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Stewart Martin
Teesside University
Borough Road
Middlesbrough TS1 3BA
United Kingdom
Email: stewartmartin2@me.com

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Quality in E-Learning: User experiences in China

Ruben Blair[1], Peter Riezebos[1], Sjoerd de Vries[1], Peter de Vries[1] and Zhu Zhiting[2]
r.c.j.blair@student.utwente.nl; p.riezebos@student.utwente.nl; s.a.devries@gw.utwente.nl;
p.w.devries@gw.utwente.nl; ztzhu@dec.ecnu.edu.cn;

[1] Faculty of Behavioural Sciences, University of Twente, Netherlands
[2] Distance Education College & E-Educational Engineering Research Center, Shanghai, China

Abstract. E-learning plays an increasingly important role in Chinese education. Its role in future education will be significant, especially given the trend of lifelong learning. Considering the degree of autonomy in terms of student participation it is essential that user experiences on platform quality and perceived service quality are optimal. Over the past decade China has invested much in its e-learning systems. The East China Normal University (ECNU) of Shanghai implemented a virtual learning environment and requested an assessment on the user experience. A quantitative questionnaire was developed based on the 'Perceived Service Quality model (PSQ)'. Based on literature the model measures reliability, responsiveness, assurance, validation of learning resources and empathy. Using a confirmatory factor analysis in LISREL PSQ is validated and the total verdict of the e-learning platform is positive.

Keywords: E-learning, user experience, virtual learning environment, online education, service quality

Introduction

The fast and recent changes on the Internet and the diverse digital technologies have made the Internet a powerful and interactive medium enabling cost-effective electronic learning (e-learning)(Khan, 1997). In recent years, educational institutions worldwide have invested extensively in implementing this approach in their education (Alexander, 2001; Bates, 2005; Pflichter, 2006; Gulati, 2008; Wang, Zhu, Chen & Yan, 2009). In particular countries like China, which have many rural areas, benefit greatly from this new form of (long) distance education (Wang, et al, 2009; Ye, Su & Yan, 2009).

In 1999 the Chinese government provided several Chinese universities with the task of creating new e-learning departments. One of the most distinguished universities in China, the East China Normal University (ECNU), established a Distance Education College (DEC) in 2001. The main focus concerns making e-learning, degree and non-degree, available for teacher education students in China. In 2009, the DEC had over 20.328 trainees studying in 80 distance training centres all over China (Wang, et al, 2009; Ye, et al, 2009).

According to Bates (2005), e-learning can be viewed as an innovative approach for delivering well designed, learner-centered, interactive, and facilitated environments to anyone, anyplace, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open, flexible and distributed learning environments. As such, e-learning focuses on its user (McCombs, Vakili,

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2005; Miller, 2005; Motiwalla, 2007; Kidney, Cummings, & Boehm, 2007). This definition can subsequently be used to develop a framework providing insight into the extent to which e-learning as a service is valued.

This study was conducted on location in China at the ECNU. The aim was to obtain insight into students' perceived service quality on the e-learning systems as provided by the ECNU. The results contribute to the continuing development of cost-effective e-learning in China. The application of the PSQ-model gives us further insight into relevant e-learning service quality indicators.

Theoretical framework

Currently 68 universities and colleges in China have been approved by the Ministry of Education to provide distance education. Today Chinese citizens have the opportunity to be educated using distance education in one of the more than 140 majors in 10 different disciplines (Ye, Su & Yan, 2009). Given the central function of e-learning it is crucial that the provided educational platform and service are of the highest quality.

In scientific literature, evaluations of e-learning systems regularly focus on educational principles or technical features. In contrast, the main perspective concerning the evaluation in this study will be dissimilar and innovative. As stated in the introduction the goal of this research project is to provide an evaluation of the perceived service quality of the e-learning system as used by the students of the East China Normal University. Due to better accessibility students are given more freedom of choice in education, thereby increasingly requiring universities to compete. In light of this competition quality of service is of prime importance for universities to distinguish themselves. In this study will will draw upon knowledge and insights from the field of service marketing and Human Computer Interaction (H.C.I.) in order to assess service quality.

Service Quality of E-learning

The General Agreement on Trade in Services (GATS) of the World Trade Organization, states that education is part of the field of service industry (Robertson, Bonal & Dale, 2002). When education is perceived in this way, the success of educational programs should be measured by the service quality it provides. Service quality is important for the future of an organization. In research amongst American, European and Japanese business managers more than 78 percent indicated that improving quality and service to customers is the key to success (Berry & Parasuraman, 1992). The success of a service organization depends on the ability of the organization to enhance its image by consistently meeting or exceeding customers' service expectations. The measuring of consumer perceptions as to the level of service quality therefore becomes critical (Joseph & Joseph, 1997).

E-learning systems, a specific form of education, can also be considered a service. Consequently, measuring the service quality can provide an organization with important information by shedding light on the quality of the education it delivers, and answering the question whether e-learning has been implemented successfully and effectively.

Views on quality of education have undergone significant changes. One of the most important transformations in education originally comes from the business sector (Rosenberg 2001). In this sector training is essential in the context of lifelong learning. A transformation has taken place from the amount of training to its actual value for the trainee.

One of the ways in which success of training was measured in organizations was by the amount of training that was provided (Rosenberg, 2001). Now it has become much more important that the training has a positive influence on the working activities of the trainee. This way training acquires an actual business value. Rosenberg (2001) states that it is important to keep in mind that the training itself is not enough to create a good business value of training, you also need the right tools, a good working environment, enough motivation and enough feedback and coaching. The same can be said for the education sector. Providing lessons itself is not enough to create a good value of education. To obtain an accurate view of the actual value of education provided by an institute, it is important to get an overall view of the service quality. This includes the learning environment, facilities, tools, teachers, lesson material et cetera.

To accommodate service quality of e-learning systems, Zhang et al. (2004) used the ISO 9001:2000 system. This standard regulates business processes in a formal way. It provides a number of requirements that an organization needs to fulfill to achieve customer satisfaction. This can be achieved through consistent delivery of products and services which meet customer expectations. The ISO standard is implemented in the service quality framework as provided by Zhang et al. (2004). To successfully implement an e-learning service quality system, there are some general requirements that have to be taken into account. First of all, it is important to understand that the service quality of e-learning should not be viewed in isolation; the quality of an e-learning system can only be maintained if service quality becomes an integral part of institutions' management system. This is why we speak of an e-learning service quality management system. According to Zhang et al. (2004) institutions should establish, document, implement, maintain and continually improve their service quality management system, rather than focusing solely on service quality.

Learners' perspective

The learning process of an e-learning system can be perceived as a co-production process between the learning-environment and the learner (Ehlers, 2004). In this study the focus on quality of the e-learning platform is determined by the learners. Perceived Service Quality (PSQ) is the learners' perception of the service quality of the e-learning platform as provided by the ECNU. PSQ is measured in terms of the result of using the e-learning system, instead of measuring the properties of the system itself. The perceived service quality is the combined effect of the characteristics of the system for the learner.

In the evaluation phase of the process of a service quality management system, the framework of e-learning service quality provides a good hands-on approach for testing the service quality. The framework of Zhang et al. (2004) can be transformed into a measurable model for the perceived service quality of e-learning.

Study objectives & research question

The main objective of this study is to obtain a general view of students' perceived service quality on the e-learning systems, as provided by the ECNU, by measuring their user experiences. Ultimately the study provides guidelines for more successful implementation of an e-learning platform in the future.

The main research question (RQ):
What are the students perceptions of service quality of the e-learning platform as provided by the ECNU?

Model development

The objectives and the main research question can be answered by dividing the content in to multiple hypotheses. To test these hypotheses a research model was developed based on the PSQ Framework.

PSQ-Framework

A widely used empirical method for measuring service quality is SERVQUAL. This multiple-item scale measures consumer perceptions of service quality on five dimensions; tangibles, reliability, responsiveness, assurance and empathy (Parasuraman, Zeithaml & Berry, 1988; Findlay & Sparks, 2002). The students are regarded as consumers because they consume the offered educational service. In 2004, in their 'Specification for Service Quality Management System of e-Learning' Zhang, Zhu, Hu, & Li (2004) used SERVQUAL's dimensions and translated them to the e-learning framework. Each dimension is divided in sub-dimensions, reliability, responsiveness, validation of learning resources, empathy and assurance. Combined the framework measures the service quality of e-learning (Zhang et al, 2004).

Perceived quality is the consumer's judgment about an entity's overall excellence or superiority (Findlay & Sparks, 2002). Perceived Service Quality (PSQ) concerns the student's experience and judgment on the e-learning service as facilitated by the educational institution. Using the PSQ framework, the user provides the researcher with detailed information about the perceived quality of each of the five dimensions. Consequential the PSQ-framework does not only result in an overall judgment, it provides the institution an empirical instrument for tracing usability problems.

Figure 1. Perceived Service Quality Framework

In Zhang et al., (2004; also see Bates, 2005) the framework of e-Learning Service Quality construct of PSQ, which was adopted here, consists of five distinct dimensions: *Validation of*

learning resources; *Assurance*; *Responsiveness*; *Reliability*; and *Empathy*. Each of these are subsequently subdivided into multiple sub dimensions; a summary of all dimensions and subdimensions in this framework is provided in Tables 1 to 5; also see Figure 1. In the new PSQ paradigm the following hypothesis is formulated:

Hypothesis 1 (H1) Perceived Service Quality (PSQ) on e-learning at the East China Normal University (ECNU) is determined by the five dimensions of service quality

Table 1. Validation of Learning Resources in the Framework of e-Learning Service Quality

1	**Validation of learning resources**	**E-learning providers should offer credible, effective and rich learning resources**
1.1	Scientificity	Learning resources should be credible and valid, excluding any error, prejudice or redundant information and should be expressed impartially
1.2	Accessibility	Learning resources should be organized by reasonable way to make it easily accessible
1.3	Integrity	Learning resources should be integral, can offer information related to the objective in depth and width, as learning pre-requirements, related resources, assessment rubric etc.
1.4	Real-time	Learning resources should be updated periodically and information on person or organization, time and frequency of updating should be indicated as well
1.5	Selection of media	Selection of media and technology should be integrated with curriculum design and should support teaching objectives and the satisfaction of students

Table 2. Assurance in the Framework of e-Learning Service Quality

2	**Assurance**	**Faculty and staff engaging in e-learning should be professional and knowledgeable to ensure the student trusts them and find them reliable**
2.1	Integrity of teaching plan	Educational institutions should provide instruction plans in detail: including learning objects, entrance qualification, learning material, learning contents, teaching schedule, evaluation process, qualification authentication, tuition fees and other expenses, time limitation of study, clause of suspending or postponing study and technology requirements etc.
2.2	Providing related information on courses	Educational institutions should provide all students with clear and comprehensive information about the course, including course objective, learning requirements, examination methods and information on assessment
2.3	Security of private information	Educational institutions should ensure the security of the students' personal information
2.4	Technology guidance	Educational institutions should provide technology service and guidance to students in course studying, including detailed guidance on hardware and software, practice opportunity before examination and technology staff
2.5	Professional knowledge of the teacher	The teacher should have adequate knowledge to teach
2.6	Complaint mechanism	Educational institutions should set up a complaint mechanism for students and give them a valid reply in time.

Table 3. Responsiveness in the Framework of e-Learning Service Quality

3	**Responsiveness**	**E-learning providers should support the student's study and provide prompt service**
3.1	Responsiveness of service request	Educational institutions should satisfy the student's service request in time
3.2	Responsiveness of the teacher	The teacher should answer students' questions and review their assignments in time (less than three weeks).
3.3	Publishing information in time	E-learning providers should publish information of teachers and management in time. For example notifications for class, exam, schedule, scores of exam, etc.

Table 4. Reliability in the Framework of e-Learning Service Quality

4	**Reliability**	**E-learning providers should perform promised service dependably and accurately**
4.1	Reliability of education institution	Promises of the educational institution should be reliable
4.2	Reliability of network system	The performance of the learning platform should perform with reliability, veracity, stability and rapidity
4.3	Reliability of questions answer	Answers provided by the educational institution and teacher on students' questions should be reliable
4.4	Reliability of evaluation	Teacher's comments on the students' performance should be impartial and reliable

Table 5. Empathy in the Framework of e-Learning Service Quality

5	**Empathy**	**E-learning providers should understand the needs of users and should offer individualized service**
5.1	Convenient learning schedule and facility	Educational institutions should schedule the time and facility to the convenience of all students
5.2	Easy to use	Learning platform, learning resources etc., should be easy to use and access. A minimum of instruction should be needed for user input
5.3	Customized service	The teacher should know the individual requirements of the student to offer customized needs
5.4	Care	The teacher should care for every student, and help them to overcome difficulties in study. Faculties should treat every student warmly and answer their questions patiently
5.5	Comfort environment	Environment of educational institutions (computer lab, etc.) should be spacious and bright
5.6	Interactivity	During the teaching process, the teacher should use many kinds of interactive methods (e-mail, BBS, telephone, etc.) to actively lead students into learning activity

PSQ-Model

Having identified which constructs form PSQ, the conceptual model was developed. The five dimensions all function as components of PSQ.

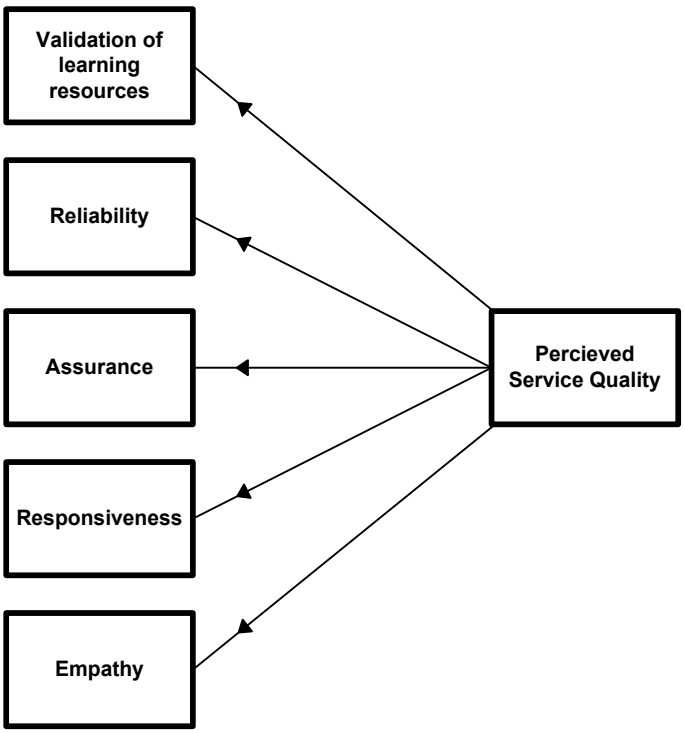

Figure 2. PSQ model on e-learning

Figure 2 shows the PSQ model on e-learning. The five dimensions combined compose PSQ.

Research methods

Data Collection

A survey technique was used to collect data. The population sample was selected from the non-degree students from the East China Normal University. After measuring for twenty-one days 212 usable questionnaires were obtained.

Measurement

To progress the investigation of PSQ by quantitative research an appropriate measure of the underlying constructs is required. Each construct, and its sub dimensions, was extensively measured using multiple questions as derived from the PSQ framework. To maximize the response ratio the questionnaire was translated from English to Mandarin Chinese. In monitoring the quality a backward translation system was used. Each question was translated by one person, then translated back by another, without the second translator seeing the original question. The backward translation was compared to the original version to see whether the questions were interchangeable. This process was repeated until the most accurate translation was developed. Finally the results of this process were carefully discussed by a team consisting of several Dutch and Chinese academics in finalizing the questionnaire.

To rule out translation issues in analyzing the data, for example the loss of meaning in the answers, the respondents had to answer the questions by means of a 5-point Likert scale. The response options ranged from completely agree to completely disagree.

Results

A total of 212 completely filled in, usable questionnaires were returned. Of these 212 questionnaires, 48 respondents are male and 164 are female. Respondents were also asked to inform on their age. This construct was divided into six groups. Most of the respondents are under the age of 30. The results show that the majority of respondents are in the age categories 20 – 25 (86 respondents) and 25 – 30 (62 respondents).

Hypothesis 1 (H1) Perceived Service Quality (PSQ) on e-learning at the East China Normal University (ECNU) is determined by the five dimensions of service quality

A confirmatory factor analysis was performed using LISREL to validate the conceptual model (PSQ). As the Chi Square Test is statistical robust, yet problematical because of the complexity of confirmatory factor analysis, the fit of the conceptual model was indicated using four steps.

First the examination of the critical number. This is the minimum sample size, below which the results cannot be validly interpreted. The sample size, n=212, exceeds the Critical Number (CN), = 111.35, needed for reliable interpretation. Second the significance of the Chi Square is considered. Both the Minimum Fit Chi Square and the Normal Theory Weighted Least Squares Chi-Square show the Chi Square is not significant (p=0.00), so a good fit between the data and the model can be made. Thirdly we examined the Chi Square Degree of Freedom Ratio, which is obtained using Chi Sq / Deg Freedom. Although the prior step show no significance, below 0.05, the Chi Square Degree of Freedom Ratio exceeds 2 (5.76). Finally, the fourth step, the Goodness of Fit Index, is required to determine the fit. The Goodness of Fit Index scores 0.95 and confirms a good fit between theory and data. Concluding we argue that the conceptual model is validated using the observed data.

General Outcomes

Prior to the general outcomes of the research the reliability was measured by means of the internal consistency. Consistency was measured using Cronbach's Alpha in SPSS. Each component scored an Alpha of .8 or higher verifying reliability on all constructs. Correlation with PSQ is significant for each dimension, as can be observed in table 6.

Table 6. Correlation on PSQ

	N	Dependent	Significance	Correlation
MeanReliability	212	PSQ	Yes	.877
MeanResponsiveness	212	PSQ	Yes	.927
MeanAssurance	212	PSQ	Yes	.957
MeanValidation	212	PSQ	Yes	.851
MeanEmpathy	212	PSQ	Yes	.928

RQ: What are the students perceptions of service quality, based on their user experiences, on the e-learning platform as provided by the ECNU?

After the reliability analysis the mean of every construct was measured. The result is a number between 1 and 5, where 1(mostly positive answers) is very good, and 5 (mostly negative answers) is very bad. The results are given in Table 7. In this table an interval per answer per construct is given and the means per construct can be read. From this table it becomes clear that Empathy has the highest mean (2.2603). This indicates that the respondents have answered the most negative on the questions in this construct. Reliability has the lowest mean (1.8805), which indicates that the respondents answered the most positive about this construct and are thus most satisfied with this aspect.

The mean of the total service quality was measured as 1.9021. On a scale from 1 (very good) to 5 (very bad), this indicates that the total service quality of e-learning at the ECNU is considered to be good.

Total service quality can also be measured by the mean sum of the individual five constructs (reliability, responsiveness, assurance, validation, empathy) of the perceived service quality model. The mean sum of these constructs can be compared to the total service quality as measured by the construct MeanQuality. To analyze if the respondents review these different constructs higher or lower than the total service quality as measured by the construct "MeanQuality" we have created the construct "MeanSUMQuality". As stated MeanSUMQuality is the mean sum of the five individual constructs. The results show that the mean of MeanSUMQuality is lower than the mean of MeanQuality. This answer reveals that when respondents are asked directly about the service quality of e-learning they give a more negative answer then when asked in different constructs. In other words, service quality is rated lower when asked directly, then when different constructs are added. A remark is that the mean of MeanQuality can still be regarded as good.

Overall the e-learning platform, as facilitated by the ECNU, is graded positively as perceived by its students. Reliability and assurance are ranked highest and empathy seems to be tending towards a more neutral place.

Table 7. Mean Results per Construct

	N	Minimum	Maximum	Mean	Std. Deviation
MeanReliability	212	1.00	3.56	1.88	0.50
MeanResponsiveness	212	1.17	3.22	2.05	0.49
MeanAssurance	212	1.00	3.34	1.98	0.51
MeanValidation	212	1.24	3.61	2.14	0.50
MeanEmpathy	212	1.24	4.15	2.26	0.53
MeanQuality	212	1.00	3.50	1.90	0.53
Valid N	212				

Conclusions and Discussion

In this chapter the results of the research will be discussed. The chapter is divided in three sections; perceived service quality, cultural differences and future research.

Perceived Service Quality

The service quality of the e-learning platform, as facilitated by the ECNU, is graded positively as perceived by its students. In more detail, the five dimensions are also graded positively. Reliability and assurance are ranked highest and empathy seems to be tending towards a more neutral place. Reliability is graded the most positive. The students' perception of the reliability of the educational institution, the network, the answer on questions and evaluation is very good. The same can be said for assurance, the students perceive the integrity of the instruction plan, the provided information, technology guidance and professional knowledge of the teacher as very good. On the other hand empathy was graded the most negative. Further research will have to point out which other possible variables are moderating PSQ.

Cultural differences

One of the issues when conducting research in China is social desirability. When the questionnaire was developed social desirability was kept in mind. The constructs were formulated in different ways and with both positive and negative questions. By using this method it was attempted to reduce the number of social desirable answers. However due to cultural differences, mainly the importance of hierarchy (power distance) and the importance of preventing loss of face may still influence the way the students have answered the questionnaire (Hofstede, 1984). The empathy questions relate in particular to the functioning of teachers and cultural influences like power distance may have resulted in social desirable or neutral answers.

Chinese higher education has a high standard of quality. Unfortunately a lot of Chinese research is written purely in Mandarin Chinese. English is not compulsory for Chinese students. This results in the fact that a lot of Chinese students are not proficient at reading and writing in English. For this research the questionnaire was translated in Chinese by using the backward translation technique. This technique has the benefit that the second or third translator never sees the original English question. Although this translation technique provides a proper translation, the translation was still done by Chinese students. It can never be guaranteed that the translation really is fully correct, because the researchers cannot read or write Chinese.

Social desirability is one of the issues that can influence the answers from Chinese students. Not only the questionnaire can be of influence on the answers of students, also the setting in which the questionnaire is conducted can be important. For this research the students had to fill in the questions after an exam, in front of the teacher. This setting is not optimal. For an optimal result without any influence of a teacher, it is advised that a questionnaire about quality (including quality of the institution and teachers) is conducted in a private setting.

Another point of interest is the fact that the perceived service quality framework has been based on SERVQUAL, an empirical method for measuring service quality. This multiple-item scale was developed with a Western cultural perspective in mind an based on the same cultural principles. As stated by Hofstede (1984), there are many work related value

differences between different cultures. These work related value differences can have a large influence in the way different cultures define service quality. In hindsight some of dimensions of the perceived service quality framework and the questionnaire based on it can therefore be culturally biased. For future research it can be interesting to review the questionnaire for cultural biased dimensions.

The PSQ model: Concluding remarks

One of the goals of this study was to develop an appropriate model for measuring the perceived service quality of e-learning platforms. The study has shown that Perceived Service Quality can be determined by the five dimensions; reliability, responsiveness, assurance, validation and empathy. Our results have shown that these insights in user perceptions can lead to a continuing improvement of such platforms. It is not excluded that there are no other dimensions which co-determine perceived service quality. Future research should reveal the existence of other dimensions.

Recommendations ECNU

As stated, overall the perceived service quality of e-learning at the East China Normal University is rated positive. The results show that the students have rated empathy the lowest of all variables. Although the variable empathy is not rated negative, but more neutral, it can be important for the overall success of the organization to optimize this variable. The variable empathy consists of the dimensions convenient learning schedule, ease of use, customized service, care, comfort environment and interactivity. This means that the university can improve the perceived quality of empathy in three ways. First of all the personal circumstances of the students during the use of the virtual learning environment can be optimized. By emphasizing a more personal approach, the teacher can optimize the dimensions customized service, care and interactivity. To further optimize the service quality concerning empathy, the East China Normal University will also have to critically review the comfort of educational facilities such as the computer lab, etc. Finally, a critical examination of the usability of the e-learning environment itself is required.

To fully optimize the perceived service quality of their e-learning systems, the East China Normal University should implement a yearly control mechanism into the evaluation phase of its service quality management system. For example, by using a questionnaire each year, students can give their opinion on the provided service quality and the university can see if the perceived service quality improves over time. The questionnaire developed in this research by means of the perceived service quality model will give a good hands-on approach for the evaluation phase in a continued service quality management process.

Future research

The research was performed at the East China Normal University only. In future research it will be interesting to measure at multiple universities in China. Comparing the results on the five dimensions will lead to an optimal PSQ framework which will be beneficial in successfully implementing e-learning on a global scale. Because of the particular outcome on empathy further research on this dimension of PSQ and cultural influence will be both interesting and necessary in obtaining completely reliable results.

Perceptions of the provided service quality are also determined by influencing factors like self-efficacy. The individual relationships could also be moderated by different personality

traits of the students. Lee, Kim and Chung (2002), showed in their research on the usage of mobile Internet services that social influence and self efficacy significantly affect the perceived usefulness and perceived ease of use. According to Bandura (1986; 1997) it is not about the skills a person has, but his or her perception of how they can use them effectively. In learning self-efficacy counts as a predictor of student's motivation and learning (McCombs & Marzano, 1990; Schunk, 1995; Schunk, Pajares & Wigfield, 2002; Zimmerman, 2002). Further self-efficacy influences computer usage. Lower levels of computer self-efficacy are related to lower learning outcomes (Welsh, Wanberg, Brown & Simmering, 2003). In their study on computer self-efficacy in predicting continuance usage of e-learning systems, Hayashi, Chen, Ryan & Wu (2004) also mention several studies that found strong evidence of a relation between self-efficacy and computer behavior at universities. Future research concerning the effects of self-efficacy on PSQ is therefore strongly recommended.

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