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Self-Efficacy, Social and Cultural Issues in Designing Online Technology Skills Transfer Programs: A Mexican Context

Dr. Rachna Kumar

Professor of Information Systems and Technology
USI College of Business
Alliant International University
San Diego, CA92131
rkumar@alliant.edu
Phone: (858)-635-4551
Fax: (858)-635-4528

Dr. Louise Kelly

Professor of Strategy and Management
USI College of Business
Alliant International University
San Diego, CA92131
lkelly@alliant.edu
Phone: (858)-635-4840
Fax: (858)-635-4528

Abstract

In this paper, we investigate a successful design for online transfer of technology skills to a developing nation. Our technology skills transfer program entailed a cost effective online delivery mode from the United States

to Mexico and explored mechanisms to counter the non-social aspects of online learning in cultures which are highly collectivist, have a high power distance, and have a high level of uncertainty avoidance. Our study also investigates the potential of online technology skills transfer programs to impact the entrepreneurship of participants in a developing economy by raising their self-efficacy scores and by integrating their learning with the entrepreneurial context of small businesses. A total of 60 vocational Mexican students and 115 Mexican small entrepreneurs were identified as participants in this study. 30 of these students and 15 of these Mexican companies participated in the online technology skills transfer part of the study which involved two online courses in database design and development as well as implementation while being integrated with the real-life context of a small entrepreneurial venture. The remaining 30 students were used as a control group to assess their self-efficacy scores. The remaining 100 small entrepreneurs were used as a sample to assess the level of self-efficacy in Mexican entrepreneurs. The paper reports the details of our design for the technology skills transfer program, methodology for assessment and monitoring, and results and experiences for online technology skills transfer to developing countries, in particular Mexico. Our study showed that online programs need specific mechanisms to counter not only the non-social aspects of online learning but also the specific cultural dimensions such as high collectivism in cultures such as Mexico. The results showed significant improvement in the self- efficacy scores of participants.

Key words: technology transfer, technology skills transfer, Mexico, database development skills, self-efficacy, Hofstede, entrepreneurship, culture, cultural dimensions, online, remote learning, social theory of learning.

Introduction

This paper reports on a study we designed to transfer technology skills to a developing economy in a grass-roots manner with the ultimate aim of strengthening entrepreneurship in Mexico. Technology transfer to developing nations faces several problems including the high cost of training, problems of managing and monitoring the program from remote distances, countering social and cultural incompatibility of styles between source and destination countries, and ensuring lasting impacts to the local business economy (Radosevic, 1999; Cimoli, 2000; Chantramonklasri, 1990;). This study utilized an online technology skills transfer design to cost-effectively deliver database development skills in a hands-on, applied business context, with content designed in the source country (United States). Effectiveness of online education has been studied by several researchers but few studies have been conducted in the context of two different, disparate social and cultural norms in the source and destination countries (in this study, United States and Mexico) (Cardenas, 2000; McGee, 2002; Coppola 2002; Kulik & Kulik, 1991). In addition, this study aimed to investigate a successful design of

online delivery in cultures which have a highly collectivist nature and have a high power distance (Hofstede, 1991; Cimoli 2000). Several studies have reported that online education is largely an individualistic and non-social endeavor with low levels of dependence on any authority figure because the instructor interaction is minimized through asynchronous technology (Zhu, 2004; Chai 2003; Compeau and Higgins, 1995a; Fishman, 1999; Staples 1997). This study tested a design to successfully counter these characteristics of online programs. Finally, the study reported here tested the potential of online technology skills transfer programs to impact the entrepreneurship of participants in a developing economy by raising their self efficacy scores and by integrating their learning with the entrepreneurial context of small businesses. Self efficacy is one of the characteristics of entrepreneurship that has been studied in previous researches. Previous studies have shown links between computer usage and self-efficacy (Compeau and Higgins, 1995b; Hill, Smith, Mann, 1987; Gist, Schwoerer, Rosen, 1989. However, the construct of self-efficacy has not been studied in the context of online technology skills transfer to a developing economy. Staples, Hulland, and Higgins (1999) found that scores on self-efficacy explain the performance of remote workers in virtual organizations and this study advances the results by investigating online learning environments in a developing country context.

A total of 60 vocational Mexican students and 115 Mexican small and medium entrepreneurs (SME) were identified as participants in this study. 30 of these students and 15 of these Mexican companies participated in the online technology skills transfer part of the study which involved two online courses in database design and development as well as implementation while being integrated with the real-life context of a small entrepreneurial venture. The remaining 30 students were used as a control group to assess their self-efficacy scores. The remaining 100 small entrepreneurs were used as a sample to assess the level of self-efficacy in Mexican entrepreneurs. The paper reports the details of our design for IST skills transfer program, methodology for assessment and monitoring, and results and experiences for online technology skills transfer to developing countries, in particular Mexico.

Theoretical Development and Refinement: Interplay of Social Learning, Culture and Self-Efficacy with Remote, On-line Interaction Patterns

In order to guide our design and understanding of the phenomenon of remote, online transfer of technology skills, we utilize three separate theories, well rooted in literature: (1) implications of the principles from the social theory of learning for online learning in Mexico, (2) implications of Hofstede's dimensions of culture for online learning in Mexico, and (3) relevance of the construct of self-efficacy for raising entrepreneurship through online delivery of learning.

Social Theory of Learning: Learning is a social phenomenon and individual learning is embedded in social and cultural contexts and interactions (Salomon and Perkins, 1998). Learning involves the acquisition of facts and knowledge (in this case, database design and development skills) as well as making sense of the topic under study in the context of how the community around them is receiving it and interacting with the reality of their worldview (Jaques, 2000). Online courses are inherently low on the social context of learning. As a result, teachers design mechanisms to naturally cause the students to interact online on not just the facts and knowledge but also on the concepts, the context of the topic, and the marketplace view of the topic. These interactions also allow for discussions, comments on participant perspectives and biases about the topic, feedback about participant constructions of world views and realities about the topics, and so on.

Zhu (2004) reports that the learning occurring in virtual or online courses would be enhanced by the consideration of three factors that reflect learning: (1) make social learning happen as a result of *active participation* in the learning system, (2) make social learning happen by encouraging *active construction of meaning*, and 3) promote social learning by including in the process ways to help participants *learn to learn*.

In our study of transferring technology skills online from U.S. to Mexico, the tenets of social theory of learning leads us to expect the need to design procedures to counter the non-social aspects of remote, online learning and to include mechanisms which increase the instance of active participation. The participants will tend to be somewhat disengaged in the learning process and in the requirements of deliverables and schedules unless specifically coerced into social learning activities.

Hofstede's dimensions of culture: The characteristics of Mexican culture can be understood according to the five dimensions used by Hofstede (1991) in his analysis of national culture. Hofstede identified five dimensions with which to characterize national culture: 1) individualism-collectivism 2) masculinity-feminity 3) power distance, and 4) uncertainty avoidance and 5) long term orientation. Hofstede's findings, although at times criticized for the narrow sample, which included only IBM employees, have been validated by similar studies such as Hamden-Turner & Trompenaars (2000). We will focus on 1, 3 and 4 in this research.

Collectivist culture: Mexican culture has been classified as moderately collectivist (Maertz et al, 1996, Teagarden & Von Glinow, 1990). Similarly, Hamden et al (2000) assigned a 30% of individualism on a scale of 0-100 for Mexican culture, a similar score to Hofstede. So, we can conclude that Mexican culture is not extreme in this first dimension. This can be contrasted with the U.S. example, where American culture is recognized as being individualistic in the extreme. Mexican culture is more on the collectivist side, meaning that Mexicans prefer to be part of in-groups (Cimoli, 2000). Maertz et. al, (1996) asserts that the two most important groups for the Mexican culture are the family and the work group.

Power distance: Power distance is a scale of dependence on relationships in a cultural context (Hofstede, 1991). In small power distance countries, there is a limited dependence of subordinates on bosses; instead interdependence is preferred in that the subordinate consults with the boss. In contrast, in countries with high power distance, there is considerable dependence of subordinates on bosses, and the subordinates respond by either preferring dependence (paternalism) or rejecting it entirely (counter-dependence). Mexico is ranked 5 among 53 countries and regions for this dimension, meaning there is a very high level of power distance or dependence (Hofstede, 1991).

Avoidance of uncertainty: This characteristic refers to the rejection of ambiguity or uncertainty in order to avoid anxiety. Mexico as a country was ranked 18 out of 53, meaning a high level of uncertainty avoidance (Hofstede, 1991). This uncertainty avoidance shows up as a fear of ambiguous situations, a suppression of deviant ideas and behaviors and resistance to innovation (Corona & Hernández 2000).

Based on Mexico's characteristics on Hofstede's dimensions, in our study of transferring technology skills online from U.S. to Mexico, we would expect that the collectivist culture of the Mexican participants will require specific on-ground interventions to develop a sense of being in an in-group, and foster both motivation and collaboration. The high power dependence of the Mexican culture will manifest itself as a high dependence on us as supervisors of the project and would require direct, face-to-face contact with the students to promote active participation. The high score on avoidance of uncertainty for the Mexican culture will cause program design aspects of open-ended interaction with entrepreneurs to be very difficult to manage.

Self-efficacy for Entrepreneurship: Self-efficacy is defined as one's self-belief that he or she can effectively and successfully execute certain actions to attain goals. (Bandura, 1997, Chen, Greene & Rick, 1998); Gist & Mitchell, 1992). Unlike personality and traits, which are relatively stable characteristics, self-efficacy grows with hard won achievements. According to Bandura (1986), individuals gradually accumulate their self-efficacy through prior cognitive, social, and physical accomplishments and learning. A high level of self-efficacy can help entrepreneurs maintain their efforts for goal attainment until their initial goals are met (Gist, 1989).

Entrepreneurship can be defined as the process of creating something new with value and devoting the necessary effort and commitment to making that happen. Research has also shown that entrepreneurs not only pursue more ambitious goals and activities but also persevere in their quest longer (Bandura, 1997). There has been much research devoted to several factors which motivate entrepreneurial orientation and ability (Lumpkin, G.T. and Dess, 1995; Hills and Schrader, 1998), with some studies suggesting that self-efficacy successfully differentiates entrepreneurs from non-entrepreneurs (Lucas, Cooper & Sarah., 2004; Makman, , Balkin, & Baron, 2002; Chen, Greene & Crick 1998; Gist & Mitchell 1992). An entrepreneur who has self-efficacy, that is one who truly believes in his or her capability to

execute all of the requirements to perform a new task successfully, is more likely to persevere longer until attainment of task completion (Bandura, 1997). The high self-efficacy of the entrepreneur is likely to contribute to his or her seeing the positive potential outcomes that might accrue from a new venture and pursuing those goals vigorously. As a result, entrepreneurial inclination may be correlated with a high level of self-efficacy (Forbes, 2005).

Few studies have been done on the relationship of entrepreneurship with self-efficacy in developing countries (Drnovsek, & Glas, 2002.). Strengthening entrepreneurship in students is one of the objectives of our study. Accordingly, we assess the self-efficacy scores of Mexican small entrepreneurs and of Mexican vocational students as an exploratory benchmark.

Hypothesis 1: The mean self-efficacy scores of the entrepreneurs will be higher than the student groups.

Research has also studied the effects of remote work involvement and self-efficacy scores (Bandura and Schunk 1981; Saks 1995). Remote work causes participants to manage their time and contributions with more self control and power than on-site situations (Hill, Smith, and Mann 1987). This tends to benefit the perception and actual traits of individual effectiveness. Another aspect that has been studied but not extensively in literature is the link between technology skills and self-efficacy (Staples, 1997; Gist, Schwoerer and Rosen, 1989). Technology skills and the information and analysis capability imparted by technology allow an individual to exert more control over their work and personal environment. Increased locus of control has been shown to lead to higher self-efficacy in individuals. Interventions which aim to transfer technology skills should then endeavor to raise the self-efficacy scores of participants to match those of entrepreneurs in this benchmark.

Hypothesis 2: The mean self-efficacy scores of the participating students will be higher than the control group of students.

Research Methods and Data Collection: Design of Technology Skills Training Study for Mexico

The database design, development and deployment skills were delivered through two online courses which were hosted on a server in the U.S. We partnered with a local university and a local chamber of commerce in the destination country. The developing country in this study was Mexico (Tijuana region) and we have another proposed project in Kenya (Nairobi region).

We aimed to have a more grass-roots level impact in the business community of the region. So we addressed the supply side of our goals by using vocational students in our training group rather than regular university students. We addressed the demand side of our goals by matching the students being trained with local small businesses. Pairs of students were placed within one business each for the duration of the course. In addition,

the businesses were paid a small grant in order to allocate time, energy and technology resources to the students and to cooperate with them in facilitating the implementation of the database skills they learned.

A total of 60 vocational Mexican students and 115 Mexican small entrepreneurs were identified as participants in this study. Thirty of these students and fifteen of these Mexican companies participated in the online technology skills transfer part of the study. The remaining thirty students were used as a control group to assess their self-efficacy scores. The remaining hundred small entrepreneurs were used as a sample to assess the level of self-efficacy in Mexican entrepreneurs. The average age of these companies was 12 years, with 318 employees and average annual revenue of $276,882. The respondents had an average of five years with the company and were 84% male. The surveys were sent out to the 121 members of CANIETI Chamber of Commerce in Tijuana, with 100 useable surveys completed, yielding an 82.6% response rate. CANIETI is the National Chamber of Commerce for electronics, so all the firms are in the electronics industry.

Over the course of five months, thirty students first learned database design and development skills, and then implemented the skills by building databases in the company with which they had been matched. The two database courses were given to the students free of charge. The course had weekly deliverables including assignments, discussion board and journal writing, which the students were required to submit online using our distance learning tool. The course was hosted on our servers and accessible via standard Internet connection. The online course was a typical BlackBoard site.

Our local Mexican university partner provided computers, Access software and Internet connection free of charge to the students. They also identified the sixty students based on a simple computer aptitude test provided by us. Thirty students were chosen at random to act as a control group for the study, and the other thirty undertook the remote, online technology skills transfer courses. We had also specified that students should have English proficiency since our training medium was in English. As mentioned earlier, these students were vocational students rather than regular university students. Our local Mexican chamber of commerce partner enlisted support from fifteen small companies to participate in the hands-on technology skills transfer project with students based on their willingness to commit to the time and study. The partners matched two participating students from the group undertaking hands-on courses with each of the fifteen participating companies based on commuting convenience. The companies were required to have at least one computer and Access software for student use.

In addition, our local Mexican chamber of commerce partner identified the one hundred small companies that were used as a sample to assess the level of self-efficacy in Mexican entrepreneurs. Their support was enlisted on a volunteer basis from the chamber's membership list. Their self-efficacy scores were assessed using a questionnaire survey which contained

multiple items relating to the construct of general self-efficacy

Questionnaire Used: Being an entrepreneur requires a diverse set of skills (De Noble, Jung & Ehrlich, 1999), not all of which can be measured by self-efficacy. In addition, validated self-efficacy scales for information systems or entrepreneurship are not yet available or underdeveloped empirically (Forbes, 2005) , so we used a general self-efficacy scale. This scale captures one's belief about what one can accomplish under different conditions, using whatever skills one presently has (Chen, Gully & Eden, 2001). This measure was an eight-item, ten-point scale (1= strongly disagree; 10= strongly agree), a modification of what that has been used successfully in previous research. Our Mexican partners were already administering surveys with the ten-point scale, so we conformed to that scale. We added four items to this eight-item questionnaire to reflect self-efficacy impacts of the online program intervention that the participants were undergoing in the courses These items were adapted from the self-efficacy measures in previous research done in the context of technology-enabled work (Brown, Ganesan, Challagalla, 2001; Staples, Hulland, Higgins, 1999; Gist, Schwoerer, Rosen, 1989). We did not include direct measures of computer self-efficacy as developed by Compeau and Higgins (1995b) because our study did not aim to measure participants' self-efficacy for computer technology related tasks. Rather, we were interested in testing participants on their scores for information utilization related and entrepreneurship related self-efficacy (Brown, Ganesan, Challagalla, 2001) .

Items included statements such as "I am strong enough to overcome life's struggles, " I can handle the situations that life brings," and "I usually feel I can handle the typical problems that come up in life." All twelve measures of self–efficacy are shown in the questionnaire in the Appendix.

The quantitative objectives of this study involve testing results for improvement in self-efficacy scores. For this, we assess and compare mean self-efficacy scores of the three groups, Mexican vocational students participating and undertaking the intervention of remote, online database skills transfer courses (group 1), control group of Mexican vocational students (group 2), and entrepreneurs in the SME sector of the local area in Mexico (group 3) .

The questionnaires were administered to students by a senior administrator from our local University partner. The responses were anonymous and held confidential. The questionnaires were administered to the entrepreneurs by an external market research company picked and managed by our local chamber of commerce partner. An overall self-efficacy score was computed by summing responses on the individual items in the questionnaire and computing the means. This is standard method used for self-efficacy measures (Lee and Bobko, 1994).

We met the students and the companies in a launch ceremony before the start of the courses and described the design, plans and course. The objectives were to set up the online course medium, familiarize the students with course design and requirements, and stress the element of remote

interaction with the project leaders and the instructors. We demonstrated to the students the online interaction with the course. The students also undertook a hands-on session in our presence where they commenced online interaction with the course. Our emails were included on the course site and we also strongly encouraged the students to interact with email for any questions at any time. The students were provided paper-based course materials free of charge, consisting of detailed, keystroke level tutorials for all the topics included in the skills training. The online material consisted of Word and PowerPoint documents discussing the concepts and summarizing the tutorials. The weekly assignments were described in great detail and emails were sent to them twice a week as reminders for the work that was assigned to them during that week.

The study design entailed only one other meeting to wrap-up the study at the end to award certificates of completion to the students and the companies.

Results

Interaction Patterns with Online Medium and with Course Content

In the first quarter duration of the study we had extreme difficulty in getting the students to keep up with the scheduled work and deliver their assignments. We analyzed the statistics generated by our online tool for site usage by student, by day, by hour and by content area. Only five of the students actually spent any time on the course site at all. Only four out of the thirty students delivered any assignments. Our emails received hardly any responses and when we did get responses, they were from the same four students. As a result, we re-oriented the design and scheduled monthly, on-ground meetings with the students. In all, we scheduled four, previously unplanned monthly meetings with the students.

All our meetings had close to 100% attendance. We found the students eager to learn and to please and to be very cooperative. During the next meeting, we broke up the class into four groups and assigned the most active five students as team leaders. We encouraged and setup Blackboard's feature for group chat sessions and interaction areas on the online course and demonstrated them to the students. We also included a requirement for the team leaders to interact with us to report on their team's individual member's work once every week. We announced a monetary award to the best databases built at the end of the study.

The week after the first monthly meeting, we received on-line assignment submissions from 50% of the class members. The statistics reported a marked increase in the number of students who used the Blackboard tool. However, although almost 75% of the students used the tool in that they logged in and spent some time browsing, the most time spent on the tool was still under 10 minutes and in many instances a mere 2 to 3 minutes. Our team leaders reported on their team members' work for the next two weeks and then stopped reporting. They continued responding to our emails

but not with much relevant content. We also noticed that the group areas for communication and collaboration were used heavily for chats between some members in the next week.

The second week after the first monthly meeting, all factors of interaction that we were tracking markedly reduced. The number of assignment submissions went down to 25%, the online tool usage went down to 10% of the students, and the average time spent per student for the week was close to 10 minutes. The next two weeks followed a similar pattern.

In our second monthly meeting, we formed a focus group. We selected the students more forthcoming in their online participation or better in deliverables and asked them to share their concerns and suggestions on the project. They communicated problems of internet access, how the internet was not available to them all the time, how they spent most of their day at school and how they did not have internet at home. The majority of the students did have computers at home but not internet access. So at school they could read the material on the screen but could not download to the hardrive. It was clear they were not interacting due to online access issues.

So we decided that students should be provided a CD-ROM of the course in addition to the online access. We later prepared that and mailed it to our Mexican university partner to distribute it to the students. However, the results and our experiences followed a pattern similar to that described after our first monthly meeting. We had also invited the companies to this meeting so that the students and companies can both get acquainted with the status of the course and meet with us. However, we had trouble getting the companies to keep up to date with their interaction with us and the students along similar lines as that described for the students.

Summarizing our results and experiences, as shown in Figure 1, the interaction of the students with the online tool was not high. Their submissions of assignments to us were not high either. However, the attendance at our meetings was very high. The week after the meetings, all interaction factors being tracked showed improvement, and decreased in weeks after that. The group chat tool was the one used the most and usually for chats among group members. Companies had similar patterns in interacting with us via email (they were not designed to be using the online tool). They did, however, cooperatively connect with the students that were matched with them, readily provided them with resources and access, and reported positive experiences with student contributions.

Self-Efficacy Scores of the Three Groups

Table 1 reports the mean scores for self-efficacy for the three groups. Table 2 shows the one-way ANOVA results for the three group's self-efficacy (group 1=participant students, group 2=control group students and group 3=entrepreneurs). The data show statistically significant differences for the mean score of self-efficacy between the control group of students, the participating students and the untreated entrepreneurs ($F= 381.976$, $p < .01$).

Figure 1: Chronology of Technology Transfer Online Course

Weeks	Student output	Technology Transfer Program adjustments	Social & Cultural Issues
1-4	• 5 of 30 students delivering assignments, • no email response	• Launch of program with students and entrepreneurs	• Collectivist culture facilitates successful launch • Social interaction motivates
4-6	• 5 Team leaders report weekly • 15 students submit assignments • More online chats	• Initiate face-to-face meetings • Designate student leaders	• Power distance positively • motivate student with designated leaders
7	• Team leader reports drop off • Only 25% of students submitting assignments		• Lack of social interaction is demotivating
8	• Further decline in student participation rates	• Involve entrepreneurs more in goals and deliverables	• Reduce uncertainty by making student interactions with entrepreneurs have more structured format
9		• Form a focus group • Provided CD-ROMs issues	
10-20	• Student participation surges /drops off according to face-to-face contact with professors		

The results also include an application of the post-hoc Scheffe test. The Scheffe test is a procedure that allows one to test unplanned comparisons among means without inflating the Type I error rate. Sheffe's test gives the freedom to test any and all comparisons that look interesting. We used a Scheffe test to examine planned comparisons between the one treatment condition and two baselines (Glantz & Slinker, 1990). These follow-up comparisons in which we used Scheffe's method (Winer, 1971) to contrast

the participant students with entrepreneurs (H1), and control group with the entrepreneurs (H1) and the control group of students with participant students (H2), showed significant differences (the participant students with entrepreneurs p < . 001; control group with the other entrepreneurs p < . 001: control group of students with participant student, p < .001) These findings further support both Hypothesis 1 and 2 . The ANOVA and Scheffe tests demonstrate that the entrepreneurs have a high a level of self-efficacy which is significantly higher than of both groups of students. The entrepreneurs exhibited a higher self-efficacy as compared with the participating students and the control students, supporting Hypothesis 1. Hypothesis 2 was similarly supported, with the participant students showing a higher level of self-efficacy than the control group of students. It should be noted that while the program did produce a higher self-efficacy, participant students in this program were not able to reach, during the program, the self-efficacy of the actual entrepreneurs. These findings are consistent with literature on self-efficacy which shows that self-efficacy continues to grow over time and with accumulated entrepreneurial experience (DeNoble, et al. 1999).

Table 1: Group Statistics: Self-Efficacy Mean Scores

1=participant students 2=control group students 3=entrepreneurs		N	Mean	Std. Deviation	Std. Error Mean
SE_average_profile	1.00	30	5.5917	.84428	.15414
	2.00	30	4.7389	.61305	.11193
	3.00	100	8.6158	.79410	.07941

Table 2: ANOVA of Self-Efficacy Mean Scores for Three Groups

	Sum of Squares	**df**	**Mean Squares**	**F**	**Sig.**
Between Groups	457.396	2	228.698	381.976	.000
Within Groups	94.000	157	.599		
Total	**551.396**	**159**			

Discussion and Interpretation of Results

Our study was technology skills-based and opportunities for active participation in the learning system were not naturally in-built. Students could participate in the system but not as part of their learning needs. Participants in this study had trouble constructing social meaning of the topics being studied because they were not connected on-ground and the course did not

have a specific center of delivery with which they mentally connected. The center of delivery was remote, in San Diego on the U.S. side of the border; the students or the companies had never visited us here; we had no specific office for functioning on the Mexican side of the border with which they could identify. We had promoted social learning by including ways to help participants learn to learn in the process with the mechanism of discussion boards and using the group leaders and teams. We did notice that every time the group leaders were identified and team members pointed out, the interaction scores improved during the next week. The group chat areas were the only areas utilized by some of the students. We had five teams and five group leaders for a participant population of 30, resulting in each group having 6 students. Smaller groups could have been more conducive to promoting the concept of learning to learn.

Based on the tenets of social of learning, we had expected the need to design procedures to counter the non-social aspects of remote, online learning and to include mechanisms which increase the instance of active participation. The participants were somewhat disengaged in the learning process and in the requirements of deliverables and schedules until we specifically coerced the social learning activities. We found that the standard online design mechanisms of weekly deliverables, discussions board topics, and management structure for monitoring students did not counter the disengagement issues for the Mexican context. These mechanisms are popularly included in online course designs in the U.S. and from experience in teaching online courses; we have found them to be reasonably successful in the U.S. in keeping the students engaged with the content and on track with the deliverables. In our Mexican study, group leaders and intermittent face-to-face meetings had more success but the frequency of face-to-face meetings was not enough to sustain the social motivation and engagement of the students in the interim.

Mexico's characteristics on Hofstede's dimensions of high collectivist culture, high power dependence and high uncertainty avoidance reduce the success of the standard online design mechanisms. Discussion boards, scheduled chats and weekly deliverables have typically succeeded in U.S. culture. However, our Mexican participants required more on-ground group and team interactions, more face-to-face meetings, more structure and specification in their entrepreneurial interactions, to be engaged with the learning.

In our technology skills transfer initiative; we found that the Mexican collectivist culture was actually working against the successful implementation of the project. Because the course work was largely delivered online it was very difficult for the Mexican students to develop a sense of being in an in-group, which had demoralizing effects on both motivation and collaboration. When we had face-to-face meetings with the Mexican students, which occurred three times over a four-month period, the productivity of the students increased. We also designated certain students as leaders in order to overcome the isolation that the Mexican students experienced in this

course. This leader interaction resulted in the students' feeling more a cohesive and connected group and worked for some time in improving the learning to a slight extent.

Also, the role of the manager or supervisor is very important to Mexicans due to the higher power distance. A supervisor is viewed as a patron or father figure (Teagarden et al, 1992). In our research, the students showed a high dependence on us as supervisors of the project. So when we did not have direct, face-to-face contact with the students, they were not able to initiate contact with us for problem solving.

Finally, avoidance of uncertainty is very relevant to our technology skills transfer work in Mexico. Students found the open-ended interaction with the entrepreneurs very difficult to manage and actually avoided interacting with the business owners as a way to minimize the uncertainty of their task. At the conclusion of the project, even the entrepreneurs indicated that they were uncomfortable because they saw the nature of their interaction with the students and with the project leaders as not being sufficiently prescribed. The specific structuring of the deliverables, as well as dimensions of interaction, helped both the entrepreneurs' and the students' willingness to perform the tasks required.

Our quantitative results showed raised levels of self-efficacy scores for students who had undertaken our remote, online database skills courses. Over the course of five months, these students had gone through requirements which they had successfully navigated in spite of their perception of uncertainty, lack of specificity, lack of social connectedness, and low guidance from a power/authority center. Their self-efficacy scores show improvement, although their means are lower than the group of local entrepreneurs in the SME sector.

Our expectations are that training the students with the database related skills and embedding them within the real-life SME environment of the businesses would impact the sustainability and transfer of training to the businesses. We found that the Mexican culture does not lend itself easily to an on-line delivery method, that issues of collectivism, high power distance and uncertainty avoidance were all impediments to the successful transfer of technology skills. This suggests that the delivery method needs to be designed very specifically to take into consideration some of the unique configurations of Mexican culture. Although the social aspects of learning can be designed into online skills training courses, the cultural aspects of the learning community impact the efficacy of the training and performance scores critically.

Contributions

Our study demonstrated that technology skills transfer and investment projects for developing countries and emerging economies have several important aspects which control their success or failure in the destination country. Remote, online technology skills transfer designs have the potential

for much success and acceptability if designed correctly. However, the popular mechanisms included in an online design, such as discussion boards, which have sufficed as motivators for social and active learning in the U.S. are not enough to counter the cultural aspects that moderate learning. In regions which are highly collectivist, high on power distance and high on uncertainty avoidance, face-to-face interaction with on-ground intervention is crucial to keep participants engaged and motivated to learn.

In addition to being feasible and cost effective, remote, online skills transfer designs could also have a grass-roots impact by including the SME sector and by impacting student preparedness for entrepreneurial ventures and for stimulating software clusters in the destination.

Many of the characteristics of the Mexican culture are in fact representative of many developing economies. This research demonstrates that there are some inherent risks in transferring a model of online technology skills development courses without modifying it to adapt to the cultural context and social learning needs of the destination country. The Mexican study affirms that there is a strong need and desire to develop these technology and related business and innovation skills and that finding cooperating institutions such as chambers of commerce and universities are necessary but not sufficient for technology skills transfer success. This research suggests that addressing the key issues of social learning and cultural dimensions in the course design and delivery is a crucial step to success in technology skills transfer to developing nations.

Limitations and Implications for Future Research

This study was conducted in one region of the destination country, that of Tijuana in Baja California, Mexico. The design and results need to be replicated with data from several regions of Mexico and later, with data from other developing countries across the world. In addition, we utilized one technology skills subject, that of database design and development. Future research should gather data and results for other technology skills related subjects, such as software programming, network building, e-commerce ventures, and so on.

This study used thirty students and fifteen small companies for the technology skills transfer portion; thirty students as a control group; and one hundred entrepreneurs as a benchmark group of entrepreneurs. Larger samples of students and entrepreneurs will give us more robust results. In addition, the sample was a convenience sample, solicited from the local chamber of commerce membership. A random sample would establish our findings as more robust and replicable for this country.

The difficulties of conducting such technology skills transfer studies in foreign countries included access, commitment, project control and need for funding. Particularly in developing countries, the need to motivate participants as well as partners requires funding. In fact, this study brought to light very many interesting features of remote project management for

developing countries. The salient features include differences in commitment styles, differences in understanding of work deliverables, differences in quality standards, and differences in levels of specificity and detail during communication. Academic studies are often challenged for funding and we found money to be a major motivator for remote project management in developing countries, specifically Mexico, in the case of this study.

Future studies will involve data sets from different regions within Mexico and from different developing countries. We would also like to conduct a longitudinal study to gauge the long term effects of such technology skills transfer interventions on the expansion of the SME sector. Larger samples where vocational students are required to harness the power of the systems they implemented in the companies in order to impact the company performance in the medium term would also be a logical extension.

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Appendix 1

SURVEY INSTRUMENT

Please indicate the extent to which you agree with each of the following statements (circle one number for each item).

Strongly disagree = 1 2 3 4 5 6 7 8 9 10 = Strongly agree

01	I am strong enough to overcome life's struggles	1	2	3	4	5	6	7	8	9	10
02	At root, I am a weak person	1	2	3	4	5	6	7	8	9	10
03	I can handle the situations that life brings	1	2	3	4	5	6	7	8	9	10
04	I'm usually an unsuccessful person	1	2	3	4	5	6	7	8	9	10
05	I feel competent in using computer technology	1	2	3	4	5	6	7	8	9	10
06	I often feel that there is nothing I can do well	1	2	3	4	5	6	7	8	9	10
07	I feel that I have enough information to make good decisions	1	2	3	4	5	6	7	8	9	10
08	I feel competent to deal effectively with the real world	1	2	3	4	5	6	7	8	9	10
09	I often think that I can control the uncertainties in life	1	2	3	4	5	6	7	8	9	10

10	I often think that I'm a failure	1	2	3	4	5	6	7	8	9	10
11	I think I am a person who is very unaware of what is happening around me	1	2	3	4	5	6	7	8	9	10
12	I usually feel I can handle the typical problems that come up in life	1	2	3	4	5	6	7	8	9	10