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ONLINE EDUCATION: UNDERSTANDING MARKET ACCEPTANCE IN THE HIGHER EDUCATION SECTOR OF SINGAPORE

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Abstract
The advent of the Internet/World Wide Web and its application to the field of education has provided new opportunities for teaching and learning. To cater for the large number of potential new students worldwide, many universities and for-profit education providers have introduced online programs. In Singapore, Web-based online education has not attracted as many students as had been expected. To attempt to explain this situation this study identifies and describes market acceptance factors. Empirical results from in-depth pilot interviews and extensive questionnaires showed that there was a multiple factorial influence on the market acceptance of online education in Singapore at the undergraduate and post-graduate level. This factorial influence can be partitioned into five factors: trust, courseware design competency, individual competency, institutional competency and finally a pull factor.

Keywords
Online learners, market acceptance, higher education

Introduction

There is a growing body of evidence suggesting that many students lack the capacity and inclination for the type of independent learning that the online learning environment demanded (Chipman 2001, Mason & Weller 2000). The cost of securing Internet access was not the main inhibiting factor as a survey of Central Queenland University students indicated that 88 percent have multiple access modes (Chipman 2001). Mason and Weller (2000) stressed that the main reasons stated for dropout in module T171 at the Open University (UK) were increased work or family commitment and not a lack of face-to-face tutorials. They further stated that the lack of prompt feedback by the tutor; ambiguous instructions on the Web; the extent to which the course content and presentation fitted the student's expectation; and their learning style; the amount of time, patience and self-discipline the student devoted to their course, affect student satisfaction within the Web-Based Learning (WBL) environment. Similarly, Warner, Christies and Sarojini (1998) cautioned the enthusiastic policy and funding support for online learning in the Australian VET system. They reported that 70% of Australian VET learners lack the disposition and skill readiness for self-directed learning, the basis of online education.

Kozlowski (2002) observed that students expressed satisfaction with having the course facilitator physically available for consultation and advisement when she was evaluating a model developed and implemented in an accredited nursing school using online and face-to-face methodologies. The face-to-

face component encouraged a sense of community and peer support that is lacking in an entirely online course. Similarly, the study by Helmi (2002) showed that the majority of respondents still valued direct interaction with a lecturer as a valuable experience that can enhance their interpersonal skill. Hill (2001) articulated that applying the right strategies and techniques for community building may lead to enhanced course outcomes (retention, satisfaction and learning outcomes) in the WBL environment. Stokes (2001) further examined the effect of the learner's temperament on the learner's satisfaction with learning in a WBL environment and concluded that college students with diverse temperaments were suitable for learning in the digital instructional environment regardless of age.

There is a need for awareness that specific types of visual presentations can improve learning and careful attention to the principles of learning can improve the design of Web-based lessons (Romero et al. 2000). Feedback from patterns of usage and external reviews of Wolfe's (2001) work provided evidence of the effectiveness of using extended analogies such as cover stories that create an analogy between the learner's position and a hypothetical situation. Data from Wolfe's offline study with undergraduate science students indicated that learners' generated analogies were associated with significant improvements in the ability to place events in natural history on a time line. Ragan and White (2001) reported on how online instructors could improve their email communications with students and so improve the appeal of online education. The authors asserted that the unusual demand for written communication (in speed, volume and clarity) in a Web environment presents a great potential for miscommunication. The study concluded that electronic communication that make students work to uncover the topic could make students unnecessarily frustrated and impatient; and structuring a concise and focused message is imperative in the online environment. Easy and immediate access by learners to the right content at the right time could motivate people to learn and apply their knowledge and skills to improve their individual and organisational performance (Levesque & Kelly 2002). To improve user acceptance of a learning site, Levesque and Kelly recommended: a) Friendly format that facilitates easy navigation through the content; b) Book-marking that allows the student to return to the last page studied; c) Interactivity; d) Visualisation technologies; e) Feedback throughout the learning experience.

Significant increases in the drop-out rate were reported when Nova Southern University (NSU) eliminated all mandatory trips by online students to the campus and replaced it with a Web-based orientation (Lieblein 2000). In subsequent years, NSU continued the Web-based orientation, introduced optional on-campus orientation and mailed students CD-ROMs that covered all orientation topics with full sets of literature and videos of the campus. The resultant declined in the student drop out rate confirmed Dringus's (2000) observations that an effective orientation for online students was crucial to student retention and help students learn how to succeed in the online culture they were entering. Leiblein further commented that an online student is time sensitive to a teacher's response to query or feedback and that the online learning environments must convey a sense of class, school and university.

In particular, four findings from the literature search deserve further study in the Singaporean context. Firstly, Chin, Bauer and Chang (2000) reported that Asian students generally found communicating online less threatening and were more willing to participate using this medium. They also reported that online education was popular amongst students regardless of cultural background. However, this paper encouraged further study on cultural differences as another differentiator for personalisation of online educational offerings in view that Asian students have significantly more trouble dealing with tasks related to online education and recorded less access to Web-based materials than Anglo-Saxon students.

Given the qualitative nature of the Chin, Bauer and Chang (2000) research, one has to be aware that their findings were the result of the researchers' interpretations. Secondly, Hofstede (2000) articulates that Anglo-Saxon students are more in-tune with student-centred educational situations whereas Asian students prefer a teacher-centred approach. If these findings are true, then it will have a major impact on any overseas universities intending to penetrate Singapore's education market. Overseas universities need to restructure their present course format in terms of the level of sophistication, pre-requisites and so on. This may explain the low acceptance of total online programs in Singapore. Thirdly, the study by Tan and Lambe (2002) reported that the low preference for Web peer-to-peer interaction among online learners present tough obstacles ahead for any attempts to build online learning communities in Singapore. In contrast, a study by Gilliver, Randall and Pok (1998) with Singaporean students revealed that the use of

IT resources can improve student learning outcomes and that there were productivity gains for educators as a result of effective use of Internet resources to deliver learning materials.

Finally, there is lack of discussion of government support, policies, course accreditation and funding in relation to the market acceptance of online education in any of the literatures. Given that 50% of Singapore's households have Internet access (Survey 2000), the adaptive use of Internet in education or society in general can contribute to a more knowledgeable population and thus contribute to the overall productivity and competitiveness of the Singapore economy. Thus, this study aimed to answer the following questions: (1) What factors affect online education market acceptance in the higher education sector in Singapore? (2) Which is the most influential factor in the market acceptance of online education in Singapore at the undergraduate and post-graduate level?

Methodology

A two-stage research design was utilised in this study. In stage 1 (exploratory study), qualitative data collection through semi-structured in-depth interviews (from education experts) was undertaken with the aim of confirming that the variables identified in the literature review were valid in the Singapore context. The second aim was to identify any other variables specific to the Singapore environment not identified in the literature review (literature gap). A 4-factor hypothetical model (adapted from Engel, Blackwell and Miniard 1990; Lawley 1998) was then developed with inputs from the literature search and in-depth interviews. The following hypotheses were then generated:

Hypothesis 1: There is a multiple factorial influence on the market acceptance of online education in Singapore.
Hypothesis 2: 'Courseware design competency factor' has the most influence in the market acceptance of online education in Singapore.
Hypothesis 3: 'Institutional competency factor' has the most influence in the market acceptance of online education in Singapore.
Hypothesis 4: 'Pull factor' has the most influence in the market acceptance of online education in Singapore.
Hypothesis 5: 'Individual competency factor' has the least influence in the market acceptance of online education in Singapore.

Stage 2 involved a descriptive analytical study where a survey was used to collect data. Data collected from in-depth semi-structured interviews and information from the literature search (stage 1) guided the development of a questionnaire for hypotheses testing. A pilot survey was conducted to assess its face validity. The final questionnaire contained the following sections:
- Section 1 covered the demographic profile of the respondents. As this study concerns online education, the respondent's background (education level, age, marital status, computing skills) may affect the survey outcome.
- Section 2 attempted to reconfirm the additional findings from the exploratory study.
- Section 3 asked respondents to rate the importance of the core findings from the resulting exploratory study to identify factors (attributes) that may affects the market acceptance of online education in Singapore (influence attribute measurement scale). It is aimed to confirm or disconfirm the hypotheses developed earlier.
- Section 4 requested respondents to rate the importance of the evaluation criteria for online education by a regulatory body (evaluation criteria measurement scale).

Closed questions were used in all sections of the questionnaire. A seven-point numerical rating scale from 'not at all important' (1) to 'very important' (7) was adopted in sections 3 and 4.

Sampling frame

In stage 1, opinions of online education professionals, members of the teaching profession and past users of online education were sought. Only experienced users of online programs (at least two) were selected for the in-depth interviews. Stratified snowball sampling was used (quota in each target group set arbitrarily at five). In stage 2, the population being studied was defined as those individuals *intending* to enrol in undergraduate and post-graduate degree education. Stage 2 utilised both interviewer-completed and respondent-completed questionnaires. Stratified sampling was used (categorised into students, working professionals and retirees). After consideration of several alternatives, the best available population frame was junior colleges offering pre-university courses and polytechnics offering diploma courses in the student category. Students were randomly selected at three junior colleges and three polytechnics. The survey of working professionals and retirees was done at community centres, libraries and randomly selected companies (selected from business directories). Letters were sent to companies requesting consent to conduct the survey in their office premises or by mail. A distribution list was kept. Overall, 667 questionnaires were distributed by mail, email, fax or by the interviewer and 463 questionnaires were returned over a 5 weeks period (response rate=69.4%). Out of those questionnaires returned, 26 were rejected due to missing responses or interviewees expressing non-interest in continuing their studies.

The survey respondents consisted of 52.6% male and 47.4% female. There was an almost balanced number of junior college/polytechnic students (48.1%) and working adults (43.5%). About half (47.4%) of the respondents indicated their intention to study for an undergraduate degree while 36.2% indicated interest in the post-graduate study. A fair percentage (16.5%) were interested in diploma level study. Most of the respondents rated themselves as often/very often users of the Internet (64.8%) while 25.6% rated themselves as occasional users. Only 9.7% of the respondents rated themselves as never use or rarely use the Internet before the survey.

Method of analysis

Data analysis of the survey data began with the preliminary analysis of the data set to eliminate out-of-range scores, outliers and normality checks using Statistical Package for Social Science program (SPSS Inc. 2001) in preparation for descriptive and correlations analysis. To increase the accuracy of the data for analysis, this study adopted an approach where missing responses or incomplete questionnaires rendered the questionnaire invalid for further analysis (reject). The results of the preliminary analysis revealed that the sample data was negatively skewed while the descriptive statistics showed a normal distribution. Special attention was given to confirm the factor scale items underlying the structure of the research hypothetical model prior to hypotheses testing. Given that there were 437 samples in the survey, it met the primary requirements for factor analysis (5:1 case/variable ratio). To test the factorability of the data set, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used. Tabachnick and Fidell (1996) recommended a correlation coefficient of 0.3, a KMO index of >0.6 and Bartlett's $p<0.5$ as appropriate for factor analysis. This study employed both Kaiser's criterion (eigenvalue >1.0) and Catell's scree test for factor extraction or determining the smallest number of factors to best represent the inter-relations among the set of variables. The Kaiser criterion has been recommended in situations where the number of variables is less than 30 or when the number of respondents is greater than 250 and where the mean communality is >0.6 (Stevens 1996). All the four factor scales in the research hypothetical model were subjected to exploratory factor analysis (EFA) using SPPS's Principal Component Analysis (varimax rotation) technique. All four factorial scales had a KMO index greater than 0.6 and Bartlett's $p<0.5$ indicating the appropriateness for factor analysis. The factor analysis results of each of the four factor scales (construct) are shown in Figure 1.
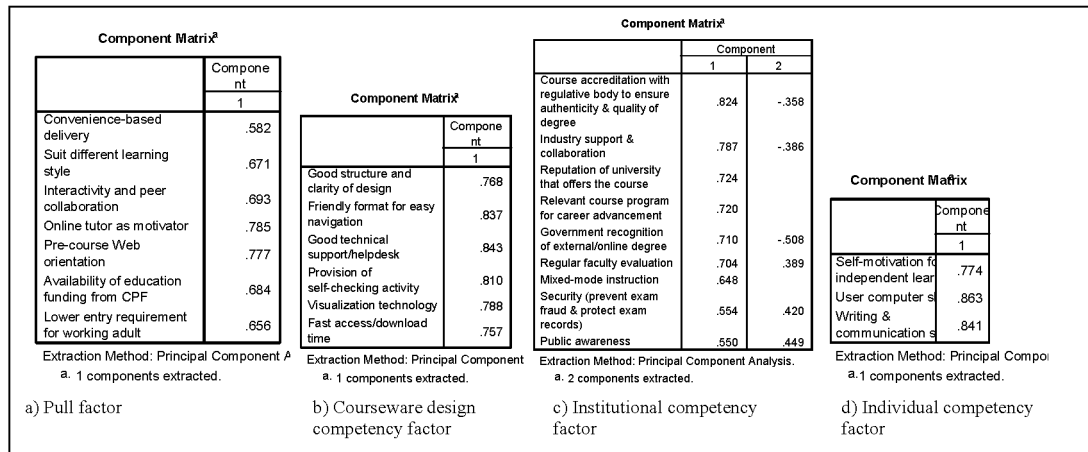
Fig 1 Principal Component Analysis results of the four factor scales in the hypothesised model

The results indicated that the measurement items in three out of the hypothesised four factor scales (pull factor scale, courseware design competency factor scale and individual competency factor scale) were best represented by a single construct (factor). Its respective component matrix tables and scree plots revealed that these three factorial scale measurement items could only have one component extracted (eigenvalue >1.0). However, EFA of the institutional competency factor scale in the hypothetical model extracted two factors. Thus, the trust factor scale was added to the original hypothesised model, comprising of six items with loading factors ranging from 0.55 to 0.72. The modified institutional factor scale now comprised of three items with loading factors ranging from -0.36 to -0.51. The re-specified model (5-factor model) is presented in Figure 2.
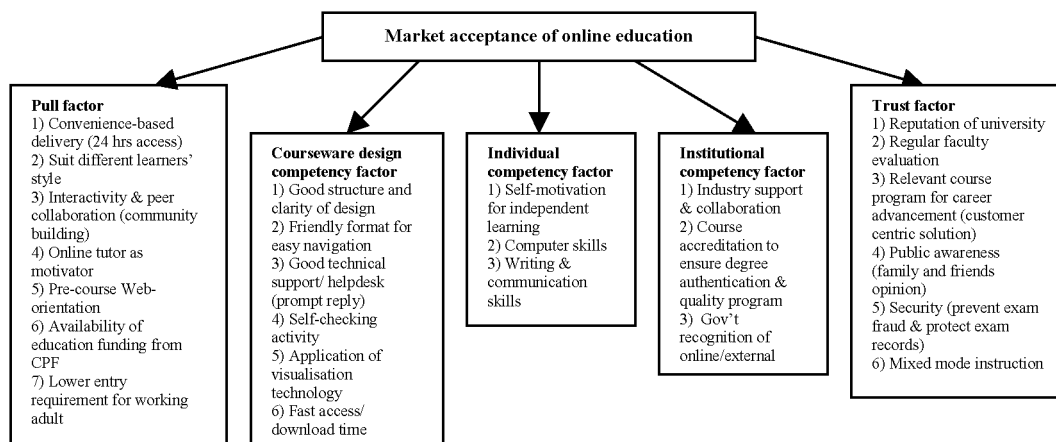

Fig. 2 Re-specified research model for factors influencing the market acceptance of
online education in Singapore at the undergraduate and postgraduate level
(Note: Trust factor was extracted from the institutional competency factor to improve the original hypothetical model)

Factorial validity test of the measurement model

Subsequently, Structural Equation Modelling (SEM) using AMOS 4.0 program (Arbuckle 1999) was conducted on all five factorial scales (measurement model) prior to full model test. The purpose of modeling each measurement model was to test the factorial validity of each theoretical construct (Bryne 2001). Given that correlation of error terms would destroy the underlying meaning of the construct (Andersen & Gerbing 1988), care was taken not to correlate any error terms. The violation of assumption of multivariate normality in this study was assumed not to be critical, given the use of Maximum Likelihood estimation in the AMOS program which is fairly robust to violation of assumptions for fairly large samples (Anderson & Gerbing 1988). Basically, all outputs of the SEM estimation process advised

that the discrepancy between the sample covariance matrix S and the population covariance matrix $\sum(\theta)$ is minimal (that is, $[S - \sum(\theta) = $ minimum]. This gave the assurance that the estimation process yielded an admissible solution. Furthermore, all parameters had no correlation >1.00 and no negative variances suggesting the feasibility of parameters estimates. Each of the measurement models will be assessed separately

The AMOS outputs on the measurement models of *trust factor* did not show much discrepancy. The measure fits statistics showed p=0.19, CMIN/DF=1.38, RMSEA=0.03 indicative of good fits. The AMOS output on the next measurement model of *pull factor* revealed that all seven variables had critical ratios above 1.96 suggesting factorial validity. However its CMIN/DF value is higher than the recommended value for good fit. A review of its Modification Indices (MI) showed high (error) covariance between two residuals indicating a possibility that the two items involved might be measuring the same thing. A re-run of the analysis without one of the items involved (suit different learning lifestyle) significantly improved its fit statistics (p=0.03, CMIN/DF=2.07 and RMSEA=0.05) for factorial validity. Meanwhile, the initial analysis results on the measurement model for *courseware design competency factor* revealed poor fit measures. Its MI showed high error covariance between two particular variables (good structure/clarity of design and friendly format for easy navigation). A re-run without one of the variables involved (friendly format for easy navigation) substantially improved its fit statistics (p=0.01, CMIN/DF=3.00 and RMSEA=0.06)

According to Byrne (2001), CFA of any three items would produce a just-identified model. In a just-identified model, the number of data variances and co-variances equals the numbers of parameters to be estimated and are of no scientific interest because they have no degree of freedom and thus cannot be rejected. Given that the measurement model of *individual competency factor* has only three variables and thus would produce a just-identified model, two variances were constrained to obtain fit statistics on one degree of freedom (p=0.24, CMIN/DF=1.37 and RMSEA=0.03). Similarly, as the measurement model of the *institutional competency factor* also has three items (just-identified model), constraints were initially placed on two variances to obtain fit statistics on one degree of freedom. However, this produced a CMIN/DF value greater than 3.0, beyond the recommended CMIN/DF value for good fit (Holmes-Smith 2000). Thus, constraints were placed on two regression paths with almost identical regression weight (industry support and course accreditation) to obtain good fit statistics based on one degree of freedom (p=0.42, CMIN/DF=0.64 and RMSEA=0.00).

The re-specified research model can be considered as a recursive full latent variable model as it had only a unidirectional regression path among the latent variables. Figure 3 summarised the results of the structural test conducted on the re-specified research model. The test statistics revealed sufficient evidence of goodness-of-fit between the re-specified research model and the sample data for further hypothesis testing in view that:
a) Its CMIN/DF value of 2.67 was within the indication of goodness-of-fit measures (Holmes-Smith 2000).
b) Its RMSEA point estimate of 0.06 equalled the cutoff value suggested by Hu and Bentler (1999), and its upper bound 90% confidence interval of 0.07 were within the range recommended by Browne and Cudeck (1993) for data fit. Interpretation of the confidence interval indicated that it can be 90% confident that the true RMSEA value in the population will fall within the bound of 0.05 and 0.07 which was a good degree of precision (Steiger 1990).
c) Its Hoelters' 0.05 and 0.01 CN values were a borderline case of 200, the indication mark for sufficient sample to yield an adequate model fit for a chi-square test (Hu & Bentler 1999).

Fit measures
Chi-sq=606.48
DF=227
P=0.00
CMIN/DF=2.67
RMSEA=0.06
RMSEA low bound=0.05
RMSEA upp bound=0.07
H 0.05 index=200
H 0.01 index=201

Modification Indices

Covariances:	M.I.	Par Change
r2<-->r4	33.75	0.15
cd4<-->r1	18.29	0.12
cd1<-->r3	22.53	0.15
ic1<-->cd6	15.28	0.14
ic1<-->cd4	15.01	-0.12
t6<-->r4	52.20	0.317
t6<-->isc1	16.070	0.149
t3<-->r1	16.128	0.171

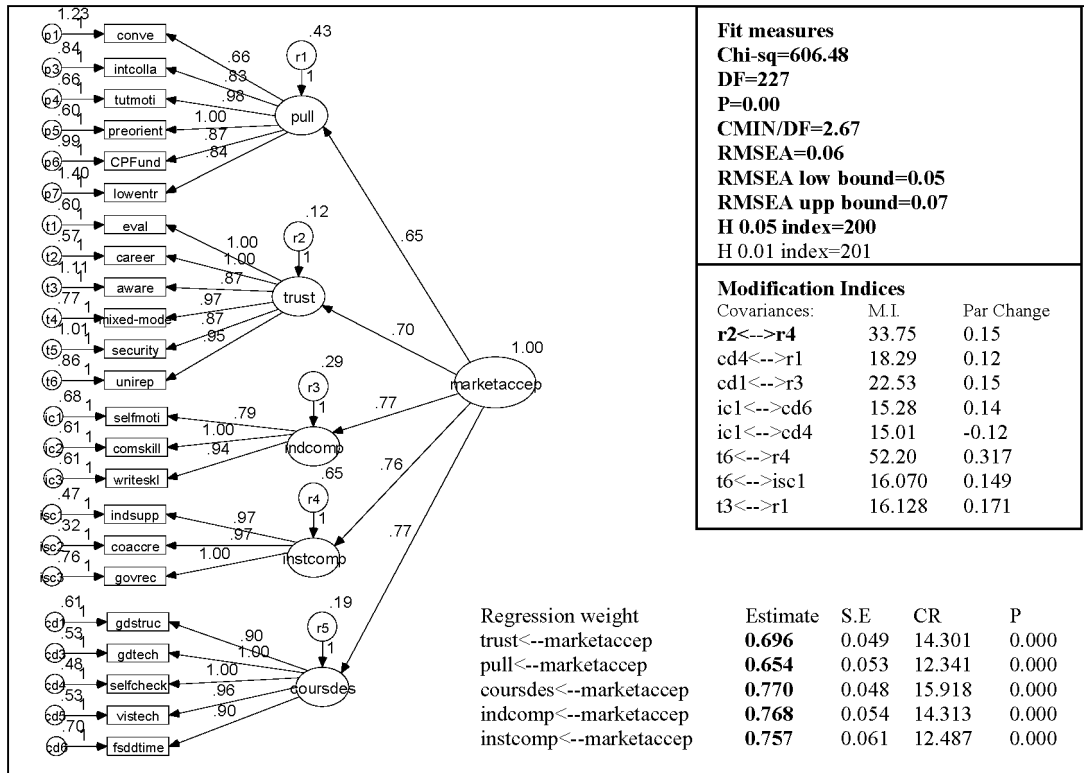| Regression weight	Estimate	S.E	CR	P
trust<--marketaccep	**0.696**	0.049	14.301	0.000
pull<--marketaccep	**0.654**	0.053	12.341	0.000
coursdes<--marketaccep	**0.770**	0.048	15.918	0.000
indcomp<--marketaccep	**0.768**	0.054	14.313	0.000
instcomp<--marketaccep	**0.757**	0.061	12.487	0.000

Fig. 3 Summarised structural test statistics of the re-specified research model of factors influencing the market acceptance of online education in Singapore

To determine the internal consistency of the measurement scale used in this study, Cronbach's alpha was used. Since no negatively worded scale item was used in the questionnaire survey, no recoding was necessary. The result of the reliability test was first checked for the correct number of items and mean score to ensure that they were within possible scores. All reliability tests on the five factorial scales in the re-specified research model indicated Cronbach's alpha coefficient value as well above 0.7. This confirmed that all the measurement scales (factor scale) in the re-specified research model were statistically valid. The reliability test results of the five factorial scales in the re-specified research model are summarised in Figure 4.

Measurement scale	Cronbach's alpha coefficient value
Trust factor	0.79
Individual competency factor	0.77
Institutional competency factor	0.87
Courseware design competency factor	0.89
Pull factor	0.82

Fig. 4 Reliability coefficient of the factor scales in the re-specified research model of factors influencing the market acceptance

Results

Core findings from the exploratory study (Stage 1)

The exploratory study using semi-structured interviews during stage 1 produced conclusive agreement that most of the findings from the literature search as presented in Figure 2 were valid as influence factors on the market acceptance of online education in Singapore. Only two findings from the literature search (regular on-campus visits for online student and student pre-assessment for suitability for online learning) were deemed irrelevant in the Singapore context. The new findings from the in-depth interviews were:

(a) The effect of government policies on distance education, ranging from recognition of external degrees, mandatory implementation of online learning modules as part of the national school curriculum, to the easing of funding from private sources (such as Singapore's Central Provident Fund) for students undertaking online degrees, have an impact on the market acceptance of online education in Singapore.

(b) A university's reputation had an over-riding importance over the cost of education as a decision-making factor in enrolment in online education.

(c) Authentication and security issues need to be tackled to address public lack of trust in online education.

(d) Utilisation of better technology for faster access/download time and better usage of video conferencing facilities and Internet telephony to promote greater interactivity via the Web.

(e) Online education is currently playing a supplementary/complementary role in the Singapore's education system.

(f) The passive learning culture of Asia is a hindrance to the rapid growth of online education in Singapore that involved self-directed learning.

Findings from the descriptive analytical study (Stage 2)

The major findings from this study include:

a) There had been a mixed feeling on the effectiveness of online education as a learning medium compared with traditional classroom-based education with the public in Singapore. This was subsequently expressed by the relatively low willingness towards enrolment in total online-delivered courses. Only 18.3% agreed and 7% strongly agreed that they would consider fully online-delivered courses in the near future. However, the majority of respondents (irrespective of gender, age, marital status and the level of intended education, although those familiars with the Internet agreed more favourably) agreed that:

   i) The increased usage of the Internet will lead to increased market acceptance of online education in Singapore.

   ii) The increased usage of computers within the national school curriculum will lead to a wider market acceptance of online education in Singapore.

   iii) Successful placement or employment of online graduates will lead to increased market acceptance of online education in Singapore.

   This study also revealed that the more one viewed online education as an effective learning medium compared to traditional classroom-based education, the more they are likely to consider total online-delivered education in the near future.

b) Perceived important influence factors on the market acceptability of online education in Singapore based on the hypothesised constructs in the re-specified research model.

   i) Perceived influence of courseware design factor
       The issue of online courseware design is extensively discussed in the literature (Dringus 2000; Levesque & Kelly 2002). This study verified that the courseware design factor was perceived as an important influence, in fact the *most* influential together with individual competency factor in the market acceptability. In the re-specified model, this construct was measured by good structure and clarity of design, good technical support/helpdesk including prompt response times, provision of self-checking activities in online courses, application of visualisation technologies and having fast access or download time. Special attention should be directed to the issue of fast access or download time. It has been confirmed conclusively (in both stages of this study) that slow download time is perceived as an important barrier to the acceptance of online education in Singapore.

   ii) Perceived influence of individual competency factor
       This is an influential factor in Singapore and was measured by the user's writing and communication skills, computer skills and their self-motivation (discipline) for independent learning. This study duplicated the findings by earlier researches (Mason & Weller 2000; Dringus 2000) that these issues were critical in the development of online education. According to Tan and

Lambe (2002), self-motivation for independent learning was reported to be only significant among novice online learners as a perceived barrier to online education in Singapore. However in this study, it was shown to be significant across all categories of online learners in Singapore.

iii) Perceived influence of institutional competency facto

This factor was measured by industry support for online education, course accreditation with regulatory body and government recognition of online degrees. The results of this study indicated that these issues were an important factorial influence on the market acceptability of online education in Singapore. While Tan and Lambe (2002) suggested accreditation as the least important, least ideal feature (from learner's perspective) of online learning in Singapore, this study found it a highly rated feature for online university education.

iv) Perceived influence of trust factor

This construct was originally extracted from the institutional competency factor during the descriptive analytical study to improve the original hypothetical model. In the re-specified model, trust factor was measured by reputation of university/institution that offers the course, mixed mode instruction (online with classroom-based teaching), regular faculty evaluation (staff evaluation), public awareness, security (utilisation of technology to prevent exam fraud, protect exam records) and relevant course program for career advancement. This study confirmed that all the observed variables in the trust factorial scale were perceived as an important influence on the market acceptance of online education in Singapore. Given the 'collectivist' and high uncertainty avoidance characteristics (Hofstede 2000) of the Singaporean society, this was not unexpected. The preference for mixed-mode instruction was emphasised quite strongly in this study.

v) Perceived influence of pull factor

The pull factor was measured by six observed variables namely: Convenience-based delivery (no class schedule to meet), availability of education funding from Singapore Central Provident Fund (CPF), lower entry requirements for working adults, online tutor as motivator, pre-course Web orientation and community building. These issues were also perceived as significant influence factors on the market acceptance of online education in Singapore, albeit the least significant among the five hypothesised factors. The issue of community building (interactivity & peer collaboration) within the WBL environment had been studied extensively by many researchers. In particular, the study by Tan and Lambe (2002) revealed that peer interactions are not high on the priorities list of online learners despite the 'collectivist' culture in Singapore. This study duplicated this finding.

An issue that was not mentioned in most studies was the effect of funding on the market acceptability of online education from the customer prospective. This is a critical issue in Singapore where free education is not a 'birth right'. The exploratory study and descriptive analytical study in this research addressed this issue comprehensively. Empirical evidence showed that there was a desire for the government to relax the Singapore's CPF ruling to allow members to withdraw funds for part-time education/online education.

All five factors as hypothesised in the re-specified model were important influence factors in the market acceptability. This confirmed hypothesis 1: 'There is a multiple factorial influence on the market acceptance of online education in Singapore (at the undergraduate and postgraduate level)'. Individual competency factor and courseware design competency factor were *jointly* perceived to be most influential while the pull factor was the least influential.

Summary

There are mixed feelings regarding the effectiveness of online education as a learning medium compared with traditional classroom-based education in Singapore. This is expressed by the relatively low willingness to enrol in totally online courses. Respondents show a strong preference for mixed-mode instructions. However, the majority of the respondents were optimistic that online education will be

widely accepted in the near future. The factors influencing the market acceptability of online education in Singapore can be grouped into a trust factor, courseware design competency factor, individual competency factor, institutional competency factor and pull factor. Specially, the issue of security, accreditation, funding for students, slow access/download time must be addressed for online education to be widely accepted.

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