The Role of Power Distance in Determining the Effectiveness of Educational Technology

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ABSTRACT
Educational technology is being deployed rapidly all over the world. Correspondingly, there is also an increase in student collaboration from different cultural backgrounds through diversified student populations, institutionalized programs and distance learning. The cultural background of students is thus important in IT and education today. This conceptual paper surmises the effectiveness of educational technology, focusing on the dimension of power distance (Hofstede 1980) due to its relevancy to the context. The focus of this paper is on exploring how educational technology affects learning outcomes, and the role of power distance in influencing the effectiveness of educational technology. We postulate that power distance is a moderating influence on the relationship between educational technology and learning outcomes. In particular, the availability of educational technology increases learning outcomes but the effect will be greater on low power distance learners than on high power distance learners. This paper begins with a review of the effectiveness of educational technology, followed by a discourse on power distance. Anchored by the literature review, a research framework is formulated based upon which propositions are raised.

Keywords: Educational Technology, Culture, Power Distance, Effectiveness, Learning Outcomes

1. INTRODUCTION
Educational technology is being deployed rapidly all over the world. Amidst this progress, globalization has boosted international collaboration of student teams. For example, the virtual collaboration between students in the Netherlands and Hong Kong in the three-year HKNET project (Rutkowski et al. 2002). There has also been an increase in culturally diverse student populations such as the jump of more than 4000 international students at the National University of Singapore from 2000 to 2005 (Annual Report 2005; Lee 2000). In addition, educational institutions are increasingly expanding into international markets via setting up new overseas campuses or distance learning (Cronjé 2006).

With the increasing diversification of student populations and cross-cultural collaborations of student teams, the cultural background of learners has been pointed out as crucial in determining educational technology's effectiveness (Leidner & Jarvenpaa 1995; Chang & Lim 2005). Indeed, culture is part of all learners and affects how they think and value learning, as well as how they respond to educational technology. Chen et al. (1999) urge researchers and educators to appreciate the role of culture in education for "a deeper and more valid understanding of the nature of student learning" (p.219).

Culture can be examined from many perspectives, but seminal research on culture by Hofstede (1980, 2001) is more pertinent to learning outcomes (Wang 2006). Hofstede (2001) constructed a taxonomy of cultural dimensions underlining value orientations of people from various national cultures. Power distance, one of these dimensions, is the focus of this paper. Power distance is the extent to which people respond to inequality in power and consider it as normal (Hofstede 2001). In educational contexts, students from large power distance cultures have large power differentials towards instructors and higher status individuals while students from small power distance societies regard other individuals as equal

to them. Power distance might affect the usage of educational technology and the ways of learning with it. For instance, students from low power distance cultures participate actively in traditional classrooms and may find it satisfying to participate via educational technology. On the other hand, students from high power distance cultures who rarely speak up in face-to-face classrooms may not feel as comfortable using educational technology. Hence, the use of educational technology may be more effective for different levels of power distance.

In light of these influences, the research questions are: firstly, how does educational technology affect learning outcomes? Secondly, what is the role of power distance in influencing the effectiveness of educational technology? This paper begins with a review of the effectiveness of educational technology followed by a discourse on power distance. Based on the literature review, the research framework and propositions will be presented before the conclusion.

2. THE EFFECTIVENESS OF EDUCATIONAL TECHNOLOGY
Piccoli et al. (2001) found that the performance outcomes are similar to the traditional learning environment although learners using educational technology reported higher computer self-efficacy and had lower satisfaction with their learning experience. Similarly, Curtis and Lawson (2001) acknowledged that the use of educational technology led to comparable collaboration as face-to-face environments. However they noted that factors like student familiarity with the medium and ease of use of the interface are also important moderating factors. Hence, some studies have revealed that educational technology is only as effective as the face-to-face mode of delivery and is commonly known as the "no significant difference" phenomenon (Hiltz et al. 2002).

On the other hand, there are studies that suggest the effectiveness of educational technology. Kulik and Kulik (1991) found that students who learned with educational technology scored higher than students without it, learned faster, enjoyed their classes more and developed more positive attitudes. Alavi (1994) observed that students with educational technology perceived higher levels of skill development, learning, interest, enjoyment, and resulted in better final grades relative to the traditional mode with the same collaborative learning technique. Chang and Lim's (2005) meta-analysis of 68 studies concluded that educational technology helps to increase the cognitive abilities of students. However, the study observed that the degree of effectiveness depends on a combination of the characteristics of the learner, the course and the instructional design. Researchers also propose that for greater student learning outcomes, what is necessary is a change of learning to new constructivist approaches and in applying technology innovatively for learning (Hiltz et al. 2002). Thus, this paper focuses on educational technology based on the constructivist approach, particularly the collaborative learning theory.

Many of these studies surmise that for educational technology to be more effective, there are a number of influencing factors (Piccoli et al. 2001; Chang & Lim 2005). However, it is neither viable nor useful to review each factor. An important aspect pointed out by several researchers' concerns *cultural background* (Leidner & Jarvenpaa 1995; Morse 2003). ***Power distance***, one of Hofstede's (1980) cultural dimensions, has demonstrated a large influence on student learning (Wang 2006). Power distance is a key cultural factor that affects group relationships and the group's performance in collaborative learning (Paulus et al. 2005; Hofstede

2001). The following section highlights power distance's impact on educational technology.

3. CULTURAL DIMENSION OF POWER DISTANCE

While there has been empirical progress on the impact of culture and IT (Leidner & Kayworth 2006), with regard to IT in education, there has been a lacuna of studies that examine the role of national culture on the effectiveness of educational technology. It is well recognized that different cultures display dissimilar behaviors due to unique developments and assumptions in each society (Morse 2003). This paper focuses on the cultural dimension of power distance (Hofstede 1980) owing to its germaneness to the context at hand. Power distance is one of the cultural dimensions constructed by Hofstede (1980, 2001) - the rest being individualism/collectivism, masculinity/femininity, uncertainty avoidance and time-orientation. These dimensions prescribe the behavior of individuals of a certain culture but have been criticized as demonstrating the idiosyncrasies of one particular organization (Gallivan & Srite, 2005) and reducing and simplifying the concept of culture (McSweeney 2002). Nevertheless, these criticisms have mostly been directed at the research methodology and not at the theory (Ford et al. 2003). These dimensions are theoretically sound (Straub et al. 1997) and make known the collective precepts that people of the same culture will value and act on. These dimensions have been independently verified and replicated by other researchers (Smith et al. 1996).

Power distance is the extent to which the less powerful people in society respond to inequality in power and consider it as normal (Hofstede 2001). Power distance has been considered to have a dominant influence on learning outcomes (Wang 2006; Paulus et al. 2005). In educational contexts, power distance is formalized as the student and teacher relationship. Hofstede (1980) observes that students from small power distance societies will have a low tolerance for inequality and hierarchy and hence regard their teachers as peers. They will also be more interactive in class. On the other hand, students from large power distance societies accept status differences and the hierarchy; they respect their teachers as authoritative figures. These students from large power distance societies will be quieter in class and focus more on absorbing knowledge from the teacher. In sum, small power distance cultures have a more student-centered education while larger power distance cultures are more teacher-centered.

Research has yet to fully examine power distance's impact on the learning outcomes of educational technology. As such, results are equivocal. Both small and large power distance learners seem to enjoy using educational technology (Bauer et al. 2000). However, Bauer et al. (2000) also found that small power distance learners were more confident in using technology than large power distance learners. Other studies report that large power distance learners had more difficulties in using technology (Smith et al. 2005), and were unclear with the rules for online behavior (Wang 2006). Additionally, educational technology might not totally meet learning needs of both cultures and students will differ in their level of learning outcomes. Research based on group support systems demonstrates that educational technology increases the participation of both high and low power distance learners and reduces status effects in high power distance cultures (Watson et al. 1994). While this matches the active learning mode of small power distance learners, large power distance learners prefer a different approach to learning which is more passive (Hofstede 1980; Smith et al. 2005). This might have consequences on their learning outcomes.

Another aspect of power distance is its role in impacting the academic performance of student teams (Hofstede 2001). Paulus et al. (2005) found that decision-making processes and methods to resolve disagreements are influenced by the group's power distance. High power distance groups believe in a rigid power structure and may be inflexible in fast-paced and highly coordinated tasks. Swigger et al. (2004) conceded that groups who had high power distance scores performed worst than teams with low power distance scores via computer-supported collaboration. This was exacerbated when teams collaborated on projects which required close coordination and were time-critical (Swigger et al. 2004). Power distance is thus a key factor that determines the effectiveness of educational technology. Different levels of power distance seem to affect the degree of learning outcomes with educational technology. Hence, research on the impact of power distance on learning outcomes should be established. The following section proposes a research framework to investigate the phenomenon.

4. RESEARCH FRAMEWORK AND PROPOSITIONS

This paper examines the availability of educational technology and its impact on learning outcomes. We define learning outcomes to be the satisfaction, self-efficacy, perceived learning and actual academic achievement of learners. Based on the earlier review, the level of power distance influences the degree of learning outcomes. The role of power distance is then posited to moderate the relationship between the availability of educational technology and learning outcomes. We illustrate the framework in Figure 1 while the definitions of the constructs are presented in Table 1.

Based on the earlier review, this paper asserts that the use of educational technology in innovative ways based on the collaborative learning approach enhances learning outcomes. Although some studies have emphasized that educational technology is only as effective as the face-to-face mode of delivery (Curtis & Lawson 2001; Hiltz et al. 2002), other studies have revealed that learning outcomes are enhanced with educational technology compared to the traditional face-to-face mode of learning (Kulik & Kulik 1991; Timmerman & Kruepke 2006). In a recent meta-analysis, Timmerman and Kruepke (2006) found that educational technology significantly increased the performance of college students compared to traditional instruction. Research has also highlighted that the use of educational technology leads to higher affective reactions, perceived learning and final course grades compared to the face-to-face process (Alavi 1994; Chang & Lim 2005). Hence, the paper proposes:

P1: Learning outcomes, in terms of satisfaction, self-efficacy, perceived learning and academic achievement, will be higher with the availability of educational technology than without.

We next visit the interaction between power distance and the learning outcomes of satisfaction, self-efficacy, perceived learning and academic achievement.

4.1 Satisfaction

This paper examines satisfaction as part of the students' desire to learn, whether the availability of educational technology results in students' satisfaction with the end learning result. With the availability of educational technology, mediated communication reduces the barrier in interaction and encourages egalitarian commitment which is in line with small power distance societies. The desire of small power distance learners to connect with others will then be met. In fact, Wang (2006) found that small power distance learners enjoyed using educational technology to connect with others.
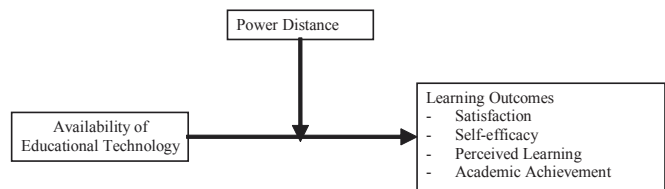
Figure 1. Research framework

Table 1. Definitions of constructs

Satisfaction	The extent of fulfillment of a desire or supply of a want (Oxford English Dictionary 1989)
Self-efficacy	**The degree to which learners feel confident of learning from a given method (Chang & Lim 2005)**
Perceived Learning	**Changes in the learner's perceptions of skill and knowledge levels before and after the learning experience (Alavi et al. 2002)**
Academic Achievement	**Actual cognitive development of learners; related to task performance and typically measured by project or course grades (Chang & Lim 2005)**

On the other hand, although educational technology reduces the barriers for interaction, learners from large power distance cultures do not have the desire to participate in class. The level of status differences perceived by these students is not affected by the medium's affordances. Frank et al. (2004) reported that even when learners from large and small power distance cultures had equal access to educational technology, students from large power distance societies were more likely to use it to socialize with their peers rather than the lecturers and avoided confronting them to prevent conflict over the online medium. Thus we propose:

P2a: The effect of availability of educational technology on satisfaction will be greater on small power distance learners than large power distance learners.

4.2 Self-Efficacy

Bauer et al. (2000) examined student's perceptions of an online course and found that the small power distance group was more confident in using the technology than the large power distance group. The small power distance group also made use of educational technology more while the large power distance students had more difficulties in navigating through the online materials. One explanation could be that the large power distance group lack access to technology. However, Smith et al. (2005) discovered that both groups of students had the same on-campus access to computers and even posted the same number of messages on a bulletin board. The researchers suggest that the predicament of large power distance learners could be due to "a difference in approach to learning" (Smith et al. 2005, p.130).

Due to their higher dependency on the instructor, students from high power distance cultures are less comfortable in independent learning with educational technology and have less self-efficacy than low power distance learners. Large power distance learners on the other hand, have a low dependency on instructors and are familiar with an active mode of learning; educational technology facilitates this and their self-efficacy of learning with it will increase.

P2b: The effect of availability of educational technology on self-efficacy will be greater on small power distance learners than large power distance learners.

4.3 Perceived Learning

Collaborative learning with educational technology stimulates students, encourages participation and the cooperation of students, which increases their perceived learning (Alavi et al. 2002). For example, educational technology allows students to post queries and thoughts at the student's own time and pace. As many high power distance cultures do not speak English as a native language, it supports students who are limited in their English proficiency to give them more time to compose their thoughts (Smith et al. 2005). There is evidence that students from high power distance cultures perceive educational technology to be less inhibiting than face to face classrooms and are more willing to participate using educational technology than in the classroom (Bauer et al. 2000).

However, other studies observe that students from high power distance cultures are constrained by the public nature of the discussions as the rules for online behavior are unclear and the discussions are in full view of the public (Wang 2006). Frank et al. (2004) also found that learners from high power distance cultures were less active in answering questions using educational technology possibly due to anxiety about "lost of face". Additionally, Chang and Lim (2005)'s meta-analysis reported that perceived learning of low power distance learners were larger than high power distance learners. Thus, we postulate:

P2c: The effect of availability of educational technology on perceived learning will be greater on small power distance learners than large power distance learners.

4.4 Academic Achievement

Power distance is a key cultural dimension that impacts the academic performance of teams (Hofstede 2001). For example, decision-making processes and methods to resolve disagreements are influenced by the group's power distance level (Paulus et al. 2005). In a group of high power distance learners, a superior

and subordinate relationship may arise because of their desire for hierarchy. Additionally high power distance groups believe in a rigid power structure and may be inflexible in fast-paced and highly coordinated tasks. Swigger et al. (2004) found that computer-supported collaboration of student teams who had high power distance scores performed worst than teams with low power distance scores. This was exacerbated when teams collaborated on projects which required close coordination and were time-critical (Swigger et al. 2004).

On the other hand, low power distance groups have been associated with better academic achievement. Paulus et al. (2005) observed that low power distance learners developed trust to overcome conflicts due to miscommunication, modeled decision-making by consensus, shared in leadership roles and assigned responsibilities based on expertise. This allowed the low power distance group to coordinate their internal processes effectively and produce better solutions. Hence we propose:

P2d: The effect of availability of educational technology on academic achievement will be greater on small power distance learners than large power distance learners.

5. CONCLUSION

The capacity of IT to support the education of students from different cultures is increasingly being relied upon due to globalization and the knowledge economy. At the same time, we are witnessing the collaboration of students of different cultural backgrounds through a diversified student population, institutionalized programs and distance learning. This paper has explored conceptually how educational technology affects learning outcomes and the role power distance can play in influencing the effectiveness of educational technology.

The paper has postulated that power distance is a key moderating linkage between the availability of educational technology and learning outcomes. In particular, the availability of educational technology increases learning outcomes consisting of satisfaction, self-efficacy, perceived learning and academic achievement; but the effect will be greater on low power distance learners than on high power distance learners. Educators, instructional designers, and researchers should not underestimate the significance of power distance in teaching and learning situations. Further work should look into designing and structuring educational technology to become more effective for high power distance learners. Inferences from our propositions would likely stimulate developments in this field. Finally, we advocate future research into other cultural dimensions.

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