

Diffusion of technology adoption in Cambodia: The test of a theory

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ABSTRACT

This study tested the diffusion of innovations theory to determine if it was applicable in describing technology adoption patterns of teacher trainers in Cambodia. Tested were eight perceived characteristics of innovation and four demographic variables. MANOVA results indicated that different types of adopters had significant differences in eight perceptual characteristics and four demographic variables. ANOVA results indicated that seven of the eight characteristics significantly impacted adoption and no demographic variable had a significant influence on adoption rates. Findings for further theoretical development, ICT project planning, and suggestions for future research are included.

Keywords: *technology; information and communication for technology; international development; diffusion of innovations; Cambodia; teacher trainers.*

INTRODUCTION

Globalization has increased interconnections as well as the interdependency of nations and individuals. Globalization however, has not ubiquitously leveled the playing field as purported by authors such as Friedman (1999). These new relationships have created an increased awareness of the digital divide that separates not only nations from nations, but communities from communities within nations. In less developed countries, the inability to effectively adopt 21st Century digital innovations hampers progress toward modernization and lowers the chance that they, as nations or collections of individuals, may someday participate and compete in the global, knowledge- driven economy. Specifically, to decrease this digital divide, there is an urgent need to understand the determinants of the adoption of information and communication technologies (ICTs) in less developed countries.

In an analysis of the determinants and effects of ICT diffusion in less developed countries, Balamoune-Lutz (2003, p. 151) found that while a substantial body of literature exists "on the possible determinants of globalization, much smaller work has been devoted to understanding the determinants of ICT diffusion, particularly in developing countries." The need to better understand ICT diffusion is balanced with the reality that it is difficult to find sustained success stories. Van Rensburb, Veldsman, & Jenkins (2008, p. 77) pessimistically noted "most of these [ICT for development] projects never properly work, and for those that might get off the ground, go back 2 years later and it's all crumbled to dust." Thus, to effectively address the digital divide and increase sustainability of ICT projects in less developed nations, it is imperative scholars, policy makers, and practitioners understand these initiatives from the stakeholders' perspective. Although there is a need to research ICT initiatives in all sectors of international development, the current research is focused only on the education sector.

The present study is conceptualized around the diffusion of innovations theory. The researcher used this theory to better understand the differences between adopters and non-adopters of a given ICT innovation in Cambodia. The current study included demographic variables to determine if the characteristics, as defined by Rogers (2003) and Moore & Benbasat (1991),

effectively describe the reality of ICT adoption in this less developed country or if more omnipresent variables (i.e., demographic) account for these differences. Determining the impact of demographic variables on ICT adoption rates informs technology trainers, policy makers, and international funders as they work to increase sustainability, spread, and replicability of future technology training initiatives in similar countries. The findings additionally serve academics as they continue to refine and use the diffusion of innovations theory in nations at different levels of development.

THEORETICAL FRAMEWORK

Rogers' (2003) model of the diffusion of innovations was influenced by the work of Ryan and Gross (1943) who studied the adoption of hybrid seed technology in two lowland farm communities. Since this study, the diffusion of innovations theory, and specifically Rogers' model of this theory, has spread across many disciplines. Researchers who study the adoption of innovations often utilize Rogers' (2003) model to better understand the technology innovation adoption process (Al-Gahtani, 2003; Kauffman and Tecyatassanasoontorn, 2005; Kilmon and Fagan, 2007; Oliver and Goerke, 2008; Tabata and Johnsrud, 2008). Meyer (2004) estimated that this model has effectively been used in thousands of studies across many fields including sociology, political science, civics, marketing, public health, communications, economics, education, and technology.

For Rogers (2003, p. 11) diffusion is the "process by which 1) *innovation* 2) is *communicated* through certain *channels* 3) *over time* 4) among the members of a *social system* [author's emphasis]." Rogers described an innovation to be "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). For Rogers, adoption is "a decision to make full use of an innovation as the best course of action available" (p. 473). Juxtaposing these concepts, Rogers' model seeks to explain the processes through which ideas, practices, or objects are communicated and thereby adopted by members of a particular society.

Rogers (2003) claimed that for any innovation, various types of adopters will naturally emerge. These adopter types broadly include: the innovators, the early adopters, the early majority adopters, the late majority adopters, and the laggards. Rogers also described that a subset of adopters exist within these broad categories. The current study used a subset of these adopter categories being: early adopters, late adopters, adopters who reinvented how they use the skills, adopters who discontinued use of the skills, and people who rejected use of the innovation altogether. Rogers noted how membership to these adoption categories is influenced by ones' subjective perceptions of certain attributes of the innovation.

Rogers (2003) stated there are five attributes that impact a person's choice to adopt an innovation: relative advantage, compatibility, complexity, trialability, and observability. Rogers called these five attributes, *perceived attributes of innovations*. Other authors have expanded these attributes and called them *perceived characteristics of innovations* (PCIs) (see esp. Chiasson & Lovato, 2001; Moore & Benbasat, 1991; Tornatzky & Klein, 1982; Zhu & He, 2002). Moore and Benbasat (1991) expanded Rogers' (2003) five perceptual factors into eight PCIs which include: relative advantage, image, compatibility, ease of use, visibility, results demonstrability, trialability, and voluntariness of use. These innovation attributes are realities perceived by the end user and thus are specifically determined by the individual. Table 1 details the eight PCIs.

As Rogers (2003) noted, the diffusion of innovations theory is most applicable to help understand how adopters differ from non-adopters. The current study takes a critical perspective on the diffusion of innovations theory and its application in less developed nations. Although the research body is rich in studies using this model and even in studies using this model in less

developed nations, there is a need for critical analysis of the outcomes of this framework. Thus the current study aims to determine if the diffusion of innovations theory, as conceptualized by Rogers, functions well in the nation of Cambodia or if perhaps demographic variables influence or explain adoption patterns better than the model itself.

Table 1: Description of the perceived characteristics of innovations

PCI	Description
Relative Advantage	<ul style="list-style-type: none"> • Degree to which an innovation is perceived as a better idea • Measured by economics, social factors, convenience, and satisfaction
Image	<ul style="list-style-type: none"> • Degree the innovation enhances one's reputation with peers
Compatibility	<ul style="list-style-type: none"> • Degree of perceived consistency with one's values, experiences, and needs
Ease of Use	<ul style="list-style-type: none"> • Perceived degree of difficulty with using the innovation
Visibility	<ul style="list-style-type: none"> • Degree the innovation is visible
Results Demonstratability	<ul style="list-style-type: none"> • Degree one can see results of using the innovation
Trialability	<ul style="list-style-type: none"> • Degree the innovation can be experimented or practiced
Voluntariness	<ul style="list-style-type: none"> • Degree using the innovation is viewed to be voluntary

Note. Based on Rogers, E.M. 2003 *Diffusion of Innovations* 5th ed. New York, NY: Free Press and Moore, G.C. & Benbasat, I. 1991. "Development of an instrument to measure the perceptions of adopting an information technology innovation." *Information Systems Research*, vol. 23, pp. 192-220.

In the current study, the researcher analyzed the factors that influenced the ICT 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 researched are the technological skills and knowledge the teacher trainers obtained through participating in the project. The training was offered as a cascading model where 28 master trainers were initially trained. These master trainers then went into the field and trained all other teacher trainers in the country. The skills taught included how to use hardware such as computers, printers, scanners, digital cameras, and digital recorders as well as software such as Word, Excel, PowerPoint, the Internet, and Internet-based email. Although physical ICTs, which include computers, peripherals, and infrastructure, are required to use the skills, these ICTs are not the studied innovation. Physical ICTs in the current study are viewed as tools through which to use the measured innovation (i.e., using the technology skills).

RESEARCH METHODS

The present study used an extended form of Rogers' (2003) model of the diffusion of innovations theory by measuring Moore and Benbasat's (1991) PCIs and comparing those results across categories of adopters. It was hypothesized that earlier adopters of the ICT innovation would perceive all of the PCIs most favorably, followed by late adopters, reinvent adopters, discontinue users, and rejecters. This pattern should be reversed for voluntariness indicating that more use was perceived to be mandated. Further it was hypothesized that demographic variables would

not significantly impact adoption rates. This hypothesis is in line with the Roger's model of the diffusion of innovations.

Participants

It should be noted that Cambodia has 26 teacher training colleges (TTCs). In the country there are: six Regional Teacher Training Centers (RTTCs) that train lower secondary teachers; one National Institute of Education (NIE) that trains upper secondary school teachers; 18 Provincial Teacher Training Colleges (PTTCs) that train primary school teachers; and one National Pre-School Teacher College that trains pre-school teachers. RTTCs are located in urban areas whereas PTTCs are located in rural areas.

Surveys were given to all teacher trainers in Cambodia (N=526). Completed surveys were received from 379 teacher trainers; 25 of whom were master teacher trainers. The current study achieved 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%. Surveys from the National Preschool Training College (N=1) and the NIE (N=1) were not used in the following 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%

Instrument

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). Moore and Benbasat (p. 211) 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 [information technology] innovations." The current study substituted the phrase 'ICT skills' for 'personal work stations.' A composite mean score was determined for each PCI variable for each teacher trainer. Teacher trainers were classified according to decision category, type of TTC (i.e., PTTC or RTTC), gender, age, and experience level.

The English 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 inter-government organizations (IGOs), non-government organizations (NGOs), and national 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 of the questions. The fourth translated survey was back translated to ensure accuracy.

RESULTS

Multiple analyses of the data were conducted. The survey data were first analyzed using descriptive statistics to determine if differences appeared among adopter types and by demographic variable. After concluding group differences appeared to exist, a multivariate analysis of variance (MANOVA) followed by univariate analysis of variance (ANOVA) were conducted in cases where the overall tests were significant.

Decision categories

The decision categories were based on Rogers' (2003) model as described above. Determining membership to a decision category was based on responses to a set of behavioral questions. Only the master teacher trainers were considered potential early adopters while all other teacher trainers were considered potential late adopters. Teacher trainers who 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 whether the person was a master teacher trainer. Teacher trainers who agreed that they used the ICT skills differently than they were taught at the ICT training were labeled as a person who reinvented the innovation. Teacher trainers who 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 that they never used the ICT skills outside of the ICT training were labeled as rejecters of the ICT innovation. Appendix A reports intercorrelations, means, and standard deviations for the PCI scores. Table 3 details the number and percentage of adopters by decision category.

Table 3: Total respondents by each decision category

Decision Category	Number of Surveys	Percentage of Teacher Trainers in each Decision Category
Early	21	5.8%
Late	185	51.4%
Reinvent	46	12.8%
Discontinuance	58	16.1%
Reject	50	13.9%
Total	360	100%

Note: 19 teacher trainers could not be classified and were excluded from analysis.

Descriptive analysis

As reported in Table 4, the mean scores of the five decision categories were organized by the eight PCI variables. A rank order of each adoption category by PCI is detailed in Table 5. Note that a higher score for voluntariness represents the degree to which use of the ICT skills was perceived to be voluntary.

Early adopters tended to report the highest agreement with all PCIs except with image. Late adopters always ranked second or third for each PCI. Reinvent adopters tended to rank second or third under each PCI except with image where they tended to agree with this PCI more so than any other adopter type. Additionally, reinvent adopters fourth in agreement least with the PCI of relative advantage. Discontinue adopters and reject adopters tended to perceive the least agreement with every PCI to a varying degree.

A descriptive analysis indicated there appeared to be group membership differences based on the four demographic variables. To determine if these differences were statistically significant, these variables were included in the MANOVA. Table 6 details the number and percentage of teacher trainers placed in each decision category distributed by demographic variable.

Table 4: Means of decision categories compared by PCI

Adoption Decision Category	N	Mean SD	Voluntariness	Relative Advantage	Image	Compatibility	Ease of Use	Results Demonstrability	Visibility	Trialability
Early	21	Mean	1.48	3.69	3.05	3.24	3.30	3.36	2.79	3.10
		SD	.49	.38	.53	.50	.57	.47	.49	.52
Late	181	Mean	1.73	3.39	3.13	3.06	2.85	2.85	2.55	2.93
		SD	.55	.44	.57	.55	.59	.61	.45	.44
Reinvent	46	Mean	1.62	3.27	3.21	3.04	2.85	2.95	2.75	3.04
		SD	.68	.52	.61	.62	.67	.62	.60	.77
Discontinuan ce	55	Mean	2.08	3.24	2.87	2.83	2.56	2.75	2.46	2.75
		SD	.64	.36	.42	.49	.61	.45	.42	.43
Reject	48	Mean	2.03	3.30	3.01	2.96	2.60	2.74	2.40	2.74
		SD	.70	.46	.46	.53	.73	.66	.53	.67

Table 5: Importance ranking by adopter type and PCI

Rank	Voluntariness	Relative Advantage	Image	Compatibility	Ease of Use	Results Demonstrability	Visibility	Trialability
1	Early	Early	Reinvent	Early	Early	Early	Early	Early
2	Reinvent	Late	Late	Late	Late	Reinvent	Reinvent	Reinvent
3	Late	Reject	Early	Reinvent	Reinvent	Late	Late	Late
4	Reject	Reinvent	Reject	Reject	Reject	Discont.	Discont.	Discont.
5	Discont.	Discont.	Discont.	Discont.	Discont.	Reject	Reject	Reject

As Table 6 details, differences appeared to exist by demographic variable. A greater percentage of early adopters were males and between the ages of 21-35. A greater percentage of later adopters were 36-59 years of age. A greater percentage of reinvent adopters were at PTTCs and were ages 21-35. A greater percentage of discontinue users were at RTTC, were women, and/or were ages 21-35. Teacher trainers who rejected use of the ICT skills tended to be more experienced.

Table 6: Percentage of teacher trainers by decision category and demographic variables

Variable		Early	Late	Reinvent	Discontinue	Reject
Type of TTC	PTTC	6.3%	52.8%	14.7%	12.3%	13.9%
	RTTC	4.6%	48.1%	8.3%	25%	13.9%
Gender	Male	7.7%	50.4%	13.3%	14.5%	14.1%
	Female	1.9%	53.3%	10.5%	20.1%	13.3%
Age	21-35	8%	45.5%	13.6%	18.8%	14.2%
	36-59	3.6%	59.5%	9.5%	14.3%	13.1%
Experience	Novice*	8.5%	54.2%	11.0%	15.3%	11.0%
	Experienced**	4.5%	52.7%	12.2%	15.8%	14.9%

*Novice teacher trainers were defined as having 1-10 years of experience.

**Experienced teacher trainers were defined as having 11-39 years of experience.

Multivariate analysis

A MANOVA was conducted to determine if there were statistically significant differences in the PCI scores among decision categories after controlling for differences due to gender, age, experiences, and type of TTC. A 5-way [5 decision category x 2 gender x 2 age x 2 experience x 2 type of TTC] MANOVA examined main effects and interaction effects between the five decision categories and the other four fixed-effect factors on the eight dependent PCI variables. Backward elimination was used to determine which variables should be excluded in the MANOVA model. Using multiple 5-way MANOVA models, the least significant term ($p > .05$) was removed until interactions with the decision category variable were significantly maximized. The final model included the main effects of all five independent variables along with the interaction effect of decision category by type of TTC.

As detailed in Appendix B, the MANOVA model revealed no significant multivariate main effect for experience [Wilks' $\lambda = .950$, $F(8, 301) = 1.96$, $p = .051$, $\eta^2 = .050$]. Significant multivariate main effects were observed for age [Wilks' $\lambda = .946$, $F(8, 301) = 2.16$, $p = .031$, $\eta^2 = .054$], gender [Wilks' $\lambda = .948$, $F(8, 301) = 2.07$, $p = .038$, $\eta^2 = .052$], decision category [Wilks' $\lambda = .771$, $F(32, 1111.63) = 2.54$, $p < .001$, $\eta^2 = .063$], and type of TTC [Wilks' $\lambda = .928$, $F(8, 301) = 2.94$, $p = .004$, $\eta^2 = .072$]. A significant interaction effect was found only for decision category with type of TTC [Wilks' $\lambda = .825$, $F(32, 1111.63) = 1.87$, $p = .003$, $\eta^2 = .047$].

The MANOVA results indicated there were significant differences in the PCI scores between age groups, gender, type of TTC, and decision categories. Additionally, there were significant differences in the set of PCI scores among decision categories and this difference depended on the type of TTC. Since there were significant multivariate effects, the univariate effects were examined by conducting separate ANOVAs on each dependent variable.

Univariate analysis

The omnibus null hypothesis was rejected since the omnibus test using a MANOVA identified significant differences among groups. To assist in interpretation of the results, multiple post hoc ANOVAs were conducted using the eight PCI variables and four demographic variables to test the significance of differences among decision categories. The significant results of the ANOVAs are detailed in Appendix C.

An ANOVA indicated a significant univariate effect among decision categories was on voluntariness [$F(4, 308) = 5.90$, $p < .001$, $\eta^2 = .071$]. Among the decision categories, early

adopters reported less latitude to use the ICT skills than did all other adoption categories. Teacher trainers who discontinued use of the ICT skills and teacher trainers who rejected use of the ICT skills reported they had more free will to use or not use the ICT skills. Late adopters and adopters who reinvented use of the ICT skills reported use was less mandatory than early adopters, but more so than teacher who were no longer using the ICT skills.

A significant univariate effect was found among groups' perception of the relative advantages of using the ICT skills and the experience level of the teacher trainer [$F(1, 308) = 9.34, p = .002, \eta^2 = .029$], relative advantage and age [$F(1, 308) = 8.21, p = .004, \eta^2 = .026$], and relative advantage and decision category [$F(4, 308) = 4.47, p = .002, \eta^2 = .055$]. Significant univariate differences included:

- Experienced teacher trainers perceived more advantages to using the skills than did novice teacher trainers.
- Younger teacher trainers felt that using the ICT skills offered more advantages over past methods of accomplishing tasks than did older teacher trainers.
- Early adopters perceived more advantages to using the ICT skills than the other four decision categories. Rejecters reported perceiving more advantages to using the ICT skills than did users who discontinued use of the skills.

An ANOVA revealed a significant univariate effect among decision groups, their perception of increased image, and the type of training college in which they taught [$F(1, 308) = 8.54, p = .004, \eta^2 = .027$]. Teacher trainers at PTTCs reported that using the ICT skills increased their stature with their peers. This is in contrast to teacher trainers at RTTCs who did not believe that using the ICT skills increased their stature with their peers.

A significant univariate effect was revealed among experience levels on compatibility [$F(1, 308) = 6.40, p = .012, \eta^2 = .020$]. Experienced teacher trainers found that using the ICT skills was more compatible with their needs and work styles than did novice teacher trainers. A significant univariate effect was also revealed between compatibility and decision category. This finding indicates that teacher trainers who discontinued use of the ICT skills did not think that using the ICT skills was compatible with their work preferences and needs. While late adopters and reinvent adopters felt that using the ICT skills was somewhat compatible with their preferences, early adopters felt that using the ICT skills was most compatible with their needs.

An ANOVA revealed a significant univariate effect among decision categories on the perceived ease of using the ICT skills [$F(4, 308) = 7.21, p < .001, \eta^2 = .086$] and an interaction effect with ease of use, decision category, and type of TTC [$F(4, 308) = 3.00, p = .019, \eta^2 = .038$]. Only early adopters reported that using the ICT skills was easy. Discontinue users and rejecters reported that using the ICT skills was more difficult than late adopters and reinvent adopters. Rejecters at PTTCs reported it easier to use the ICT skills than did rejecters at RTTCs, albeit both groups noted difficulty in using the skills. Late adopters, reinvent adopters, and teacher trainers who discontinued use at RTTCs reported that using the ICT skills was easier than these respective categories of teacher trainers at PTTCs.

A significant univariate effect was found among decision categories on the perception of demonstrability [$F(4, 308) = 4.91, p = .006, \eta^2 = .046$]. Early adopters reported seeing the most outputs of using the ICT skills. Rejecters and discontinue users perceived seeing the least amount of results from using the ICT skills.

A significant univariate effect was found among decision categories on their perception of seeing others use the ICT skills [$F(4, 308) = 2.51, p = .045, \eta^2 = .032$]. Rejecters saw the least amount of people using the ICT skills. Early adopters saw the most people using the ICT skills. Nonetheless,

all decision categories reported it was uncommon to see other teacher trainers using the ICT skills.

An ANOVA found a significant univariate effect among decision categories on the perceived trialability of using the ICT skills [$F(4, 308) = 4.04, p = .003, \eta^2 = .050$]. Early adopters and reinvent adopters reportedly believed they were given ample opportunities to practice using the ICT skills. Rejecters and discontinue users reportedly believed they were not given adequate opportunities to practice using the ICT skills.

Table 7 describes the variance in the choice to adopt the ICT skills using R^2 . The ANOVA analyses indicated that 14.5% of the variance in the choice to adopt the ICT innovation was explained by the extent adoption of the ICT skills was viewed as being mandated (i.e., voluntariness). In addition, 12.7% of the variance in the choice to adopt the ICT skills was explained by the extent adoption of the ICT skills was viewed as being easy to use. It was found that 12.2% of the variance was explained by the extent to which potential adopters saw other people using the ICT skills.

Table 7: Univariate variance of PCIs

PCI	R^2
Voluntariness	.145
Relative Advantage	.101
Image	.109
Compatibility	.084
Ease of Use	.127
Results Demonstratability	.088
Visibility	.122
Trialability	.075

DISCUSSION

The current study has five main findings. First and most importantly, it was found that demographic variables did not impact adoption rates. It was found however that certain demographic variables influenced how teacher trainers perceived certain PCIs. For example, experience and age influenced how teacher trainers perceived relative advantages. Younger and more experienced teacher trainers tended to agree more with the ability to find advantages of using the ICT skills than did older, less experienced teacher trainers. Furthermore, experienced teacher trainers perceived using the ICT skills to be more compatibility with their needs and desires versus less experienced teacher trainers. Since these findings appear to be contradictory, there is need for further qualitative investigation. It is possible that younger teacher trainers are more tech savvy whereas more experienced teacher trainers have more job related duties where an ICT solution would be applicable.

Second, it was determined that adoption of the ICT skills for Cambodian teacher trainers was influenced uniquely by six of the seven PCIs. Image was the only PCI that did not significantly influence adoption. As is evident in Table 5, reinvent adopters followed by late adopters most strongly agreed that using the skills increased their image with peers. This was contrary to the hypothesis that early adopters would rank each of the PCIs highest followed by late adopters. It is possible that reinvent adopters have such unique group characteristics that they are viewed as creative adopters who were able to help their peers solve 'outside the box' problems. The fact that early adopters ranked third in the strength of their agreement with image also indicates that

being leaders and teachers of the skill does not automatically increase one's image. It is possible that early adopters had unique challenges and experiences that caused them to lose respect with their peer groups. Further research is needed to understand the unique challenges of these groups.

A third important finding is that the PCIs did not necessarily influence adoption independently; significant interaction effects were found. Although image did not appear to directly influence one's decision category, image coupled with the type of TTC did significantly influence one's adoption category. Adopters in PTTCs in all categories (except rejectors) had stronger agreement that their image increased using the skills than did adopters in RTTCs. This finding however may be more attributed to location. Since PTTCs are located in rural villages, using ICT skills is more innovative and more cutting edge. Whereas at RTTCs the use of these ICT skills is more accepted and mainstreamed as is evident by the plethora of Internet kiosks found throughout larger Cambodian towns.

Fourth, it was found that membership into the adoption groups was unique defined. In the current study, adoption categories were more specific versus those traditionally presented by Rogers (2003). Since digital innovation and use of ICT skills is a relatively new phenomena in Cambodia, the category of 'innovator' simply was not applicable, especially given the limited population of teacher trainers. The master trainers were elected by their TTC to be trainers primarily because of they had advanced English skills, a willingness to commit to be an ICT trainer for two years, and they had basic technology skills. Selection to be a master trainer was not because these teacher trainers were on the cutting edge of adopting any innovations or skills. Additionally, since this study was conducted two years after the initial ICT training, the 'laggard' category proved to be too vague. Use of the subcategories of 'rejectors' and 'discontinued users' produced statistically significantly different categories of end users. These categories are described by Rogers, but are not found in his most basic model of adoption of the diffusion of innovations theory. Further research is needed to determine if this finding is due to the short timeline of measurement or due to issues inherent in this one less developed nation.

Fifth, the current study has significant theoretical implications. Moore and Benbasat (1991) extended Rogers' (2003) model by adding two unique PCIs: Image and voluntariness. Although the results for the PCI of image were mixed, voluntariness explained the greatest degree of variance among adoption groups. Results of the current study indicate that in Cambodia, teacher trainers' perception of voluntaries significantly impacted adoption patterns. This indicates that the PCI of voluntariness should remain in future models and is not, as suggested by Rogers (2003), a component of other PCIs. This finding however, may be linked to socio-cultural and socio-political factors as well. Cambodia is an authoritarian nation where its citizens are accustomed to doing what is expected and what is told of them. If use of these skills is expected and perceived to be mandatory, adoption rates will naturally increase. There is a need for future studies to be conducted in less authoritarian nations to determine if this is a consistent and replicable finding.

Additionally, the finding that demographic variables did not significantly impact overall adoption rates has tremendous impact on theoretical development. To date, this may be the only study to test if variables outside of the model significantly influenced adoption rates. These findings seem to indicate that the diffusion of innovations theory is effective at capturing most of the variance in the choice to adopt the use of an ICT innovation.

CONCLUSION

As described above, the descriptive analysis indicated group differences may have existed. The MANOVA results indicated there were statistically differences among groups of adopters on the

eight PCIs and the four demographic variables. The ANOVA results indicated that seven of the eight PCI had significant differences among groups of adopters. The only PCI that did not show a significant difference among the groups was that of image. Thus the degree to which use of the ICT skills increased a person's image with their peers did not have a significant influence on a person's choice to adopt the innovation. The degree to which the end user felt that use of the ICT skills was mandated explained the highest degree of variance among adopters.

With regards to demographic data, experience influenced the perception of how advantageous it was to use the ICT skills. Experience also influenced the perception of how compatible use of these ICT skills were with existing preferences and work styles. The type of TTC significantly influenced one's stature and reputation as well as one's perception of complexity. Nonetheless, no demographic variable impacted innovation adoption patterns.

The findings are very positive for policy makers, project developers, and educators as current initiatives in ICT in education in less developed nations are expanded and future ones are designed. Demographic details did not significantly impact overall adoption, therefore differentiated and individualized training is not necessary. Nonetheless, since certain PCIs were influenced by demographic variable, it may be prudent to slightly adjust future training to capitalize on these findings. For instance, ICT trainers can proactively find ways to increase the perceived advantages for younger teacher trainers. This type of adjustment can easily be done within the structure of current training programs.

The findings of the current study indicate that the diffusion of innovations theory is an effective mechanism to understand how and why users choose to adopt a given ICT innovation. The likelihood of sustainability, spread, and replicability is increased by using this theory to plan and implement future ICT innovations. In less developed nations such as Cambodia, where funding is scarce, projects are few, experts are expensive, and technological infrastructure is limited, failures and setbacks simply are not options. Using a tested theory such as the diffusion of innovations to increase adoption may be a vital component to successful nation building in an ICT infused, globally linked world. The current research informs policy leaders about how to maximize stakeholders' adoption of ICT innovations while also informing policy implementers on how to increase adoption rates. Incorporating lessons learned from the current study into future policies and projects may increase the positive impact ICTs will have on less developed nations and thus have a positive impact on closing persistent digital divides.

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APPENDIX A

Pearson correlation^a, means, and standard deviation of PCIs

PCI	1	2	3	4	5	6	7	8
1. Voluntariness	1.00							
2. Relative Advantage	-.154**	1.00						
3. Image	-.150**	.332**	1.00					
4. Compatibility	-.151**	.419**	.468**	1.00				
5. Ease of Use	-.040	.257**	.359**	.464**	1.00			
6. Results Demonstratability	-.062	.318**	.308**	.540**	.677**	1.00		
7. Visibility	-.181**	.024	.162**	.194**	.255**	.333**	1.00	
8. Trialability	-.112*	.164**	.241**	.336**	.396**	.372**	.303**	1.00
M	1.80	3.36	3.08	3.02	2.80	2.86	2.56	2.90
SD	.62	.45	.54	.55	.65	.60	.50	.54

Note: *p<.01

**p<.05

a. Listwise, N=351

APPENDIX B

Results of the 5-way MANOVA

Effect	Wilks' Lambda	F	Hypothesis df	Error df	p	Eta Squared
Intercept	.021	1788.715*	8	301	<.001	---
Gender	.948	2.071*	8	301	.038	.052
Age	.946	2.157*	8	301	.031	.054
Experience	.950	1.963	8	301	.051	.050
Type of TTC	.928	2.936	8	301	.004	.072
Decision Category	.771	2.535	32	1111.628	<.001	.063
Decision Category x Type of TTC	.825	1.865	32	111.628	.003	.047

APPENDIX C

Significant ANOVA results

PCI	Effect	Sum of Squares	F	Hypothesis df	Error df	p	Partial Eta Squared
Voluntariness	Decision Category	7.428	5.898	4	308	<.001	.071
Relative Advantage	Experience	1.691	9.339	1	308	.002	.029
	Age	1.486	8.206	1	308	.004	.026
	Decision Category	3.234	4.466	4	308	.002	.055
Image	Type of TTC	2.381	8.538	1	308	.004	.027
Compatibility	Experience	1.840	6.395	1	308	.012	.020
	Decision Category	3.765	3.271	4	308	.012	.041
Ease of Use	Decision Category	10.694	7.205	4	308	<.001	.086
	Decision Category x Type of TTC	4.455	3.001	4	308	.019	.038
Results Demonstratability	Decision Category	4.941	3.708	4	308	.006	.046
Visibility	Decision Category	2.229	2.512	4	308	.045	.032
Trialability	Decision Category	4.521	4.038	4	308	.003	.050

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