CHAPTER 3: METHODOLOGY

This chapter describes the methodology employed in the current study. The purpose of the study was to analyze the factors that influenced the innovation adoption process of teacher trainers participating in the UNESCO *Establishing the Effective Use of ICT for Education for All in Cambodia* project. The innovation under analysis was the collection of skills and knowledge gained through participating in this ICT in education project. These skills include how to use software such as Word, Excel, and PowerPoint, how to navigate the Internet, and how to use hardware such as computers, printers, scanners, and digital cameras. Quantitative and qualitative data were collected from teacher trainers through a survey and through face-to-face interviews. Supporting data came from in depth analyses of UNESCO project documents, MoEYS documents, informal discussions with UNESCO project staff, and the researcher's onsite experiences while serving as an intern on this UNESCO project.

This mixed methods study tested an extended form of Rogers' model of the diffusion of innovations theory by measuring Moore and Benbasat's (1991) perceived characteristics of innovations (PCIs) and comparing those results to different categories of adopters. The researcher tested the tenants of the Rogers' model within the confines of the UNESCO ICT in education training. It was hypothesized that earlier adopters of the ICT innovation would perceive the PCIs most favorably, followed by late adopters, reinvent adopters, discontinue users, and rejecters. Further, it was hypothesized that that each group of teacher trainers would experience unique adoption challenges.

Participants

Completed surveys were received from 379 teacher trainers; 25 of whom were master teacher trainers for an overall return rate of 72.1%. This represents a 77.7% return rate from teacher trainers at PTTCs and a 62% return rate from teacher trainers at RTTCs. Table 2 details that return rates from TTCs ranged from 50% to 100% (see Appendix D for details). Surveys from the National Preschool Training College (N=1) and the National Institute of Education (N=1) were not used in the subsequent statistical analyses since these institutions are notably different from the other TTCs in Cambodia.

Table 2

Survey Completion Rates According to Type of TTC

Type of TTC	Number of Teachers Trained Including Master Trainers	Number of Surveys Returned	Return Rate
PTTC	336	261	77.7%
RTTC	187	116	62%
National Preschool Training College	2	1	50%
National Institute of Education	1	1	100%
Total	526	379	72.1%

Data Collection

Survey

The survey used in the current study was a slightly altered version of a four-point Likert scale, 25-item instrument developed by Moore and Benbasat (1991) (see Appendix E and Appendix F). Moore and Benbasat noted that although the questions for the instrument were tested for reliability and validity and were developed with respect to a particular ICT innovation (i.e., personal work stations) for a particular audience (i.e., U.S. university professionals) it was nonetheless "believed that they could be easily reworded

by substituting the names of different IT innovations, though additional checks for validity and reliability would be prudent after rewording" (p. 211). The current study substituted the phrase 'ICT skills' for 'personal work stations.' A composite mean score was determined for each teacher trainer under each PCI variable. A decision category was determined for each teacher trainer based on responses from the behaviors questions as described below. Additionally, each teacher trainer was classified according to the type of TTC (i.e., PTTC or RTTC), gender, age, and experience level.

The original survey was translated into Khmer by a UNESCO staff member who served as the Khmer translator for the ICT in education project and on various other NGO projects. A second Khmer coworker who worked for UNESCO but not on the ICT in education project edited the translated survey. The first and second translators collaborated to create a third version of the translated survey. A third translator read the edited survey and made final grammatical and spelling corrections without changing the meaning. The fourth translated survey was back translated into English by the original Khmer translator.

The researcher worked closely with a representative from the MoEYS who served as the UNESCO ICT in education project focal person. With the aid of this person, the researcher disseminated the translated survey in two rounds. The survey, along with the informed consent information was first given to every master teacher trainer (see Appendix C). The survey was administered during a national meeting on ICT curriculum improvement on June 21, 2006. The surveys were returned to the researcher the following day.

Master teacher trainers were asked by the researcher through the representative of the MoEYS to disseminate copies of the same survey at their respective TTCs to teacher trainers who received the ICT in education training. The master teacher trainers were directed to discuss with each teacher trainer the informed consent process. In the following weeks, the second round of surveys was delivered to the MoEYS via the master teacher trainers.

Two open-ended questions were added to the quantitative survey. These questions were: (1) Please describe in detail an experience when you felt you have used the ICT skills successfully; and (2) Please describe in detail an experience when you have not been successful using the ICT skills.

Interviews

In July and August of 2006, the researcher interviewed 17 teacher trainers at their respective TTCs (see Appendix G for the interview protocol). The interviews were conducted with the assistance of the representative of the MoEYS as well as a hired translator. Nine teacher trainers were interviewed from Phnom Penh RTTC. Additionally, three teacher trainers from Kandal RTTC and three teacher trainers from Kandal PTTC were interviewed. Finally, the researcher interviewed a master teacher trainer from the NIE and a teacher trainer from Banteay Meanchey PTTC. These teacher trainers and were selected through a convenience sampling procedure.

Document Analysis

The researcher served as an intern at UNESCO in the Phnom Penh, Cambodia office on the *Effective Use of ICTs in Education for All in Cambodia* project from June 1st, 2006 to August 31, 2006. Through this three-month internship the researcher had the

opportunity to analyze all project documents including formal and informal evaluations, budgets, and anecdotal evidence provided by project staff. During the internship, the researcher analyzed a UNESCO survey on the state of ICT in seven rural provinces (Richardson, 2006), attended ICT in education meetings, and prepared the final report for the ICT in education project.

Validity and Reliability

Reliability of the qualitative data was addressed by coding predominantly against Rogers' model of the DOI. Reliability and validity were also maximized by triangulating data from various sources: a quantitative survey; open-ended questions attached to the survey; interviews; document analyses; and on site experiences.

Content validity of the survey was addressed by the original developers who noted "the method of developing the scales provides a high degree of confidence in their content and construct validity" (Moore & Benbasat, 1991, p. 210). Using three translators and four survey iterations as described above addressed the face validity of the translated survey.

Reliability of Quantitative Data

Prior to analysis, reverse scaled items were flipped to enhance clarity of interpretations. As reported in Table 3, internal consistency reliability of the PCI scales in the present study were consistent with those reported by Moore and Benbasat (1991). However in the current study, the scales used to measure if the innovation was voluntary and visible had noticeably lower reliability. The current research study achieved a Cronbach's alpha of .12 for the visibility PCI while Moore and Benbasat reported a Cronbach's alpha of .83. Additionally, the current study achieved a Cronbach's alpha of

.63 for the PCI of voluntariness while Moore and Benbasat's survey had a Cronbach's alpha of .82. In the case of visibility, the reliability was so low that the extent to which a teacher trainer observed other teacher trainers using the ICT skills was not adequately tested. With regard to voluntariness, reliability was lower than conventional norms but it was anticipated that this PCI might be indicative and was retained.

Table 3

Reliability of PCIs Using Alpha Coefficients

PCI	Number of Items	Cronbach's Alpha Reported by Moore and Benbasat (1991)	Cronbach's Alpha of Current Study
Voluntariness	2	.82	.63
Relative Advantage	5	.90	.91
Image	3	.79	.82
Compatibility	3	.86	.79
Ease of Use	4	.84	.83
Results Demonstratability	4	.79	.78
Visibility	2	.83	.12
Trialability	2	.71	.69

Data Analyses

Assigning Decision Categories

Rogers (2003) claimed the "decision stage in the innovation-decision process takes place when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject an innovation" (p. 177). Rogers noted "instead of simply accepting or rejecting an innovation, potential adopters are on many occasions active participants in the adoption and diffusion process, struggling to give meaning to the new idea as the innovation is applied to their local context" (p. 187). Rogers' model posits that adoption can involve both early and later adopters. Based on Rogers' model, the decision categories for the current study were: early adopters, late adopters, teacher

trainers who reinvented the innovation, teacher trainers who experienced discontinuance, and teacher trainers who rejected the innovation. Determining the decision category was based on responses to behavioral questions of the survey (see Appendix E and Appendix F).

Only the master teacher trainers were considered potential early adopters while all other teacher trainers were considered potential late adopters. Teacher trainers who agreed or strongly agreed that they used all or some of the ICT skills gained from the ICT training were labeled as late adopters or early adopters depending on if the person was a master teacher trainer or a teacher trainer. Teacher trainers who agreed or strongly agreed that they used the ICT skills differently than they did at the ICT training were labeled as a person who reinvented the innovation. Teacher trainers who agreed or strongly agreed that they quit using the ICT skills gained from the ICT training were labeled as a person who experienced discontinuance. Finally, teacher trainers who agreed or strongly agreed that they never used the ICT skills outside of the ICT training were labeled as rejecters of the ICT innovation.

Table 4 details the categorization scheme of all teacher trainers in the study. Initial categorization was based on survey responses from the behavioral questions. Initial categorization revealed that teacher trainers could be labeled under multiple categories. Categories were collapsed using the following criteria:

- Teacher trainers who reported rejecting the ICT training in any form were labeled as rejecters of the ICT innovation (*n*=50).
- Teacher trainers who reported using the ICT training without change to the technical skills were labeled as late adopters of the ICT innovation (*n*=185).

- Teacher trainers categorized as late adopters of the ICT innovation but who no longer used the ICT skills were labeled as had experienced discontinuance (*n*=58).
- Teacher trainers who reported using the ICT skills differently from how they were taught at the training were labeled as reinventors of the ICT innovation (*n*=46).
- Due to unusable data, some teacher trainers could not be categorized using the above criteria and were removed from the study (*n*=15).

After collapsing these categories, 339 teacher trainer surveys were placed in the five decision categories.

Categorization of the master teacher trainers was done in the same manner as categorization of the teacher trainers. The only exception was that every master teacher trainer was considered to be a potential early rather than late adopter. To remain in this category master teacher trainers had to agree or strongly agree that they used all or some of the ICT skills gained through the ICT training. Group membership of master teacher trainers was assigned using the following criteria:

- All but six master teacher trainers fell into only the early adopter category and were labeled accordingly (*n*=17).
- Four master teacher trainers fell into the early adopter category but were also classified as a master teacher trainer who reinvented the skills. Since the present research study did not attempt to differentiate the extent of use among early adopters and given the small number of members in this group, these master teacher trainers were combined with the early adopter category (*n*=4).
- One master teacher trainer discontinued use of the ICT skills and was excluded from the study (*n*=1).

- One master teacher trainer did not respond to the behavioral questions and was dropped from the study (*n*=1).
- The master teacher trainers from the National Institute of Education and the National Preschool Training College were excluded from the study (*n*=2).

In total 21 master teacher trainers were categorized as early adopters.

Table 4

Total Respondents by Each Decision Category

Combined Decision Category	Number of Surveys	Number of Surveys in Analyses	Percentage of Teacher Trainers in each Decision Category
Reject		50	13.89%
Reject	4		
Reject; Late	13		
Reject; Discontinuance	2		
Reject; Late; Reinvent	4		
Reject; Late; Discontinuance	14		
Reject; Discontinuance; Reinvent	3		
Reject; Discontinuance; Reinvent; Late	10		
Discontinuance		58	16.11%
Discontinuance; Late	49		
Discontinuance; Late; Reinvent	9		
Late		185	51.39%
Late	185		
Reinvent		46	12.78%
Reinvent	2		
Reinvent; Late	44		
Early		21	5.83%
Early	17		
Early; Reinvent	4		
Undetermined			
Potential Late Undetermined	13*		
Undetermined DOI Decision Category	2*		
NIE and National Pre-School College	2*		
Early; Discontinuance	1*		
Potential Early Undetermined	1*		
Total:	379	360	100%

*Note: Surveys not included in analyses

Qualitative Data Analysis

Interview transcripts and the open-ended survey questions were analyzed using NVIVO 2.0, a qualitative coding software package. Data from the multiple sources were

analyzed according to the constant comparative method. This process involved collecting data, seeking themes looking for diversity, coding, working with the data, and comparing emerging codes with old codes. This method allowed the researcher to continually look for evidence that either disconfirmed or confirmed emerging evidence of the PCIs as well as challenges associated with the adoption of the innovation.

Quantitative Data Analyses

All survey responses were inputted into SPSS 13.0 statistical analysis software. A descriptive statistical analysis was conducted to determine the nature of the data. Advanced analyses of the data included a MANOVA to determine if group differences existed followed by various post hoc ANOVAs on those differences. These analyses were followed up with a post hoc discriminant analysis to determine the characteristics that most influenced a teacher trainers' decision in adopting the ICT innovation. Results from these analyses procedures are described in the following chapter.