribed site, *intrinsic motivation* was higher with use in action mode than in goal mode, and *intrinsic motivation* was a significant predictor of *behavioral intention* and *user behavior* for user-selected sites. In support of Hypothesis 4 and consistent with Sun and Zhang (2008), *intrinsic motivation* was an antecedent of *performance expectancy* with *effort expectancy* as a mediator, and was an antecedent of acceptance outcomes for three types of website. Although the effect of *intrinsic motivation* is mediated, the results demonstrate its indirect effect on acceptance. The impact is important because it suggests that intrinsically motivating features of artifacts, such as websites, can indirectly—through *intrinsic motivation, effort expectancy,* and *performance expectancy*—influence acceptance outcomes, although a test of this conjecture is beyond the scope of the current article. Although *intrinsic motivation* can be a powerful factor influencing system acceptance (e.g., Davis et al., 1992), this will depend on the quality of interaction offered by the system. System features that enhance *intrinsic motivation* include challenge, curiosity, control, and fantasy (Malone & Lepper, 1987). It is likely that the user-selected sites, both those used in goal mode, and, even more, those used in action mode, offered more of these features than the prescribed library site. Although no data were collected to verify this, it is plausible that a reason for the significant influence of *intrinsic motivation* of voluntarily used sites in the current study was that users experienced these sites as hedonic rather than utilitarian. This conjecture is consistent with van der Heijden's (2004) theoretical position regarding the power of *intrinsic motivation* in the acceptance of hedonic products. The results from this article and the theoretically justified role of *intrinsic motivation* in the acceptance of hedonic systems lead to a recommendation to reconsider *intrinsic motivation* as a factor in UTAUT, at least for hedonic products.

The research model was tested for two types of web-based system to support learning in higher education as well as user-selected sites (in goal mode and action mode). The model varied in its predictive power of acceptance outcomes and the predictors of these outcomes, with a lower predictive power for the VLE in Study 1, as is consistent with Hypothesis 1. Overall, the results support the direct and moderated effects of technology-acceptance variables on acceptance outcomes in the research model, in support of UTAUT (Venkatesh et al., 2003) and the role of *intrinsic motivation* (Davis et al., 1992).

Previous research focusing on student-users' acceptance of educational systems found evidence for the influence of *performance expectancy* and *effort expectancy* on *behavioral intention* (Lau & Woods, 2009; Saadé & Bahli, 2005; Thong et al., 2002) and *user behavior* (Ngai et al., 2007; Pituch & Lee, 2006), end-user computing satisfaction as a mediator of the effect of *performance expectancy* and *effort expectancy* on *user behavior* (Roca et al., 2006), *performance expectancy* as a mediator of the effect of *effort expectancy* on *user behavior* (Selim, 2003; van Raaij & Schepers, 2008) and the influence of *intrinsic motivation* and *performance expectancy* on *behavioral intention* (Lee et al., 2005). In contrast to the current study, none of these studies used both *behavioral intention* and *user behavior* as an outcome measure, many did not include a VLE and none included a library site.[8] The results from research that studied the acceptance of a VLE complement those of the current study in finding evidence for two predictors of *behavioral intention* (*performance expectancy* and intrinsic motivation in Lee et al., 2005—but *social influence* and *user behavior* were not included in the model) and four predictors of *user behavior* (*behavioral intention, performance expectancy, effort expectancy* and attitude toward use, Ngai et al., 2007—but *intrinsic motivation* and *social influence* were not included in the model).

## Acceptance and System Integration

Although the current study investigated the acceptance of different web-based educational systems (VLE and library system) separately, in reality students need to use these systems together for their academic work. Consequently, the acceptance of a single system is not sufficient for academic success. However, an integrated system can provide a mechanism for a higher level of acceptance and use for the combined available resources. A high level of acceptance of a VLE can be a good starting point for promoting the acceptance of integrated systems (e.g., VLE, library systems, and e-mail). In addition to the advantage of potential high acceptance, another advantage of an integrated system could be that the constituent subsystems will be used more because they are all accessed through the same user interface. However, a potential disadvantage of an integrated system, if not designed carefully, is that users may find different (sub)systems difficult to locate and these may therefore be underused. Furthermore, if different systems with conflicting user interfaces are integrated in the same overall system, users may suffer from usability problems caused by the assimilation paradox (Carroll & Rosson, 1987). This involves users inappropriately employing knowledge of the user interface of one (sub)system to that of another. In addition, because of the

[8] Although Thong et al. (2002) included a digital library, the library site in the current study supported access to both offline and online library materials, whereas a digital library only offers online materials.

productivity paradox, effective use of web-based systems—in particular library systems—is not guaranteed. Library systems require not only procedural knowledge in the use of system functionality, but—more fundamentally—also conceptual library knowledge. Users who lack this knowledge will not be able to effectively use academic library systems and may resort to World Wide Web-searches (Jones, 2002)—perhaps even exclusively using this type of search, and this will result in a poor quality of academic work. The effective use of library systems may be promoted by electronic performance support systems that assist with both procedural aspects of system use (e.g., van Schaik et al., 2006) and conceptual aspects (e.g., van Schaik, Barker, & Famakinwa, 2007; Barker, van Schaik, & Famakinwa, 2007). In summary, integrated, carefully designed and supported systems may result in combined high acceptance with high effectiveness. These considerations regarding integration and the use of electronic performance support apply more broadly to computer-based systems used together in a particular context, beyond students' use of computers in higher education.

## Limitations

Limitations of the studies include the use of a non-experimental design and completion of a survey as part of course requirements. Experimentally designed websites (VLE and library site) with the same style of user interface, but different functionality, and completely voluntary participation by a wider range of students would increase internal and external validity. Although the finding that model for *user behavior* was not significant is consistent with the conjecture that the necessity of using a VLE for study in higher education is the overriding factor for its acceptance, contributing factors to the lack of significance may be:

a. the use of a self-report measure for *user behavior*; and
b. individual-difference variables (e.g., the Need for Cognition; Cacioppo & Petty, 1982) and situational variables (e.g., ease of access to a computer) that were not measured.

## Future Directions

Future research should explore the general applicability of UTAUT, including the role of *intrinsic motivation* and other constructs of motivation (e.g., self-efficacy and task value)—because they have a distinct impact on behavior (see, e.g., Malka & Covington, 2005)—by applying this model to a wider range of systems (e.g., handheld devices—Cyr, Head, & Ivanov, 2006; e-commerce—van der Heijden, 2003; Cyr, Hassanein, Head, & Ivanov, 2007), user populations (e.g., varying in capabilities, experience and perceptions of computers—Shneiderman, 2000), organizations (e.g., commercial and public sector—Nielsen, 2004), and culture (Fusilier, Durlabhji, & Cucchi, 2008). The relation between effectiveness of use and acceptance should also be investigated. Based on the

discussion of the results above, research—in the framework of UTAUT—into students' use of some sites in the context of their peer "network" (e.g., social-networking sites) versus their use of other sites that do not have this context offers the prospect of a further advance in technology acceptance modeling. As a moderator, this social context of use could influence the relative strength of the established predictors (performance expectancy, effort expectancy, and social influence) on acceptance outcomes. Another potentially important moderating influence on acceptance outcomes is national culture (see, e.g., Srite & Karahanna, 2006), in particular in higher education with students from a variety of cultural backgrounds. Furthermore, a burgeoning focus of HCI research is users' aesthetic experience and, more generally, user experience (e.g., Hassenzahl & Tractinsky, 2006); however, the role of aesthetics and user experience in technology acceptance remains under-researched (but see Cyr et al., 2006 and van der Heijden, 2003). The general question for this research is to what extent user experience can enhance system acceptance and, more specifically, how aesthetics variables and other artifact features interact with established technology-acceptance variables in their effect on acceptance outcomes.

## CONCLUSION

UTAUT is a significant synthesis of extant technology acceptance models. The current study used UTAUT to explore technology acceptance to a range of websites used in higher education. As predicted, the research model—based on UTAUT—was more successful in explaining the acceptance of a prescribed library site than that of a prescribed VLE. The model was also successfully applied to user-selected websites, and the impact of *intrinsic motivation* on *performance expectancy* was mediated by *effort expectancy*. The results demonstrate the broad scope of applicability of UTAUT and motivate its recommended wider use.

## APPENDIX—Questionnaire items

### Study 1

*Performance expectancy*

I find X[a] useful in my studies.
Using X enables me to accomplish tasks more quickly.
Using X increases my productivity.
If I use X I will increase my chances of progressing in my studies.

*Effort expectancy*

It is easy for me to become skillful at using X.
I find X easy to use.
Learning to operate X is easy for me.

*Social influence*

People who influence my behavior think that I should use X.
People who are important to me think that I should use X.

*Facilitating conditions*

University staff has been helpful in the use of X.
In general, the university has supported the use of X.

*Behavioral intention*

I intend to use X in the next month.
I predict I would use X in the next month.
I plan to use X in the next month.

*Voluntariness*

My use of X is[b]

*Note*. The items all used 7-point scales. The endpoints were Strongly disagree (presented left) and Strongly agree (presented right), except for Voluntariness.
[a]X: Blackboard (VLE) or the library website.
[b]Endpoints: Nonvoluntary (presented left) and Completely voluntary (presented right)

## Study 2 (library website)

*Performance expectancy:* as in Study 1
*Effort expectancy:* as in Study 1
*Social influence:* as in Study 1
*Facilitating conditions:* as in Study 1
*Behavioral intention*: as in Study 1
*Voluntariness:* as in Study 1
*Intrinsic motivation*

I find using the library website to be enjoyable.
The actual process of using the library website is pleasant.
I have fun using the library website.

*Note*. The items all used 7-point scales. The endpoints were Strongly disagree (presented left) and Strongly agree (presented right), except for voluntariness with endpoints Nonvoluntary (presented left) and Completely voluntary (presented right).

## Study 2 (self-selected sites)

*Performance expectancy*

I find X[a] useful in particular activities outside my studies.
Using X for particular activities outside my studies enables me to accomplish tasks more quickly.

Using X enhances my effectiveness in particular activities outside my studies.
Using X makes it easier to do particular activities outside my studies.

*Effort expectancy*

It is easy for me to become skillful at using X.
I find X easy to use.
Learning to operate X is easy for me.

*Social influence*

People who influence my behavior think that I should use X.
People who are important to me think that I should use X.

*Behavioral intention*

I intend to use X in the next month.
I predict I would use X in the next month.
I plan to use X in the next month.

*Voluntariness*

My use of X is[b]

*Intrinsic motivation*

I find using X to be enjoyable.
The actual process of using X is pleasant.
I have fun using X.

*Note*. The items all used 7-point scales. The endpoints were Strongly disagree (presented left) and Strongly agree (presented right), except for Voluntariness.
[a]X: a website used outside university studies.
[b]Endpoints: Nonvoluntary (presented left) and Completely voluntary (presented right)

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