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A TECHNOLOGY ACCEPTANCE MODEL FOR UNIT GUIDE INFORMATION SYSTEMS

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Abstract

Curriculum mapping is an important task in implementing, embedding and monitoring the knowledge, skills and attributes that graduates must acquire in their program of study. Curriculum mapping ensures correspondence between learning outcomes, learning activities and assessments. To aid in performing this complex task, many higher education institutions are using unit/study guide tools or curriculum mapping tools. These tools may be known under different names in different institutions but we will refer to these tools as unit guide information systems. To evaluate the utilisation and acceptance of these tools, this research-in-progress paper draws on an extensive body of literature related to technology acceptance that includes social cognitive theory and model of PC utilization to explain the influence of perceived usefulness and perceived ease of use. Our research extends the technology acceptance model by incorporating the external variables of self-efficacy, anxiety and social influence. The results are expected to indicate which of the external factors are most important in predicting and explaining attitude and intention to use unit guide information systems.

Keywords: Curriculum mapping tools, Technology acceptance model, Unit guides, Unit Guide Information Systems, User acceptance.
1 INTRODUCTION

A focus on standards and benchmarking in the Higher Education (HE) sector, as we see embodied in the Bologna Process, have also generated much interest and discussion around graduate attributes (GAs) and curriculum mapping. GAs are the qualities, skills and understandings that a university agrees its students should develop during their time with the institution such as communication skills, critical thinking, teamwork, creativity, ethical behaviour and social responsibility. Curriculum mapping ensures correspondence between learning outcomes (LOs), learning activities (LAs) and assessment tasks to measure and provide evidence that graduates have attained the intended LOs and GAs appropriate to their discipline and qualification levels (Cleary et al. 2007). This information is often contained in a Unit Guide (UG). A UG outlines the unit content, its learning objectives, assessments and rules governing the teaching and learning in that unit. Additionally they tend to include other components such as teaching staff details and teaching activities and learning resources. They may be known under many different names such as course/unit outlines, study guides, course guides, unit plan, course finder, syllabus, learning guide or course/unit catalogue.

However, according to Jones (2009), problems associated with current practice around UGs include, but are not limited to: loss of knowledge; duplication of work; little or no knowledge of how one course relates to another; almost certain duplicate development and holes in the curriculum; lack of ability for people teaching and supporting a program to understand the overall picture; and no ability to provide the overall view to students. To address such issues we are seeing in many HE institutions the emergence of a new class of information system: Unit Guide Tools or Curriculum Mapping Tools (Oliver & Whelan 2010). Curriculum mapping tools ensure that decisions about the curriculum are not made in a vacuum. Curriculum maps are a key requirement for curriculum development, which includes identifying professional development needs of academic staff, as curriculum maps provide the necessary information to identify the requirements of a particular course and program.

The process of curriculum mapping produces an object that can help academic and other staff to communicate about the curriculum of a course (Holycross 2006). We will refer to these tools as Unit Guide Information Systems (UGIS). A UGIS is a tool to ensure that: the course has clear and understandable course LOs that are learnable, measurable and assessable and reflect the GAs as appropriate to the discipline; every unit in the course contributes to the student’s achievement of those course LOs; every unit has a syllabus, clear and concise LOs, a teaching pattern (for example, workshops and tutorials) devised to assist students to achieve the outcomes; and assessment tasks which directly measure the students’ achievement of the learning outcomes (UNE 2009).

There appears to be a natural link between curriculum renewal, standards and graduate attributes: Barrie et al. note that “the way a higher education system, university or discipline monitors and assures the development of graduate attributes is one of the most influential drivers of effective implementation” (Barrie et al. 2009 p.23). Information Systems (IS) will play an important role in ensuring that higher education graduates have the necessary knowledge and skills, as envisaged in the most recent national study of the HE system in Australia (Bradley et al. 2008), to drive any knowledge nation and protect and improve its reputation as a global education provider. Unit Guide tools, in particular, will play a central role in achieving these goals.

However, to achieve these important goals, UGIS must be accepted and used. Acceptance of these new tools has not been previously studied or reported. To understand the factors affecting acceptance, we chose to build on existing theory and extend Davis’ (1989) Technology Acceptance Model (TAM). Others have suggested the use of the Technology-Organisation-Environment (TOE) Framework (Baker 2009) in place of TAM. However, TOE focuses on adoption rather than acceptance. The goal of the TAM is to provide an explanation of the determinants of technology acceptance that is in general, capable of explaining user behaviour across a broad range of end-user computing technologies and user populations (Davis 1989; Davis et al. 1989; Saade & Kira 2006). In this paper we introduce a technology acceptance model specifically designed for Unit Guide Information Systems, which we call TAMUGIS (Technology Acceptance Model for Unit Guide Information System).
2 LITERATURE REVIEW

Acceptance of technology is defined as the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support (Dillon 2001). The literature on technology acceptance describes an extensive collection of models and theories that could be used to explain the acceptance of information technology (Venkatesh et al. 2007). These models concern individual acceptance of technology. Typically they incorporate attitude or intention as a dependent variable.

Many theories of technology acceptance have been proposed and expanded for the past decades in current information system research literature. In this context, most of the studies inspiring these theories have generated acceptance models that can be used to determine the likelihood of information system usage and they all attempt to explain what factors influence the acceptance or rejection of the tools by its potential users. Among these, widely used theories are:

- The Theory of Reasoned Action (TRA) (Ajzen & Fishbein 1980). TRA has been used extensively to study technology acceptance.
- The Theory of Planned Behaviour (TPB) (Ajzen 1991). TPB extends TRA by including perceived behavioural control as an additional determinant of behavioural intention. Similar to TRA, TPB has been used to predict intention and behaviour in a wide variety of setting.
- The Technology Acceptance Model (TAM). TAM was developed as an adaption of TRA by Davis (1989) and Bagozzi et al. (1992). It was developed specifically to predict who is most likely to accept new technology in a workplace environment. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, particularly: perceived usefulness and perceived ease of use. Upgrade versions of TAM are TAM2, Unified Theory of Acceptance and Use of Technology (UTAUT) and TAM3.
- Social Cognitive Theory (SCT) (Bandura 1986). SCT is one of the most powerful theories of human behaviour. It is a learning theory based on the ideas that people learn by watching what others do (observation) within the context of social interactions and experiences. Compeau & Higgins (1995) applied and extended SCT for the acceptance of technology to the context of computer utilization.
- The Model of PC Utilization (MPCU). MPCU is largely derived from Triandis (1977) theory of human behaviour. This model presents a competitive perspective to that proposed by TRA and TPB. Thompson et al. (1991) adapted and refined Triandis’ model for IS contexts and used the model to predict individual acceptance and use of an information system.

Research on user technology acceptance in the educational setting is diverse. In education, the use of technology acceptance models to study technology acceptance situations would be a useful tool for understanding and managing technology initiatives. For example, Gong et al. (2004) recognize the significant role of information technology in modern education and proposes a framework comprised of a combination of TAM and social cognitive theory (SCT) to evaluate IT acceptance by teachers. Meso & Liegle (2005) uses TAM to assess the suitability and fit of .NET, as a pedagogical (academic) tool for teaching a technical information system (IS) course. The study proposes the efficacy of the technology acceptance theory as a method for evaluating the pedagogical fit and suitability of specific IT for teaching specific IS courses. Gao (2005) has described the technology acceptance models to serve the purpose of assessing thought-provoking products such as text books and technology systems etc. and provide a valuable tool to educators. Kiraz & Ozdemir (2006) integrate TAM constructs with six different educational ideologies and conclude that different educational ideologies may have different effects on teachers’ technology acceptance. Besides, in the setting of e-learning, Davis & Wong (2007) use TAM and the flow model to improve and analyse students’ participation and engagement with an eLearning system and Saade (2007) proposes and validates the utility of an extended TAM to differentiate between the influences of the performance-related outcome expectations, personal-related outcome expectations.

These studies show that a lack of acceptance of an information system (IS) by its end users serves as an obstacle for the organization and its examination is necessary. On the other hand resistance of technology innovations by users limits the expected benefits. Although in total we identified around
20 studies concerning the acceptance of technology in education, none concern Unit Guide Information Systems (UGIS). Hence, we present our Technology Acceptance Model for Unit Guide Information System (TAMUGIS) next.

3 THE RESEARCH MODEL

Developing a system to ensure that LOs and GAs are embedded across a curriculum is important. Thus, we have constructed a research framework for the acceptance of UGIS which draws on an extensive body of literature related to technology acceptance. To explain our technology acceptance framework, we have adapted various constructs from the intention-attitude models that were originally developed in the psychology and information sciences disciplines. The selection of constructs was based on characteristics, requirements, issues and other features identified in the literature as relevant to the domain of unit guides and curriculum mapping, as we outline below.

This research intends to gain an understanding of the opinions and attitudes of academics, particularly unit convenors, towards accepting a UGIS if it was to be put into use in their department/faculty/university. The theoretical basis for our research draws on constructs from Davis’ TAM and extends it with constructs from Social Cognitive Theory and Model of PC Utilization, as shown in Figure 1.

![Figure 1. Core constructs of the three models (top row) and our selected constructs (bottom row).](image)

We acknowledge that TAM has been criticized for parsimony that hampers its use for guiding systems design and technology management practices that are aimed at enhancing users’ acceptance of technology (Hu et al. 2005). Efforts to address the parsimoniousness of TAM included adding key antecedents (Venkatesh & Davis 2000) and integrating key concepts from other relevant theories (Chau & Hu 2002). Despite the criticisms, TAM has been extensively used as a theoretical underpinning for developing generalized models as well as models targeting specific user acceptance contexts. For example, in an attempt to evaluate and integrate concepts from various models, Venkatesh et al., (2003) conducted a comparison of 8 models and their extensions to propose Unified Theory of Acceptance and Use of Technology (UTAUT). A number of meta-analyses of the TAM have demonstrated that it is a valid, robust and powerful model. For example, Lederera et al. (2000) have recorded more than 15 published studies over a period of 10 years (from 1989 to 1999); King and He (2006) identified 88 studies published on the TAM, that confirm the model can be used in a wide variety of contexts; and a meta-analysis by Legrisa et al. (2003) identified 22 studies that tested the integrity of the models developed using a well-defined methodology as well as providing complete and available results.

Building on extended TAM as others have done, we add a number of constructs from two models, SCT and MPCU, potentially relevant to the UGIS domain. Each of these models has a significant illustrative power; a model which presents an integration of constructs from these models may
present a considerable improvement over a model taken alone (Dishaw & Strong 1999). All these models such as TAM, SCT and MPCU offer an essential understanding into the theoretical basis for exploring the factors that describes the utilization and acceptance of unit guide tools rather than their adoption and its links with the curriculum renewal, standards and graduate attributes. The elements of these models are selected as theoretical concepts (Bagozzi & Phillips 1982) for best description of attitude of academics towards using UGIS and takes into account that attitudes about UGIS will differ among academics. Thus, the academics attitudes towards UGIS can be discussed by combining these different factors. Combination of technology acceptance models, encompass great illustrative influence as compared to theory taken alone. The primary objective of the research allows the suggested framework to be extended to acceptance and use of UGIS (a new IS) in general. Therefore, in line with other uses of TAM in the educational context we did not include outcome expectations (personal and performance related) and affect from SCT and job-fit, complexity, facilitating conditions, long-term consequences from MPCU. However, in keeping with the theory’s roots, the current research will only examine the effect of self-efficacy, anxiety and social influence. We adapted the constructs intention to use, attitude, perceived usefulness and perceived ease of use from TAM; Social influence from MPCU and anxiety and self-efficacy from SCT for this study. Further explanation of our choice of constructs follows.

Attitudes towards curriculum mapping and pedagogical vocabulary need to be addressed through the mapping process to ensure that staff understand the value and become engaged in the process (GCA 2008). The empowerment of academic teaching staff is vital in curriculum review as they are the principal source of curriculum development (GCA 2008). It is important that staff do not perceive the curriculum mapping exercise as threatening or as an administrative burden (Sumsion & Goodfellow 2004). Curriculum mapping can also be a fearful exercise for academics, particularly if they do not understand the content, are resistant to change or have a sense of exclusive ownership of content (Davenport et al. 2009). Due to the nature of the content in a UG, they often act as a form of contract between the teaching staff and student. Unit Guides are often publically available and may be reviewed by academic peers as part of quality assurance processes. Thus, there can be significant pressure to ensure correctness and completeness, often at a time just prior to a course commencing. As a result, it is also feasible that some level of anxiety may be associated with use of the UGIS.

These features suggest that our model should include perceived usefulness (also called performance expectancy), perceived ease of use (also called effort expectancy), attitude towards using the UGIS, intention to use the UGIS, social influence, unit guide specific self-efficacy and unit guide specific anxiety. Hence, it is suggested that.

Hypothesis 1: UGIS specific self-efficacy will have a positive influence on perceived ease of use.

Social cognitive theory (Bandura 1986) suggests self-efficacy as a direct determinant of an individual’s behaviour. According to Marakas et al. (1998), computer self-efficacy is a multi-level construct operating at two distinct levels: at the general computing level and at the specific application level (application specific self-efficacy). General computing self-efficacy is defined as an individual judgment of efficacy across multiple computer domains and application-specific self-efficacy is defined as an individual perception of efficacy in using a specific application or system within the domain of general computing.

In this study, unit guide information system specific self-efficacy is defined as the personal confidence in using the UGIS. Survey questions associated to this dimension will try to measure the belief that one has the necessary skills for using the UGIS.

Hypothesis 2: UGIS specific anxiety will have a negative influence on perceived usefulness.

Hypothesis 3: UGIS specific anxiety will have a negative influence on perceived ease of use.

In general, use of technology often has unpleasant side effects, which may include strong, negative emotional states. Other researchers define information system specific anxiety as a state of mind being fearful or apprehensive when using or considering the system. In this study, unit guide specific anxiety is defined as the feeling or tendency that is associated with a person’s interaction with using
the UGIS. Survey questions associated to this dimension will try to measure the experience / level of uneasiness with using the UGIS.

Hypothesis 4: Social influence will have a significant influence on intention to use UGIS.
Hypothesis 5: Social influence will have a positive influence on perceived usefulness of UGIS.

In this study, social influence refers to the degree to which a teaching staff/academic/unit convenor perceives that their colleagues, HOD, Deans believe he/she should use UGIS. In this model, we hypothesize that social influence will have a positive and significant effect on both perceived usefulness and intention to use unit guide.

Hypothesis 6: Perceived usefulness will have a positive influence on attitude towards using UGIS.
Hypothesis 7: Perceived ease of use will have a positive influence on attitude towards using UGIS.
Hypothesis 8: Perceived ease of use will have a positive influence on perceived usefulness.
Hypothesis 9: Attitude towards using UGIS will have a positive influence on intention to use UGIS.

Extended TAM posits that attitude is a determinant of behavioural intention for system use, and that attitude towards using a particular system is determined by two salient beliefs, perceived usefulness and perceived ease of use. Further, perceived ease of use is a determinant of perceived usefulness because, assuming other things being equal, users consider a system more useful when it is more effort-free. These relationships have been examined and supported by many prior studies (Davis 1989; Davis et al. 1989; Venkatesh & Davis 1996, 2000).

With respect to social factors, our research model identifies perceived usefulness and perceived ease of use as key factors. Perceived usefulness is both used as an independent and dependent variable since it is predicted by perceived ease of use, and it predicts attitude towards using unit guide and intention to use unit guide at the same time. The model identifies attitude towards using unit guide attitude towards using unit guide as a critical determinant of acceptance of the technology. In this study, attitude reflects a teaching staff/academic/unit convenor’s feelings of favourableness or unfavourableness towards using UGIS. According to TAM, SCT, and MPCU, individuals with a positive attitude towards a technology are more likely to accept a technology than those not showing such an attitude.

Figure 2 illustrates the research model. This captures UGIS specific anxiety and UGIS specific self-efficacy as antecedents to perceived usefulness and perceived ease of use for UGIS. The two constructs in turn influence attitude towards using UGIS. Moreover, social influence is an antecedent to perceived usefulness and intention to use UGIS.

Figure 2. The Research Model for TAMUGIS.
4 PROPOSED RESEARCH METHOD

To test the proposed research model the survey method will be used for data collection and the model assessed using the partial least squares (PLS) approach to structural equation modelling. The researchers will use the PLS because it: best applies if the phenomenon to be investigated is relatively new and it makes fewer demands regarding sample size than other methods; does not require normal-distributed input data (Urbach & Ahlemann 2010). For this research we will use the linear process flow adopted by PLS framework discussed by Urbach & Ahlemann (2010) as shown in Figure 3. The framework presents a generic process model. The reason to choose this framework is because in many cases, researchers decide to return to previous steps in order to revise decisions made, either because intermediate results make this necessary or the researchers may want to compare alternative model variants or data analysis approaches.

Figure 3. Framework adopted for applying PLS in structural equation modelling by (Urbach & Ahlemann 2010)

The PLS algorithm consists of a preparatory phase, an iterative main procedure, and a final phase. During the first phase, all variables are normalized so that results can be interpreted easily and the main procedure can apply simplified computations. The main procedure consists of two steps. The first step is called outside approximation and the second step is called inside approximation. Both steps of the main procedure estimate all variables in the form of weighted aggregates and the calculation of the weights is done by means of regression. During the final phase of the algorithm, factor loadings, path coefficients, as well as validation measures, are computed. All constructs in the research model are mainly adapted from Venkatesh et al. (2003).

A survey has been developed as an instrument for data collection to achieve the following objectives:
- To check the acceptance of the UGIS.
- To identify the influence of external variables in the acceptance of UGIS.
We have adopted the questions used previously to measure the constructs included in our model, adapting the wordings of the items to the context of using UGIS. All items will be measured using a 5-point Likert-type scale ranging from “Strongly Disagree” to “Strongly Agree” with a middle neutral point. The scales measuring perceived usefulness (8 items), perceived ease of use (9 items), UGIS specific self-efficacy (7 items), UG specific anxiety (4 items), social influence (5 items), attitude towards using UGIS (4 items) and intention to use UGIS (4 items) are mainly adapted from the meta-study by Venkatesh et al., (2003). Altogether, the final survey instrument includes 41 items representing the 7 main constructs, as well as demographic items (e.g. gender, faculty, department, position, current role, experience etc.) and unit guide tool/template information and evaluation items.

To test the usability of our instrument we conducted a small voluntary pilot with convenors in our own institution. Three females and one male participated in our pilot study. Three were senior lecturers (Computing Department—male, Accounting Department—female, Statistics Department—female) and one associate lecturer (Mathematics Department—female). At this stage it is premature to attempt to draw any conclusions regarding the model. However, we note some results which will be interesting if in our full study the same findings are revealed. The pilot indicated some concerns over reduced productivity, voluntariness of the system and the lack of fit with their current processes. There was agreement on the ease of use; however this perception was contingent on adequate support, namely built-in or human help.

As the next phase of this study, we have invited academics and unit convenors at universities across Australia that are using curriculum mapping tools to participate in our study via a survey instrument. Since the use of a UGIS is internal to an organisation, we do not know which institutions, departments and individuals are using this new class of information systems. Following the recruitment procedure in our Human Ethics application, in early 2012 we contacted all Learning and Teaching Associate Deans and Directors of Teaching in every faculty in all of the 39 universities in Australia, requesting them to pass on an invitation to participate in our study to their teaching staff. Although many HE institutions are interested in UGIS, they are not yet in wide use. For example, at our own institution a UGIS will be rolled out in the second half of 2012. We are uncertain how many institutions have deployed tools and we do have not control over whether our invitation is passed on. Nevertheless, to date we have 105 responses. Our next step is to use the software package, SmartPLS 2.0, on our data to develop and assess the measurement model and the structural model. Although UGIS are only emerging across Australia, understanding better the factors which influence the use of UGIS at this early stage in the market will be even more valuable in influencing the design and deployment of UGIS in the future.

5 CONCLUSION

The aim of this study is to expand our understanding of the technology acceptance of UGIS that influence unit convenors and academics “attitudes” and “intentions” regarding the process of curriculum mapping. This study is expected to contribute to a better understanding of academics and unit convenors willingness to use unit guide tools.

In this study a research model has been developed that brings together the various intention-attitude theories to explain technology acceptance. The proposed model will then be assessed using survey data and the PLS-Path Modelling approach. The results are expected to demonstrate the importance of unit guide specific anxiety and self-efficacy on usefulness and ease of use, and the impact of attitude and social influence on intention to use unit guides. At the same time, it is expected that there will be some limitations with this work. For example, this study discusses the role of three external variables (anxiety, self-efficacy, social influence) in the acceptance of UGIS. Although, these external variables are widely acknowledged in the technology acceptance literature there may be other external variables impacting the acceptance of UGIS that have not been included in the research model.

As UGIS aim to assist with embedding of GAs within a program of study and ensure that LOs have been achieved by graduates, the findings of this study are expected to be useful to the higher education sector by contributing towards the establishment and maintenance of cross institutional standards and benchmarks.
References


