ACCEPTANCE THEORIES FOR BEHAVIOR IN CONDUCTING RESEARCH: INSTRUCTORS IN THE
RAJABHAT UNIVERSITY SYSTEM, THAILAND

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Responding to globalization and its effects on education and research development, the Thai government decided to push all public universities to become autonomous and establish a system of quality assurances. The establishment of quality assurances has had a large impact on many Thai instructors, especially in new public universities. Thai instructors are now forced to more focus on conducting research because the number of research publications is regarded as one of main criteria for quality universities. The purpose of this study is to investigate the key factors, at the individual and university levels, which impact on the instructors’ behavior in conducting research of the full time instructors in the faculty of Management Science from the Rajabhat Universities in Thailand. The current study will help explain how and why the instructors accept or refuse to conduct research and provide insight into the salient factors motivating the instructors to produce more research by conducting HLM. Data were collected from 694 participants at 37 institutions via a questionnaire survey. The findings revealed that there was no difference among these 37 universities on behavior in conducting research. The key factors statistically influencing behavior in conducting research of the instructors were facilitating conditions, academic degree, social influence, and usefulness as well as ease of conducting research that the instructors perceived. This study gained 46% of effect size.
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CHAPTER 1

INTRODUCTION

Background

Becoming aware of the effects of globalization on education and research development, the Thai government has made efforts to achieve a level of advancement similar to that of developed countries (Commins, Songkasiri, Tia, & Tipakorn, 2008; Nitungkorn, 2001; Sangnapabowarn, 2003; Sombatsompop, Markpin, Ratchatahirun, Yochai, Wongkaew, & Premkamolnetr, 2010; Svasti & Asavisanu, 2006; Waugh & Ketusiri, 2009). Consequently, since 1990, significant changes in the education system at the university level have begun (Nitungkorn, 2001; Sangnapabowarn, 2003; Waugh & Ketusiri, 2009). The government decided not only to push all public universities to become autonomous so that their administration would be more flexible, leading to efficiency (Nitungkorn, 2001; Sangnapabowarn, 2003), but also to establish a system of quality assurance (Nitungkorn, 2001; Sangnapabowarn, 2003; Waugh & Ketusiri, 2009). According to the Ministry of University Affairs of Thailand, the system of quality assurance includes both internal and external evaluations (Nitungkorn, 2001).

Internal quality assurance refers to the educational processes and activities within the institutions which are carried out in order to meet the expectations of the university council. External quality assurance refers to a mechanism employed by expert outsiders to examine the quality system. The criteria used as a guideline for quality assessment are composed of nine aspects: (1) mission/objective/planning, (2) teaching and learning, (3) student recreational activities, (4) research, (5) social academic service, (6) preservation of arts and culture, (7) administration, (8) budgeting, and (9) quality assurance and enhancement (Nitungkorn, 2001).
As a result, Thai instructors are now forced to focus on conducting research because the number of research publications is regarded as one of the main criteria for quality universities (Commins et al., 2008; Svasti & Asavisanu, 2006). Only teaching alone is not enough for Thai instructors; instead, they should conduct research also (Nitungorn, 2001; Numprasertchai & Igel, 2005; Sinthunava, 2011).

Thailand, currently, has a total of 79 public universities (Office of Higher Education Commission, 2013). In 2004, the number of public universities increased rapidly due to the establishment of two new university systems: the Rajabhat University (RU) and Rajamangala University of Technology (RMUT) Systems (Kirtikara, 2012; Svasti & Asavisanu, 2006). The Rajabhat University (RU) system was formerly known as the ‘Rajabhat Institute’ and was founded from a pre-existing ‘teacher college’ (Kirtikara, 2012; Sangnapabowarn, 2003; Sinthunava, 2011; Waugh & Ketusiri, 2009). The RU system includes 40 Rajabhat Universities located in various cities throughout the country such as Bangkok, Chiang Mai, Nakorn Ratchasima, Udon Thani, and Yala. Their purpose is to aid development in the regions (Office of Higher Education Commission, 2013). The RUMT system was consolidated from about 40 technological institutes into the current nine Rajamangala Universities of Technology. As a result, all of the forty Rajabhat Universities and nine Rajamangala Universities are presently viewed as ‘new public universities’ in Thailand (Kirtikara, 2012; Sangnapabowarn, 2003; Sinthunava, 2011; Waugh & Ketusiri, 2009). The forty Rajabhat Universities appear to receive more attention because they have been presented as the largest system of all the public universities and the higher educational systems in Thailand.
The establishment of quality assurances has had a large impact on many Thai instructors, especially in the new public universities (Nitungkorn, 2001; Kirtikara, 2012; Sangnapabowarn, 2003; Sinthunava, 2011; Waugh & Ketusiri, 2009). While most of the original public universities have long focused on conducting research, the new public universities are still preparing themselves to meet the quality assurance demands (Sangnapabowan, 2003). Many studies have revealed the problem of the small numbers of publications produced by the new public universities (Intaganok, Waterworth, Andsavachulamanee, Grasaresom, & Homkome, 2008; Sangnapaboworn, 2003; Sinlarat, 2004; Sinthunava, 2011; Sombatsompop et al., 2010; Svasti & Asavisanu, 2006). Some of the leadership teams in the Rajabhat Universities have understood this situation and have prepared themselves to survive in the new environment; for example, the presidents have introduced many training programs, renovated infrastructures, and increased offered financial support for producing research or creating textbooks (Sinthunava, 2011). Some instructors in the new public universities have started taking courses on how to do research, how to write a research proposal, and how to use statistics to analyze data (Sinthunava, 2011). Kirtikara (2012) pointed out the reasons why the research works that have been produced by the new public universities are smaller in number when compared to those of the older universities: the older institutions not only have been given higher educational budgets and more research grants by the government for a long time but also have had a smaller workload per instructor and better staff to student ratios. Thus, for the instructors in the new public universities, the large income which they earn from teaching has been more attractive than the conducting of research (Kirtikara, 2012; Sinthunava, 2011). In fact, maximum teaching loads have been set, but if the instructors wish to teach more, the
presidents cannot prohibit it, and the more the instructors teach, the more money they earn (Sinthunava, 2011), as a result, their teaching hours may be unequal; for example, they may teach such as 12, 15, 18, 21 or 24 hours per week.

Because teaching is the primary task of the instructors especially in the new public universities (Kirtikara, 2012), conducting research is not mandatory. Rather, the new public university leaders may encourage their instructors to submit several forms of research, such as research papers or textbooks, in order to gain academic positions because a higher proportion of instructors holding academic positions can improve the quality of the universities (Sinthunava, 2011) and lead to the development of competitive universities as well (Nitungkorn, 2001; Kirtikara, 2012; Sangnapabowarn, 2003; Sinthunava, 2011; Waugh & Ketusiri, 2009). Thai universities, especially the new public universities, include instructors who may hold master or doctoral degrees; thus, the instructors are not appointed to the rank of assistant professor as the first academic position at the beginning of their teaching work. Instead, they are initially classified as lecturers. After five years of teaching experience, they are eligible to submit research in any of several forms, such as research papers or textbooks, to obtain the academic position of assistant professor. The higher academic positions of associate professor and professor also require more teaching years and additional such forms of research. Of the two new public university systems, the RMUT system seems to have a better chance of increasing its production of research than the RU system because it has received external funds for development in technological fields (Kirtikara, 2012). Fortunately, the government has just provided extra budget for programs to develop the level of the instructors.
in the new public universities, such as study abroad programs and improving of the learning infrastructure (Kirtikara, 2012; Sangnapabowan, 2003).

**Need for the Study**

Although Thailand recognizes the importance of encouraging Thai instructors to conduct higher quality research, especially in the Rajabhat Universities, as they are new universities (Kirtikara, 2012; Sangnapabowarn, 2003; Sinthunava, 2011; Waugh & Ketusiri, 2009), there have been few recommendations for ways to encourage instructors to engage in and produce more research based on empirical studies. As evidenced in the literature, there is little information about the factors that may influence the behavior in conducting research of the instructors in the Rajabhat Universities. A few empirical studies exist, such as Numprasertchai and Igel (2005), which suggested that Thai instructors have more collaboration with industries in the search for new knowledge and resources. Because of the deficiency in prior literature regarding behavior in conducting research among the instructors in the Rajabhat Universities, the investigation of factors related to this behavior becomes paramount. Better insight into the relevant factors would be invaluable for the Rajabhat Universities to provide appropriate research training programs for them and to encourage them to conduct more research in the right way; in turn, the Rajabhat Universities will become more competitive with other universities.

This study is to contribute to the faculty of Management Science that the researcher belongs to. There are 37 Rajabhat Universities that offer the faculty of Management Science. Three out of 40 Rajabhat Universities, Chaiyaphum Rajabhat University, Roi Et Rajabhat University, and Sisaket Rajabhat University, offer the faculty of Business Administration instead
of Management Science. Although these two faculties are involved in similar fields in Thailand’s context, in order to protect the debatable problem, these three Rajabhat Universities are excluded from the study. Also, implementing with the single field (Management Science) can control and improve the precision of the results of this study although different discipline areas were found that did not significantly relate to research productivity, but rather to teaching productivity (Hassan et al., 2008). Moreover, the past literature in English version regarding the faculty of Management Science of Rajabhat Universities is rare. To fill these gaps of knowledge, the current research needs to be conducted.

**Theoretical Framework**

The concepts from two behavioral theories have been integrated to develop the conceptual model of this study: the technology acceptance model 2 (TAM 2) posited by Venkatesh and Davis (2000) and the unified theory of acceptance and use of technology (UTAUT) proposed by Venkatesh, Morris, Davis, and Davis (2003). Both theories provide explanations of the ‘behavioral intention’ and ‘actual behavior’ of humans.

The TAM 2 was developed from the original TAM (Davis, 1989), which was in turn developed from the theory of reasoned action (TRA), the work of Fishbein and Ajzen (Chuttur, 2009; Taylor & Todd, 1995; Venkatesh & Davis, 2000). In the original TAM, behavior intention and actual behavior are explained by two main factors: perceived usefulness (PU) and perceived ease of use (PE). Venkatesh and Davis developed TAM 2, which added the five determinants of the PU: subjective norm, image, job relevance, output quality, and result demonstrability; but no determinant of the original PE factor was added. The theory of technology acceptance model (TAM) was initially considered as the first theoretical framework
of this study for three reasons: (1) its popular use in much research (Chuttur, 2009; Lee, Kozar, & Larsen, 2003), (2) confirmation of the good predicting ability of PU and PE for the explanation of behavior intention and actual behavior from many empirical studies over many decades (Pavlou & Vryonides, 2009; Swanson, 1982; Szajna, 1996), and (3) the fact that the technology acceptance model was originally developed from behavioral theories (Chuttur, 2009; Taylor & Todd, 1995; Venkatesh & Davis, 2000) while other relevant theories were developed later from the TAM.

The theory of the original TAM as well as that of TAM 2, however, has been critiqued in that it has only two main predictors and that those may not be enough for an explanation of human behavior in the relevant area (Chuttur, 2009). The second theory of UTAUT is an alternative for this study. Venkatesh et al. (2003) compared eight models – (1) the theory of reasoned action (TRA), (2) the technology acceptance model (TAM), (3) the motivational model (MM), (4) the theory of planned behavior (TPB), (5) the model combining the TAM and TPB (C-TAM-TBP), (6) the innovation diffusion theory (IDT), (7) the social cognitive theory (SCT), and (8) the model of PC utilization (MPCU) - and then presented the unified theory of acceptance and use of technology (UTAUT). The UTAUT theorizes that four constructs are significant determinants of user behavior: performance expectancy, effort expectancy, social influence (SI), and facilitating conditions (FC). The performance expectancy (PE) of the UTAUT captures the PU of the original TAM and TAM 2, and the effort expectancy (EE) of the UTAUT captures the PE of the original TAM and TAM 2. Thus, this study has opted to apply the SI and FC from the UTAUT into the conceptual model as well. Due to the fact that the theory of the original TAM as well as that of TAM 2 was developed from the theory of reasoned action (TRA),
proposed for the explanation of general behaviors (Chuttur, 2009; Davis, 1989; Taylor & Todd, 1995; Venkatesh & Davis, 2000), and that the UTAUT provides an explanation for behavioral intention and actual behavior (Venkatesh et al., 2003), they can also be used to explain the behavior in this study. Therefore, the PU and PE predictors from TAM 2 and the SI and FC predictors from UTAUT have been applied as part of the conceptual model of this study.

The relevant literature suggests that the time that an individual instructor spends on teaching and on completing other aspects of her/his workload may negatively affect the amount of time spent conducting research (Hassan, Tymms, Ismail, 2008). Borg (2007) and Borg and Alshumaimeri (2012) indicted that teachers need to have enough hours to read and do research. Teaching loads, however, may have a positive effect on research productivity if they are less than eight hours (Mitchell & Rebne, 1995). The relevant literature also suggests that the academic degree that a faculty or staff member or an instructor has attained may positively affect his/her research productivity (Clarke, 2010; Kirtikara, 2012; Sangnapabowarn, 2003; Su, 2011). Faculty members who hold doctoral degrees tend to produce more research (Clarke, 2010; Su, 2011). Therefore, teaching loads and degree level are additionally factored into account in the conceptual model of this study.

Based on the literature reviewed it is possible that behavior in conducting research, corresponding to the concept of research engagement or research productivity (Clarke, 2010; Fairweather, 2002, Hassan et al., 2008), will be different among the Rajabhat Universities. This is because there are the differences among the Rajabhat Universities that are expected to have links to the behavior in conducting research of the instructors. Two characteristics were found
to be unequal among the Rajabhat Universities: the percent of the instructors holding the ranks of assistant professor, associate professor, and professor together and the percent of the instructors holding doctoral degrees (National Academic Position, 2013). Although the proportions of the instructors holding the ranks of assistant professor, associate professor, and professor and the instructors having doctoral degrees in the Rajabhat Universities have gradually increased since 2004, the year in which they became universities (Kirtikara, 2012; Svasti & Asavisanu, 2006), the extent of this increase presently remains unequal among the universities. For example, the percent of the instructors holding professor ranks at the 37 Rajabhat Universities ranges from 3.96% to 100%, and the percent of the instructors having completed doctoral degrees at the 37 Rajabhat Universities ranges from 5.45% to 26.79% (see Appendix D). Therefore, these university factors may have direct influence on and explain the variation of behavior in conducting research of the instructors in the Rajabhat Universities.

In addition, as suggested previously by studies such as Kirtikara (2012) and Sinthunava (2011), the usefulness and ease that the instructors from each Rajabhat University perceive may differ. Furthermore, people who live or work in different societies may be influenced by their different societies; as a result, their behavior may not be the same due to the different characteristics of the societies (Davision, Kwak, Seo, & Choi, 2002; Hox, 2010; McCoach, 2010; West, Welch, & Galecki, 2007; Raudenbush & Bryk, 2002; Woltman, Feldstain, MacKay, & Rocchi, 2012). That implies that the different contexts in which the Rajabhat Universities exist may influence the behavior in conducting research of the instructors. Thus, these university factors possibly also have indirect influence by interacting with the usefulness and ease of conducting research that the instructors perceived. This is because the instructors who have
completed doctoral degrees are mostly viewed as having more potential to conduct or produce research (Clarke, 2010; Hassan et al., 2008; MatichonOnline, 2011; Sangnapabowarn, 2003); thus, these doctoral instructors may feel more strongly that it is easy to conduct research. Consequently, in the Rajabhat Universities that have unequal percentages of instructors holding doctoral degrees, the effect of the perceived ease (PE) on the behavior of conducting research at the various Rajabhat Universities may be unequal as well. A similar notion is relevant for the instructors who hold academic positions (assistant professors, associate professors, and professors). To illustrate, one of the benefits from submitting research work is gaining academic positions. Possibly, the perceived usefulness (PU) of these assistant professors, associate professors, and professors may be stronger than that of typical instructors.

In sum, Figure 1 presents the conceptual model of this study with the relationships among six individual independent variables, two university independent variables, and the dependent variable, based on the behavioral theories mentioned above and on prior relevant research.
Figure 1. The conceptual model. The individual belief variables are developed from two theories: TAM 2 (Venkatesh & Davis, 2000) and UTAUT (Venkatesh, Morris, Davis, & Davis, 2003); the other variables are applied from the literature.

Purpose of the Study

The purpose of this study is to investigate the key factors, at the individual and university levels, which impact on the behavior in conducting research of the full time instructors of the Rajabhat Universities in Thailand. The current study will help explain how and why the instructors accept or refuse to conduct research and provide insight into the salient factors motivating the instructors to produce more research by using the technology
acceptance model theory (TAM 2, proposed by Venkatesh & Davis, 2000) and the unified theory of acceptance and use of technology (UTAUT), proposed by Venkatesh et al., 2003) as the theoretical framework, that perceived use (PU) of conducting research, perceived ease (PE) of conducting research, social influence (SI), and facilitating conditions (FC), including teaching load and degree level explain behavior in conducting research for instructors in the faculty of Management Science at the Rajabhat Universities, Thailand; and to test whether the percent of instructors holding academic ranks and the percent of instructors holding doctoral degrees at the university level have direct and moderating effects on the perceived usefulness and perceived ease of conducting research respectively, by conducting hierarchical linear modeling (HLM) in order to better understand the possible variation among the universities. This study emphasizes the testing of the individual-level effects; however, the cross-level interactions also come into the scope of this study.

Research Hypotheses

As applied the theories of the technology acceptance model 2 (TAM 2) and the unified theory of acceptance and use of technology (UTAUT) to this study, these theories support the following hypotheses:

Hypothesis 1: Behavior in conducting research will vary among the universities.

Hypothesis 2: Percent of instructors holding academic ranks at the university level will have a positive direct effect on behavior in conducting research at the university.

Hypothesis 3: Percent of instructors holding doctoral degrees at the university level will have a positive direct effect on behavior in conducting research at the university.
Hypothesis 4: Perceived usefulness will have a positive direct effect on behavior in conducting research.

Hypothesis 4a: The effect of perceived usefulness will vary among the universities.

Hypothesis 4b: There will be a cross-level interaction between perceived usefulness and the percent of instructors holding academic ranks at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding all academic ranks.

Hypothesis 5: Perceived ease will have a positive direct effect on behavior in conducting research.

Hypothesis 5a: The effect of perceived ease will vary among the universities.

Hypothesis 5b: There will be a cross-level interaction between perceived ease and the percent of instructors holding doctoral degrees at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding doctoral degrees.

Hypothesis 6: Social influence will have a positive direct effect on behavior in conducting research.

Hypothesis 7: Facilitating conditions will have a positive direct effect on behavior in conducting research.

Hypothesis 8: Teaching loads will have a negative direct effect on behavior in conducting research.

Hypothesis 9: Degree level will have a positive direct effect on behavior in conducting research.
Delimitations

1. This study is delimited to the full-time instructors in the faculty of Management Science at the 37 Rajabhat Universities, Thailand.

2. In this study, the data are cross-sectional and gathered at only one time; therefore, limited claims of causality of level 1 can be claimed. All of the individual factors that refer to an individual’s belief were selected and proposed based on TAM 2 (Venkatesh & Davis, 2000) and UTAUT (Venkatesh et al., 2003). The other two individual factors are demographic factors.

3. Two university factors were added in order to provide better understanding of possible differences among the participants who may be influenced by their institutions. Thus, this study will test both the direct effects of the individual factors and the indirect effects (moderation) of the university factors on individual behavior.

4. To gain the benefits of rapid turnaround and economy of design, this study is delimited to administering a survey design with self-report measures (Creswell, 2014).

Limitations

1. Due to its focus on the faculty of Management Science in Thai universities, this study may not be able to explain behavior in conducting research for other domains and countries because the norms and cultures in the Management Science field and in Thailand may differ from those in other contexts.

2. Because of the use of a questionnaire survey, the data of this study may be limited due to self-report biases such as social desirability (McDonald, 2008; Paulhus & Vazire, 2007; Podsakoff, & Organ, 1986). The social desirability scale of the Gender-Free Inventory of
Desirable Responding or GFIDR (Becker & Cherny, 1994) has been employed as a marker variable to test for this bias (Williams, Pillai, Lowe, Jung, & Herst, 2009).

3. This study employs the single method of a six-point Likert-type scale for four individual belief factors (PU, PE, SI, FC); thus the data may be limited by a common method bias (Etchegaray & Fischer, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff, MacKenzie, & Podsakoff, 2012). Two approaches controlling for a common method variance bias are to strengthen the research design and to use statistical control (Reio, 2010). The research design can be improved before the data are collected. The statistical approach is a way to check the common method variance (CMV) by using a marker variable technique in confirmatory factor analysis (CFA) (Reio, 2010; Williams, Hartman, & Cavazotte, 2010).

4. Participation in the survey for this study is fully voluntary, and this may create the result of a response bias. This study provides anonymity and confidentiality for the participants, informs participants that there are no right or wrong answers in the survey, and provides scale items and the instructions in the survey clearly and precisely in order to limit the response bias (Reio, 2010).

Definition of Terms

Instructor

The term ‘instructor’ in this study refers to a person who teaches in a university. Particularly, this paper focuses on the instructors who are teaching in the Rajabhat Universities, Thailand. In these Rajabhat Universities, an individual instructor might hold a master or doctoral degree. Also, the individual instructor may (1) not hold an academic position and be
classified in the position of ‘lecturer’ or (2) hold one of these academic positions: assistant professor, associate professor, or professor.

Behavior in Conducting Research

The meaning of ‘behavior in conducting research’ in this study can be captured by the following terms used in previous studies: research engagement (Clarke, 2010), academic productivity (Hassan et al., 2008), research capability (Svasti & Asavisanu, 2006), faculty productivity (Fairweather, 2002), and academic research productivity (Mitchell & Rebne, 1995). These terms relate to various types of research. Thus, the conducting of research in this study is defined as the conducting of research in the following forms: research papers, books or textbooks, chapters in edited books, articles in magazines or others similar publications, and conference papers, in either Thai or English versions.

Perceived Usefulness

The term ‘perceived usefulness’ of conducting research refers to the degree to which a person believes that the new behavior (behavior in conducting research) enhances his/her job. The definition is adapted from the definition of perceived usefulness by Venkatesh and Bala (2008). Also, perceived usefulness refers to the providing of a person with benefits, such as economic benefit, image, enhancement, convenience, and satisfaction (Taylor & Todd, 1995; Shin & Fang, 2004).

Perceived Ease

The term ‘perceived ease’ of conducting research refers to the degree of ease associated with conducting research. The definition is adapted from the definitions of perceived
ease of use provided by Venkatesh and Bala (2008) and of effort expectancy provided by Venkatesh et al. (2003).

**Social Influence**

The term ‘social influence’ on conducting research refers to the level to which a person recognizes that important people believe he/she should conduct research. The definition is adapted from the definition of social influence by Venkatesh et al. (2003). Social influence is directly related to subjective norm - the perceived social pressure to perform or not perform the behavior (Ajzen, 1991).

**Facilitating Conditions**

The term ‘facilitating conditions’ for conducting research refers to the degree to which a person believes that supportive infrastructures, resources of existing organizations, and knowledge necessary to promote the conducting of research, including human and guideline supports, exist. The definition is adapted from the definition of facilitating conditions by Venkatesh et al. (2003).

**Micro-level unit**

In multi-level or clustered data, the term ‘micro-level unit’ refers to the element or individual (e.g., student) within the higher level (Stoker & Bowers, 2001). For example, students are the micro-level units within a school.

**Macro-level unit**

In multi-level or clustered data, the term ‘macro-level unit’ refers to the higher level (Stoker & Bowers, 2001). For example, students are micro-level unites nested within the schools which are considered as macro-level units.
Summary

The introduction chapter provides an overview of this study in order to introduce the research topic by presenting these following sections: background regarding the problematic situation in the Rajabhat University System in Thailand, need for the study, theoretical framework, purpose of the study, research hypotheses, delimitations, limitations, and definition of terms. Chapter 2 contains the literature review.
CHAPTER 2
LITERATURE REVIEW

Introduction

This study has considered various possible factors which may affect the behavior in conducting research on the part of instructors. This literature review chapter provides the rationales supporting each hypothesis of this study as well as the preliminary information that should be considered with regard to the following topics: considerations regarding universities in Thailand, Behavior in conducting research and the variation, and effects on instructors and the variation.

Considerations Regarding Universities in Thailand

According to Nitungorn (2001), Sangnapabowarn (2003), and Sinlarat (2004), Thailand’s universities historically placed greater emphasis on teaching than on research, and they originally aimed to produce educated people to serve in the public sectors rather than to pursue academic knowledge. After World War II, America came to influence in Southeast Asia; consequently, the conceptualization of the Thai University changed from the ‘specialized university’ to the ‘comprehensive university,’ and the universities established afterwards offered many more programs enabling their graduates to also serve in the private sectors (Sinlarat, 2004). Sinlarat also stated that although the American concept of the comprehensive university, which places emphasis on the conducting of research, has influenced the Thai educational tradition, in practice the instructors as well as the teachers do not produce new knowledge. Rather, they teach by remembering knowledge from textbooks and then transmitting it to their students (Sangnapabowarn, 2003; Sinlarat, 2004). The consistent
problem in education in Thailand is that teaching and learning are based too much on memorization and demonstrate a lack of critical thinking (Jenkins, 2011; Nitungorn, 2001, Sangnapabowarn, 2003, and Sinlarat, 2004). Overall, it has proven to be quite challenging for Thailand’s higher education to put an emphasis on producing new knowledge based on research (Sangnapabowarn, 2003; Sinlarat, 2004). However, the education system of Thailand has been developed gradually. The Rajabhat University system was established primarily for the purpose of serving the various regions in Thailand; therefore, they were founded in many cities across the country in order to distribute education to the various regions equally (Office of the Higher Education Commission, 2013).

Behavior in Conducting Research and the Variations

This study focuses on the behavior in conducting research on the part of the instructors in the thirty seven (out of forty) Rajabhat Universities that offer degrees in the faculty of Management Science. In 2004, all forty Rajabhat Universities across the country were transformed from Rajabhates Institutes into Rajabhat Universities and have continued functioning under the Rajabhat University Act of 2004 (Suanpang & Petocz, 2006). The transformation of the Rajabhat Universities was the one of the results of the fact that the Thai government has become aware of the effects of globalization and has tried to catch up with developed countries (Waugh & Ketusiri, 2009; Sangnapabowarn, 2003; Nitungkorn, 2001). Another important result is that the government established a system of quality assurances that includes both internal and external evaluations. Consequently, the quality assurances have had a large impact on not only the instructors but also the new public universities such as the Rajabhat Universities (Kirtikara, 2012; Sinthunava, 2011; Waugh & Ketusiri, 2009;
Sangnapabowarn, 2003; Nitungkorn, 2001). Individually, Thai instructors are now forced to pay attention to conducting research because the number of research publications is regarded as one of the main criteria for quality universities also (Commins, Songkasiri, Tia, & Tipakorn, 2008; Svasti & Asavisanu, 2006; Numprasertchai & Igel, 2005; Nitungorn, 2001). Some of the instructors have started taking research or statistics courses (Sinthunava, 2011). Some of the leaders in the Rajabhat Universities have recognized the situation and prepared themselves for the new university status (Sinthunava, 2011). The government also has realized the importance of increasing faculty members’ ability to produce more research, and then provided extra budget for programs to develop the level of the instructors in the Rajabhat Universities, such as study abroad for faculty members to pursue doctoral degrees (Kirtikara, 2012; Sangnapabowan, 2003). This is because it has been recognized that a person who completed a doctoral degree probably has greater potential to conduct or produce research (MatichonOnline, 2013; Clarke, 2010; Hassan, Tymms, & Ismail, 2008; Sangnapaboworn, 2003). Because the review of literature shows that there are some differences among Rajabhat universities, and that that can lead to differences in their behavior regarding conducting research, I propose the following hypothesis:

**Hypothesis 1: Behavior in conducting research will vary among the universities.**

**Explanation of the Variation among Rajabhat Universities**

At university level, the development of education quality may lead to differences among the universities. The differences or variations among the Rajabhat Universities probably have a link to the behavior in conducting research of the instructors as reflected in the number of research forms they have produced. Figure 2 shows the conceptual model regarding the variation of the dependent variable, which may be explained by two university-level variables.
Figure 2. Level-2 effects and the variation. The variation of the dependent variable and the link to two university-level independent variables.

The number of the instructors in a given Rajabhat University who have submitted research or produced textbooks to gain academic ranks varies from 5 to 153. When compared to the total number of instructors at each university, the percent of the instructors holding professor ranks at the 37 Rajabhat Universities ranges from 3.96% to 100% (National Academic Position, 2013). In fact, the proportion of the instructors who held academic ranks has improved, but additional improvement is still needed. By 2013, the proportion of the instructors who held academic positions in the Rajabhat University system had risen to 24.5% assistant professors, 4.5% associate professors, and less than 1% professors (the rest, 71%, are lecturers) (National Academic Position, 2013). Thus, the different proportions of the instructors
holding academic positions in the Rajabhat Universities can be positively connected to the number of research papers produced by the instructors within an individual university (MatichonOnline, 2013; Sinlarat, 2004; Sangnapaboworn, 2003). Based on the review of literature, I propose the following hypothesis:

**Hypothesis 2:** The percent of instructors holding academic ranks at the university level will have a positive direct effect on behavior in conducting research at the university.

Moreover, the number of doctorates held by the faculty members in the Rajabhat Universities varies, ranging from 3 to 99 (National Academic Position, 2013). When compared to the total number of all instructors at each university, the percent of the instructors having completed doctoral degrees at the 37 Rajabhat Universities ranges from 5.45% to 26.79% (National Academic Position, 2013). Because the faculty members who completed doctoral degrees were found that they tend to conduct more research (Clarke, 2010; Su, 2011), the universities that include many doctorates should be able to produce more research. Based on the review of literature, the number or percent of doctorates has a positive relationship with the number of research the university can produce, and that can provide a reason for the difference among the universities in the number of publications they have produced.

**Hypothesis 3:** The percent of instructors holding doctoral degrees at the university level will have a positive direct effect on behavior in conducting research at the university.

**Effects on Instructors and the Cross-level Interactions**

The following sections present the direct effects of individual-level variables on the dependent variable, which include two types of effects: random and fixed effects, including two cross-level interactions. At individual level, two random effects are the result of two individual
beliefs variables: perceived usefulness (PU) and perceived ease (PE) of conducting research. Four fixed direct effects are the result of two individual beliefs variables (social influence (SI) and facilitating conditions (FC)) and two demographics variables (teaching loads and degree level). Two cross-level interactions were theorized: (1) between PU at individual level and the percent of instructors holding the ranks of assistant professors, associate professors, and professors at the university level and (2) between PE at the individual level and the percent of instructors holding doctoral degrees at the university level. Figure 3 illustrates the conceptual model with the random, fixed, and cross-level interaction effects.

Figure 3. Fixed, random, and moderating effects. The dashed arrows present the random effects and the solid arrows present the fixed effects.
Perceived Usefulness (PU) and Perceived Ease (PE)

In the technology acceptance models (TAM/TAM 2), these two predictors typically come together. The original conceptualization of their use was for this problem: persons in organizations are not willing to use the systems available in their workplaces although if they use them, the systems will confer benefits for their jobs and performance (Davis, Bogozi, & Warshaw, 1989; Venkatesh & Davis, 2000). Two main factors (PU and PE) have been offered as explanations for that problem. Both have been used widely in many research studies (Chuttur, 2009; Lee, Kozar, & Larsen, 2003) and have been offered as evidence in much empirical research (Abdalla, 2007; Karahanna & Straub, 1999; Naeini & BalaKrishnam, 2012; Saade & Bahli, 2005; Smith, 2008). Most of those studies found that perceived usefulness is more salient than perceived ease of use. Because PU and PE can be used to explain why there is little use of technology systems in organizations (Davis, 1989; Davis et al., 1989; Pavlou & Vryonides, 2009; Swanson, 1982; Szajna, 1996; Venkatesh & Bala, 2008), they can also be used to explain why there has been little conducting research by the instructors in this study. In applying these variables to this study, I propose the two following hypotheses.

Hypothesis 4: Perceived usefulness will have a positive direct effect on behavior in conducting research.

Hypothesis 5: Perceived ease will have a positive direct effect on behavior in conducting research.

Variation and Cross-level Interactions

In the multilevel model, which contains independent variables from different levels, it is important to specify which relations between the independent variables and the dependent
variable are direct effects and which relationships are cross-level interactions (Hox, 2010). Hox stated that the problems in multilevel models should be explained by multilevel theories. Individuals can be influenced by their social context. For example, students nested within the same school may have similar characteristics because they share variance of the same characteristics from the same school, while students from different schools may differ in characteristics due to differences among schools (Davision et al., 2002; Hox, 2010; McCoach, 2010; Raudenbush & Bryk, 2002; West et al., 2007; Woltman et al., 2012). If there are effects of the social context on individuals, they are referred to as intervening processes (Hox, 2010). Using level-1 predictors to produce fixed effects is common, but using level-2 predictors to produce fixed effects is an inappropriate strategy because it violates the assumption of homoscedasticity (Woltman et al., 2012). Thus, in the context of two-level hierarchical data, the term cross-level interaction refers to the effect of a level-2 predictor on the relationship between a level-1 predictor and the dependent variable (Raudenbush & Bryk, 2002). Identical concepts can be applied to the instructors nested within the Rajabhat Universities. Two different subjective characteristics at the Rajabhat university level have been found, and it is assumed that they may indirectly influence the behavior in conducting research of the instructors: (1) the number of doctoral instructors at the university level, and (2) the number of instructors holding academic ranks at the university level. According to Hox (2010), when there are many predictor variables from different levels, there are possible interactions. The rationales supporting the moderating effects of these university predictors on the dependent variable are as follows.
**PU variation.** Submission of quality research or authorship of textbooks is mandatory for Thai instructors who wish to gain promotion and academic ranks (Sangnapaboworn, 2003; Sinlarat, 2004; Sinthunava, 2011), and it is linked to the proportion of the instructors given academic ranks. According to National Academic Position (2013), among the 37 Rajabhat universities, the proportion of instructors who hold academic positions is 25% assistant professors, 4% associate professors, 1% professors, and the remaining 70% are typical lecturers. As well, the numbers of assistant, associate, and full professors taken together at the 37 Rajabhat Universities are unequal, ranging from 2 to 109 (National Academic Position). Appointment to the rank of assistant professor, associate professor, or professor means that the particular instructor has completed the conducting and submitting of some forms of research for publication. One of main benefits of conducting research for the Rajabhat instructor is gaining an academic rank. In the Rajabhat Universities with a high number of instructors holding academic ranks, the effect of perceived usefulness of conducting research (PU) on conducting research may stronger than that in the universities with a low number of such instructors. Thus, I propose the following hypotheses.

*Hypothesis 4a: The effect of perceived usefulness will vary among the universities.*

*Hypothesis 4b: There will be a cross-level interaction between perceived usefulness and the percent of instructors holding academic ranks at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding all academic ranks.*

**PE variation.** The percent of faculty members holding doctorates in the 37 Rajabhat university system varies, ranging from 5.45%–26.79% (National Academic Position, 2013), and
this probably helps to explain the differences in ease that the instructors perceived among the Rajabhat Universities. This is because most studies suggest that gaining knowledge and research experiences during the pursuing and after the completing of doctoral degrees is necessary for producing further research on the part of instructors (Edem, 1994; Hassan et al., 2008; Hasselback et al., 2012; Su, 2011). Additionally, Borg (2007) suggested that knowledge and the importance or ease of research that teachers perceived affect their engaging in research. If these ideas are true, then when compared with the instructor who holds a lower degree, an instructor with a doctoral degree probably perceives that it is easier to conduct research because he/she has more research knowledge and experiences (skills). One of the ways to be able to visually detect the cross-level interaction as well as to better understand the variation is to assume that there are three levels of the numbers of doctorates at the university level: higher mean, mean, and lower mean. Theoretically, at the mean level, perceived ease of conducting research (PE) at individual level has a positive effect on the dependent variable. Yet, at the higher mean where there are many instructors with doctoral degrees or at the lower mean where there is lack of instructors with doctoral degrees, the strength of the relationships between perceived ease (PE) and the behavior in conducting research at the three levels of mean may be unequal. Based on the review of literature, I propose the following hypotheses.

*Hypothesis 5a: The effect of perceived ease will vary among the universities.*

*Hypothesis 5b: There will be a cross-level interaction between perceived ease and the percent of instructors holding doctoral degrees at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding doctoral degrees.*
Social Influence (SI)

The term social influence refers to a common feature that is part of every-day life, both economic and social, because people influence others or are influenced by others many times each day (Kahan, 1997; Smith, Louis, & Schultz, 2011). Some people like to think that they arrive at their opinions on their own, yet often they are actually indirectly influenced by others (Denrell, 2008). This influence can change one’s beliefs, behavior, or attitudes (Burger, 2012) as evidenced in much research in various areas (Kahan, 1997; Li & Tang, 2013; Robinson & Higgs, 2011; Smith et al., 2011; Sridhar & Srinivasah, 2012). The TAM 2 and UTAUT offer the social influence variable as a construct for predicting behavior intention and actual behavior (Oshlyansky, Cairns, & Thimbleby, 2007; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Wang & Shin, 2009). The uses of the social influence variable in empirical research can be summarized into three themes: social influence and identity process, social influence and changes in behavior, and social influence and social changes (Smith et al., 2011). The current study is related to changes in behavior. Based on the review of literature, social influence is relevant to explaining the behavior in conducting research of instructors, and I propose the following hypothesis.

**Hypothesis 6: Social influence will have a positive direct effect on behavior in conducting research.**

Facilitating Conditions (FC)

The notion of facilitating conditions can cover various factors (conditions) that will facilitate a behavior: the infrastructures or resources of organizations supportive of conducting research, human resources (a specific person or group who will assist with difficult processes),
and the knowledge necessary to behave in the desired ways are the FC items presented in the UTAUT (Venkatesh et al. 2003). Conducting research requires supportive human resources (Sinthunava, 2011), infrastructures (Sangnapabowarn, 2003; Sinthunava, 2011) and knowledge (Jenkins, 2011; Sangnapabowarn, 2003; Sinlarat, 2004). Based on the review of literature, conducting research requires facilitating conditions, I propose the following hypothesis.

_Hypothesis 7: Facilitating conditions will have a positive direct effect on behavior in conducting research._

**Teaching Loads**

According to the review of literature, teaching loads or workloads have been suggested to have a negative impact on the number of publications that instructors have produced because they negatively affect the time available for conducting research (Hassan et al., 2008; Kirtikara, 2012; Sangnapabowarn, 2003). However, it has been argued that having teaching loads lower than eight hours per week can have a positive impact on the conducting of research (Mitchell & Rebne, 1995). The instructors in the Rajabhat Universities are more likely to have high workloads (Kirtikara, 2012; Sinthunava, 2011). In the faculty of Management Science of the 37 Rajabhat Universities, workloads of the instructors are probably high also, ranging from 12 to 24 hours per week. Borg (2007) studied American teachers and found that the main reason teachers do not engage in research is that they ‘have no time’. To increase research productivity or engagement, it is necessary that teachers have enough hours to read and conduct research (Borg & Alshumaimeri, 2012; Stack, 2004). Supporting this idea, Chase et al (2013) suggested that university teachers strategically manage their time in order to achieve
Based on the review of literature, teaching loads have a negative link to conducting research, I propose the following hypothesis.

*Hypothesis 8: Teaching loads will have a negative direct effect on behavior in conducting research.*

**Degree Level**

It has been suggested that people who have completed a doctoral degree have greater potential to conduct or produce research (Clarke, 2010; Hassan et al., 2008; MatichonOnline, 2011; Sangnapaboworn, 2003). Some studies use different terms, such as highest qualification (Hassan et al., 2008) and qualification (Clarke, 2010), but these terms all capture the same meaning. Supporting this notion, some studies use variables referring to knowledge gained after the earning of doctoral degrees, such as ‘teaching years since doctorate,’ ‘age at PhD,’ and ‘year of PhD’ (Clemente, 1974; Hasselback, Reinstein, & Abdolmohammadi, 2012; Su, 2011). In the context of the Rajabhat University System, the instructors may hold master or doctoral degrees. Although the proportion of the instructors with doctoral degrees increases every year, some instructors still remain with the academic status as holders of master degrees. The review of the literature suggests that the degree level of instructors has a positive direct effect on their behavior in conducting research. Thus, I propose the following hypothesis.

*Hypothesis 9: Degree level will have a positive direct effect on behavior in conducting research.*

**Summary**

This literature review chapter has presented the relevant considerations regarding the universities in Thailand, which are linked to the problematic situation, and has then provided
the types of evidence that will be used, based on the relevant literature. The evidence
supporting the nine hypothesis of this study is provided in these two following sections: (1)
behavior in conducting research and the variation and (2) effects on instructors and the cross-
level interactions. Chapter 3 provides methodology.
CHAPTER 3

METHODOLOGY

Research Design

This quantitative study employed a cross-sectional survey to collect data at one time. Participation in the survey is voluntary. Due to the data nature of this study presenting instructors nested in universities, Hierarchical Linear Modeling (HLM) with two levels, an appropriate statistical test for such data (Davision et al., 2002; Hox, 2010; McCoach, 2010; Raudenbush & Bryk, 2002; West et al., 2007; Woltman et al., 2012), was used for testing the research hypotheses in order to better understand the possible variation among the universities. Level 1 is the individual level including the instructors in the faculty of Management Science. Level 2 is the university level including the universities in the Rajabhat University System. Thus, the data of this study include the dependencies of multilevel data (Ciarleglio & Makuch, 2007).

The conceptual model is expected to show two main types of effects: direct effects including both fixed and random effects, and indirect effects referring to cross-level interactions. Six individual-level predictors are expected to yield six direct effects, among which the effects of PU and PE varied among the universities. Two university-level predictors are expected to yield two direct fixed effects and two cross-level interactions. Table 1 summarizes all of the hypotheses and the effects generated from the individual-level and university-level predictors.
Table 1

Summary of Hypothesis Testing With Variables

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Effect</th>
<th>Type of effect</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 (vary among universities)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>University-level predictors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>PROF--- &gt;B</td>
<td>Fixed</td>
<td>Positive</td>
</tr>
<tr>
<td>H3</td>
<td>DOCT--- &gt;B</td>
<td>Fixed</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>Individual-level predictors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4, H4a</td>
<td>PU--- &gt;B</td>
<td>Fixed/Random</td>
<td>Positive</td>
</tr>
<tr>
<td>H5, H5a</td>
<td>PE--- &gt;B</td>
<td>Fixed/Random</td>
<td>Positive</td>
</tr>
<tr>
<td>H6</td>
<td>SI --- &gt;B</td>
<td>Fixed</td>
<td>Positive</td>
</tr>
<tr>
<td>H7</td>
<td>FC--- &gt;B</td>
<td>Fixed</td>
<td>Positive</td>
</tr>
<tr>
<td>H8</td>
<td>TL--- &gt;B</td>
<td>Fixed</td>
<td>Negative</td>
</tr>
<tr>
<td>H9</td>
<td>DL--- &gt;B</td>
<td>Fixed</td>
<td>Positive</td>
</tr>
<tr>
<td><strong>Cross-level interactions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4b</td>
<td>PROF--- &gt;(PU---&gt;B)</td>
<td>Interaction</td>
<td>Positive</td>
</tr>
<tr>
<td>H5b</td>
<td>DOCT--- &gt;(PE---&gt;B)</td>
<td>Interaction</td>
<td>Positive</td>
</tr>
</tbody>
</table>

*Note. B = behavior in conducting research (dependent variable). PU= perceived usefulness, PE= perceived ease, SI= social influence, FC = facilitating conditions, TL=teaching loads, DL=degree level, PROF = percent of instructors holding the academic ranks of assistant professor, associate professor, and professor at the university level, DOCT= percent of instructors holding doctoral degrees at the university level.*
Population

The population in this study is the full-time instructors in the faculty of Management Science of the Rajabhat University system in Thailand. As the instructors are nested within the universities, the population data of this study involve two levels: the university level and the individual level. Instructors are represented as the level-1 units and universities are represented as the level-2 units. These two types of units are integrated into one multi-level dataset. Such data are also known as ‘clustered data’ or ‘multi-level data’ (e.g., Hox, 2010). The population of the clustered data includes two types of units: macro-level units and micro-level units (Stoker & Bowers, 2001).

The macro-level units refer to the higher level or the university level of this study. The population of the macro-level units of his study is equal to 37. The population of micro-level units, the full-time instructors of the faculty of Management Science clustered within the 37 Rajabhat Universities across Thailand, is not made available for public; therefore, the researcher called each Rajabhat University to obtain the number of the full-time instructors of its faculty of Management Science. The population of person units was equal to 2,295, at the time this study was conducted. Table 2, in the first and second columns, provides the total number of the primary sampling units (PSUs) at the university level and the total number of the full-time Management Science instructors in each university unit.

Sample

The approach for selecting the sample size for multilevel data is a bit more complex (Hox, 2010; West et al., 2007). Due to the sample from nested data being viewed as a multistage sample, a multi-stage or cluster sampling method can commonly be used (Gili,
The multi-stage sampling method involves more than one stage of selection; for example, two-level data require two stages of selection. The selection at the first stage is conducted to select PSUs and that at the second stage is conducted to subsample the units from each PSU (Kish, 1965; Stapleton & Thomas, 2008). The PSU that is selected at the first stage is typically called a ‘cluster.’ Yet, if all elements in the selected clusters are sampled, this approach is specially referred to as a cluster sampling method (Stapleton & Thomas, 2008). A stratified random sampling method - dividing the population into groups and then randomly selecting the sample (Hart, 2007) - can also be an alternative for multi-level data (Acar, 2009; Whitener, 2001). In a large population, stratification may be used as additional technique at the first and any other stages of selection (Kish, 1965; Stapleton & Thomas, 2008). However, the population of 37 macro-level units in this study may be considered not to be too many; thus, the stratifying technique was not applied in this study. Rather, this study employed the most commonly used method of a multi-stage sampling technique; thus, two-stage selection was conducted.

**Two-Stage Sampling Technique**

At the first stage, following the theoretical procedure, the clusters were randomly sampled from the population. The number of the clusters selected is denoted as J. In the scholarly multi-level modeling literature, the cluster size (J) is emphasized due to its importance for increasing the power for testing random effect variances (e.g., Kish, 1965; Snijders, 2005; Spybrook, Bloom, Congdon, Hill, Martinez, & Raudenbush, 2011; Stoker & Bowers, 2002). In fact, past multi-level modeling literature implied that in the framework of multi-level modeling a researcher should increase J as much as possible; however, this increasing is usually limited by
its high cost. Therefore, in this study, the population of all 37 PSUs was sampled. Then 37 clusters were included in the multi-level sample dataset.

In the secondary stage, theoretically, the elements (instructors) will be selected from each cluster. No certain formulas for calculating the initial sample size in a multi-level context are available. Most hierarchical linear modeling literature has suggested calculating sample size with power by using the optimal design software (e.g., Hox, 2010; McCoach, 2010; Raudenbush & Bryk, 2002; Raudenbush & Lui, 2000; Spybrook, 2008). Few simply set up 10% or 20% for initial sample size (e.g., Kish, 1965; Stoker & Bowers, 2001). According to Krejcie and Morgan’s Table (1970, p.608), a sample size of 331 is necessary for the population of 2,400 (N). This number can be used as an initial sample size for further sample size calculation. Instead of using a fraction to weight, this study simply applies a percent. Hence, when the population of 2,295 is 100%, then 331 becomes a 100% sample. For clusters of unequal size, the technique of proportionate sampling of elements can be applied in order to ensure that the sample represents the population (Kish, 1965). Kish (1965) stated that this technique is what is referred to as ‘representative sampling,’ and it generates ‘miniatures of the population’ (p.82).

Table 2, in the third column, provides the weighed cluster size at each university. This technique allows the subsample sizes to vary (Kish, 1965), varying from n=2 to n=23. Unfortunately, unequal sizes of clusters can become a problem for ordinary least square (OLS) analysis (Stoker & Bowers, 2002).
Table 2

*Population and Initial Sample Sizes at Each Level*

<table>
<thead>
<tr>
<th>Multi-stage sampling</th>
<th>Population</th>
<th>Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Krejcie &amp; Morgan’s Table)</td>
</tr>
</tbody>
</table>

**Stage 1: Primary Sampling Units (PSUs)/University Level**

All Rajabhat Universities offering Faculty of Management Science  37  36*

[N=37* / J=37]

**Stage 2: Secondary Sampling Units/ Individual Level**

All instructors in Faculty of Management Science at each RU  2,295  331*

[N=2,400*]

<table>
<thead>
<tr>
<th>RU</th>
<th>Population</th>
<th>Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>RU01</td>
<td>72.0 (3%)</td>
<td>10.0 (3%)</td>
</tr>
<tr>
<td>RU02</td>
<td>43.0 (2%)</td>
<td>6.0 (2%)</td>
</tr>
<tr>
<td>RU03</td>
<td>90.0 (4%)</td>
<td>13.0 (4%)</td>
</tr>
<tr>
<td>RU04</td>
<td>78.0 (3%)</td>
<td>11.0 (3%)</td>
</tr>
<tr>
<td>RU05</td>
<td>30.0 (1%)</td>
<td>4.0 (1%)</td>
</tr>
<tr>
<td>RU06</td>
<td>70.0 (3%)</td>
<td>10.0 (3%)</td>
</tr>
<tr>
<td>RU07</td>
<td>12.0 (1%)</td>
<td>2.0 (1%)</td>
</tr>
<tr>
<td>RU08</td>
<td>63.0 (3%)</td>
<td>9.0 (3%)</td>
</tr>
<tr>
<td>RU09</td>
<td>47.0 (2%)</td>
<td>7.0 (2%)</td>
</tr>
<tr>
<td>RU10</td>
<td>81.0 (4%)</td>
<td>11.0 (4%)</td>
</tr>
<tr>
<td>RU11</td>
<td>65.0 (3%)</td>
<td>8.0 (3%)</td>
</tr>
<tr>
<td>RU12</td>
<td>75.0 (3%)</td>
<td>12.0 (3%)</td>
</tr>
<tr>
<td>RU13</td>
<td>50.0 (2%)</td>
<td>7.0 (2%)</td>
</tr>
<tr>
<td>RU14</td>
<td>64.0 (3%)</td>
<td>8.0 (3%)</td>
</tr>
<tr>
<td>RU15</td>
<td>96.0 (4%)</td>
<td>13.0 (4%)</td>
</tr>
<tr>
<td>RU16</td>
<td>57.0 (2%)</td>
<td>9.0 (2%)</td>
</tr>
<tr>
<td></td>
<td>RU</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>17.</td>
<td>RU17</td>
<td>22.0 (1%)</td>
</tr>
<tr>
<td>18.</td>
<td>RU18</td>
<td>48.0 (2%)</td>
</tr>
<tr>
<td>19.</td>
<td>RU19</td>
<td>70.0 (3%)</td>
</tr>
<tr>
<td>20.</td>
<td>RU20</td>
<td>73.0 (3%)</td>
</tr>
<tr>
<td>21.</td>
<td>RU21</td>
<td>54.0 (2%)</td>
</tr>
<tr>
<td>22.</td>
<td>RU22</td>
<td>57.0 (2%)</td>
</tr>
<tr>
<td>23.</td>
<td>RU23</td>
<td>62.0 (3%)</td>
</tr>
<tr>
<td>24.</td>
<td>RU24</td>
<td>45.0 (2%)</td>
</tr>
<tr>
<td>25.</td>
<td>RU25</td>
<td>40.0 (2%)</td>
</tr>
<tr>
<td>26.</td>
<td>RU26</td>
<td>40.0 (2%)</td>
</tr>
<tr>
<td>27.</td>
<td>RU27</td>
<td>78.0 (3%)</td>
</tr>
<tr>
<td>28.</td>
<td>RU28</td>
<td>162.0 (7%)</td>
</tr>
<tr>
<td>29.</td>
<td>RU29</td>
<td>113.0 (5%)</td>
</tr>
<tr>
<td>30.</td>
<td>RU30</td>
<td>81.0 (4%)</td>
</tr>
<tr>
<td>31.</td>
<td>RU31</td>
<td>30.0 (1%)</td>
</tr>
<tr>
<td>32.</td>
<td>RU32</td>
<td>30.0 (1%)</td>
</tr>
<tr>
<td>33.</td>
<td>RU33</td>
<td>75.0 (3%)</td>
</tr>
<tr>
<td>34.</td>
<td>RU34</td>
<td>74.0 (3%)</td>
</tr>
<tr>
<td>35.</td>
<td>RU35</td>
<td>54.0 (2%)</td>
</tr>
<tr>
<td>36.</td>
<td>RU36</td>
<td>51.0 (2%)</td>
</tr>
<tr>
<td>37.</td>
<td>RU37</td>
<td>43.0 (2%)</td>
</tr>
</tbody>
</table>

Note. *The sample numbers of 36 and 331 is from the population of 37 and 2400, respectively, according to Krejcie and Morgan’s Table (1970, p.608). The sample size is equal to the sum of all weighted cluster sizes. It is assumed as the initial sample and the basis for further calculation of the minimum sample size expected in the multi-level model.
The Nature of Clustered Data

Hierarchical data structures are very common in social and behavioral science (Ciarleglio & Makuch, 2007; McCoach, 2010; Raudenbush & Bryk, 2002; West et al., 2007; Woltman et al., 2012). The hierarchical linear modeling, also known as multilevel modeling, or random coefficients modeling, assumes non-independence of observations (Ciarleglio & Makuch, 2007). In other words, the characteristics of the units of analysis (participants) are typically similar within a given cluster because the participants share variances from the same factors or environments within the same cluster (Raudenbush & Bryk, 2002; Warne, McKyer, Condie, Diep, & Murano, 2012), but the characteristics probably differ among clusters (McCoach, 2010; Raudenbush & Bryk, 2002; West et al., 2007). Ignoring a level of nesting structure can result in overestimated variation at an individual level (Chen, Kwok, Luo, & Willson, 2010; Moerbeek, 2004).

In the framework of multi-level data or clustered data, the similarity among elements within the same cluster is known as ‘homogeneity,’ and the difference among clusters is called ‘heterogeneity.’ The homogeneity can be confirmed by measuring the intra-class correlation coefficient, the ICC or ‘rho’ (Stapleton & Thomas, 2008). The intra-class correlation coefficient (ICC) is a measure to determine how many variances of the dependent variable come from the differences among clusters (Guo, 2005; Raudenbush & Bryk, 2002; Warne et al., 2012). In education, the ICC values of .10 (Hox, 2010) and .20 are common (Hox, 2010; Warne et al., 2012). This feature of clustered data generates various problems such as the well-known problem of the ‘design effect’ (deff) (Hox, 2010; Warne et al., 2012). This also can explain why an increase in the number of selected clusters (J) is of greater advantage than an increase in
cluster size (n), if possible. The concept of rho is very important to many analyses of clustered data, including the analysis of sample size.

**Sample Size Calculation (Effective N of Multi-level Data)**

In multi-level design, the number of independent elements nested within a multi-level design is called the ‘effective N’ (Stoker & Bowers, 2002). At the first stage, “the effective N of macro-level units is J” (Stoker & Bowers, 2001, p.6), randomly sampled from the PSUs. Stoker and Bowers (2002) concluded that the effective N of micro-level units (at the second stage) is more complicated because of the concepts regarding homogeneity and the ICC (ρ, rho), and rho ρ is used to calculate the effective N of observations for a level-1 variable (Hox, 2010; Kish, 1965; Stoker & Bowers, 2002). The formula of the effective N as below:

$$\text{Effective sample size} = \frac{N}{1 + \text{ICC} (n-1)} = \frac{Jn}{1 + \text{ICC} (n-1)}$$

To obtain the value of the Effective N at the second stage, n and ρ must be known. The past literature regarding the instructors clustered within the Rajabhat Universities does not provide rho (ρ); thus, the common rho in education of .10 (Hox, 2010) is inserted into the formula.

Although the cluster size (n) is known for every cluster, and the Effective N for each individual-level variable can be identified, the next problem is that the cluster sizes (n) are unequal (Stoker & Bowers, 2002): which the reasonable and appropriate n should be used. One suggestion has been proposed. Spybrook (2008, p.282) stated that in case of unequal size clusters “it is permissible to substitute the harmonic mean for the number of participants per cluster because it provides a good approximation for the calculation (Raudenbush, 1997).” The formula of the harmonic mean is:
\[ n_{\text{harmonic}} = \frac{J}{\sum n_j} \]

\[ n_{\text{harmonic}} = \frac{37}{1 + \frac{1}{10} + \frac{1}{6} + \frac{1}{13} + \cdots + \frac{1}{5}} \]

\[ n_{\text{harmonic}} = \frac{37}{5.2} \]

\[ n_{\text{harmonic}} = 7 \]

The harmonic \( n \) of this study is equal to 7, and this number is used to define the Effective N for one level-1 predictor:

\[
\text{Effective N per level-1 predictor} = \frac{Jn}{1 + \rho(n-1)}
\]

\[
= \frac{37 \times 7}{1 + 0.10(7-1)}
\]

\[
= \frac{259}{1 + 0.6}
\]

\[
= 161.87
\]

Therefore, to make possible the detection of the effects of six level-1 predictors,

\[
\text{Effective sample size} = 161.87 \times 6
\]

\[
= 970
\]

For level-2 variables, Warne et al. (2012) stated that the clustering effect has the greatest impact on the effectiveness of \( N \). Moreover, in fact, an increase of micro-level units is more likely to be useless for detecting clustering effects and power (Kish, 1964; Snijders, 2005; Spybrook et al., 2011; Stapleton & Thomas, 2008). To detect the effects of cross-level interactions, Aguinis, Gottfredson, and Culpepper (2013) suggested that the popular rule of thumb ‘30-30’ should be abandoned and implied that the ratio of 3:2 for the average level-1
sample size to the level-2 sample size: however, there is little guidance for the creation of simple formulas. For this study, the number of 970 is taken as a reasonable sample size. The next step is to determine whether this sample size will be enough to detect power of significance and the effects. Although the researcher faces a problem in increasing the number of clusters, the other techniques such as including a cluster-level covariate are able to increase power (Spybrook, Raudenbush, Liu, Congdon, & Martinez, 2008).

**Power Analysis**

Power is defined as the probability that the null hypothesis will be rejected when the alternative hypothesis is true (Spybrook et al., 2008). In order to detect power, the number of the sample must be sufficient. The sample of interest (N= 970), representing the population, yields an average of 26 participants per site (970/37). For hierarchical linear modeling, Hox (2010) and Guo (2005) suggested using optimal design software for gaining sufficient power and selecting an appropriate cluster size to control cost.

To examine if the obtain cluster size (n) of 26 provides enough power, the optimal design requires the alpha (\( \alpha \)), the intraclass correlation coefficient (ICC or rho), the number of universities (\( J \)), and the standardized effect size (\( \delta \)). The common alpha value of .05 is used. The intraclass correlation coefficient inputted is .10, \( \rho = .10 \), the general ICC (\( \rho \)) value in education (Hox, 2010). The number of universities (\( J \)) equals 37. For the standardized effect size, Cohen (1969) indicated the standardized effect sizes of .20, .50, and .80 as small, medium, and large, respectively, but fortunately, the optimal design allows a range of effect sizes (Raudenbush & Liu, 2000). The standardized effect size, \( \delta \), is defined as “the difference in the population means
of the two groups divided by the estimated standard deviation of the outcome variable.”
(Spybrook, 2008).

This study can expect an effect size ($R^2$) of at least 35% for the model with six level-1 predictors (covariates) as underestimation. This is because PU, solely, has yielded 34%-52% of the variance in the dependent variable (behavior) (Venkatesh & David, 2000). PE, solely, has yielded 60% of the explained variance (Venkatesh, 2000). Together, PU and PE have provided an effect size of 52% - 67% (Venkatesh & Bala, 2008). In addition to PU and PE, this study has added four additional individual predictors. Note that it is important to take into account the different types of effect size. Indeed, the effect size of $r^2$ and Cohen's are different; however, they can be compared. Table 3 provides a comparison between the d effect size (Cohen’s) and $r^2$ (Cohen, 1969).

Table 3

Comparison between Cohen’s Standardized Effect Size and $r^2$

<table>
<thead>
<tr>
<th>Cohen’s standard</th>
<th>d effect size</th>
<th>$r^2$ effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5</td>
<td>.360*</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>.329*</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>.200</td>
</tr>
<tr>
<td>Large</td>
<td>.80</td>
<td>.138</td>
</tr>
<tr>
<td>Medium</td>
<td>.50</td>
<td>.059</td>
</tr>
<tr>
<td>Small</td>
<td>.20</td>
<td>.010</td>
</tr>
</tbody>
</table>

Note. * The smallest effect size $r^2$ that is expected in this study regarding the level-1 predictors (.35 or 35%) is classified as higher large standard (more than .80 or 1.4 < d < 1.5). Data are retrieved from Cohen (1969, p.22)
Although an underestimation, the expected effect size of $r^2 = .35$ is still estimated as higher than the large standard ($1.4 < d < 1.5$). To maintain underestimation of the future result of the expected effect size, the standardized effect size of .40 (small to medium) was applied in the model in order to detect power. The power of .80 or greater is recognized to be sufficient (Spybrook, 2008).

**Power with level-1 covariates.** In the optimal design software, the ‘person randomized trials (PRT)’ is available to examine the power without and with level-1 covariates (predictors). The PRT with under tab ‘multi-site (blocked) trail’ can graphically provide power for treatment effect on y-axis with various relations such as power vs site size (n), power vs effect size ($\delta$), or effect size variability ($\sigma_\delta^2$). The model under this option assumes random site effects and can be considered as a two-level hierarchical linear model (Spybrook et al, 2011, p.30). To examine the power for treatment effect, this design requires the number of clusters (J), cluster size (n), effect size ($\delta$), $R^2$ of level-1 covariates, and effect size variability ($\sigma_\delta^2$). Under the scenario of this study, the effect size variability ($\sigma_\delta^2$) is unknown; thus, it is set from .01 to .20. Figure 4 illustrates such scenario that presents the relations between power and the effect size variability with the effect size explained by level-1 covariates ($R^2$). The $R^2$ of level-1 covariates is compared between without $R^2$ (0%) and with the expected $R^2$ of .35 (35%). The power obviously is more than the acceptable level (.80).
Figure 4. Person randomized trial- Multi-site trial- Power vs Effect size variability, without \( R_{L1}^2 = 0 \) and with level-1 covariates \( R_{L1}^2 = .35 \). At, \( \delta = .40, \alpha = .05, n = 26, \) and \( J = 37 \).

**Power with level-2 covariates.** In the context of multi-level data, the ‘cluster randomized trails (CRT)’ with under tab ‘treatment at level 2’ is suggested to graphically examine various relations such as power vs effect size, power vs total number of clusters \( J \), including power with adding level-2 covariates (Hox, 2010; McCoach, 2010; Raudenbush & Bryk, 2002; Raudenbush & Lui, 2000; Spybrook, 2008). Specifically, in this study the number of \( J \) is fixed, the expected sample size is fixed with the cluster size \( n \) of 26. The optimal design allows inserting \( R^2 \) of level-2 covariates into the model for the purpose of comparing the designs without and with a covariate (Spybrook et al, 2008). Indeed, the scenario of this study can be recognized as indicating that the proportion of the variation explained by level-2 covariate \( R_{L2}^2 \)
is unknown, and it is possible that the researcher may be faced with gaining a lower standardized effect size than was expected.

Figure 5 present the design of such a scenario. With the cluster size of average n=26 with the lower standardized effect size ($\delta = .35$) compared to the expected effect size ($\delta = .40$), the power still remains more than .80 when the proportion explained variation by level-2 covariate ($R^2_{L2}$) is set at a range from .05 to .20. As well, the power is increasing when the proportion of explained level-2 covariates is higher.

![Figure 5. 2-level CRT- power vs proportion of explained variation by level-2 covariate. At, $\delta = .35$ and .40, $\alpha = .05$, n=26, and J= 37.](image)

Figure 5. 2-level CRT- power vs proportion of explained variation by level-2 covariate. At, $\delta = .35$ and .40, $\alpha = .05$, n=26, and J= 37.
**Power and the cross-level interactions.** According to the documentation for the ‘optimal design’ software (Spybrook et al., 2011; Spybrook et al., 2008), no option for examining the relations regarding cross-level interactions is available in the optimal design. One suggestion has been found that the model with a cross-level interaction requires the sample size larger than the model with level-1 and level-2 covariates (Aguinis, Gottfredson, & Culpeper, 2013). Due to the fact that the explained variance of the sample depends not only on the sample size, but also on the sample design (Kish, 1965), considering the economic feasibility of the sample and its ability to detect power, the sample size (N) of 970 or cluster size (n=26) is superior and selected.

The researcher, however, wish to know that how many minimum sample size (N) or cluster sizes (n) that make it possible to detect the sufficient power of .80 in the model including level-2 covariates. In this design, the number of cluster (n) is assumed that it is unknown. The design with the expected explained variance of two level-2 covariates in this study assumes a low value of $R^2_{L2} = .10$ (10%). Figure 6 illustrates the comparison between the results without and with a covariate design with the expected standardized effect size ($\delta = .40$). The proportion explained variation by level-2 covariate ($R^2_{L2}$) is set at zero and .10. At the average cluster size of 26 with $R^2_{L2} = 0$, the power is higher than .80. The power slightly increases when $R^2_{L2}$ is added in the design ($R^2_{L2} = .10$). According to Figure 6, the cluster size (n) of 12 or the sample size (N) of 444 is sufficient to gain the power of .80 with 10% variance explained by level-2 covariates.
Figure 6. 2-level CRT- power vs number of subjects per cluster (cluster size). At $J=37$, $\rho=.10$, $\alpha=.05$, $n=26$, and $\delta=.40$. $R^2_{L2}$ is set at 0 and .10.

In survey sampling with voluntary participation, the sample size can be controlled by the limitation of the response rate (Kish, 1965). The expected sample size ($N$) of 970 is large enough and is oversampled; however, note that the minimum sample size ($N$) of 444 is sufficient to detect the statistical power of the model (.80). The technique of including level-2 covariates by aggregating level-1 covariates would be used in the data analysis procedure if it were needed as implied from the benefit of including a cluster level covariate on the power (Spybrook et al., 2008). In this study, the surveys that were responded and sent back to the researcher were equal to 697. That was more than the calculated minimum sample size of 444. The procedure employed to acquire the sample and to deal with the clustered data is addressed next in the sections on data collection and data analysis.
Instrumentation

To test the theoretical framework of the behavior in conducting research of the instructors in faculty of Management Science from the Rajabhat University System, six individual predictors, perceived usefulness (PU) of conducting research, perceived ease (PE) of conducting research, social influence (SI), facilitating conditions (FC), teaching loads, and degree level, were measured as level-1 covariates. Two level-2 university predictors were measured as level-2 covariates: percent of instructors holding academic ranks at the university level and percent of instructors holding doctoral degrees at the university level, from the 37 Rajabhat Universities. Thus, this study includes 10 measures of eight independent variables, one marker variable (Social desirability), and one dependent variable (Behavior in conducting research).

The questionnaire for this study is a self-administered paper questionnaire that includes a total of 38 items (see Appendix C). There are two sections in the survey. The first section includes three parts.

Part I contains four items related to perceived usefulness of conducting research (PU), four items related to perceived ease of conducting research (PE), four items related to social influence (SI), and four items related to facilitating conditions (FC). All of the items in Part I were evaluated on a six-point Likert type scale ranging from 1 to 6, in which 1 means strongly disagree, 2 means disagree, 3 means somewhat disagree, 4 means somewhat agree, 5 means agree, and 6 means strongly agree. Part II has five items related to the behavior in conducting research (B), the dependent variable of this study, and the respondents were asked to enter the number matching the number on their research form produced. Part III contains 10 items related to the social desirability scale which were evaluated by tallying the responses to yes or
no questions. ‘Yes’ is equal to one score, and ‘No’ is equal to zero score. The negative items were tallied as reversed scores.

The second section contains seven demographics questions including two individual predictors: the teaching loads and the degree level variables. There is no questionnaire item for the two university predictors: the percent of the instructors holding academic ranks at the university level and the percent of the instructors holding doctoral degrees at the university level because these data have been retrieved from a secondary source (see Appendix D).

Additionally, the questionnaire questions were grouped and ranged by construct or variable in order to project the true picture and protect against the possible confusion and frustration of the respondents (Davis & Venkatesh, 1996). The survey was created in an English version, and it was translated into a Thai version by adopting the traditional forward and backward translation or back-translation (Brislin, 1970). Furthermore, following the suggestions for controlling for common method bias by Podsakoff, MacKenzie, and Podsakoff (2011), this study reduces the tendency to provide socially desirable responses by stating in the consent form and survey instructions that ‘your answers are confidential and there are no right or wrong answers.’ (see Appendix C). Table 4 presents the survey items of this study and the importance of each item to the hypotheses and variables.
Table 4

Survey Items and Variables

<table>
<thead>
<tr>
<th>Items on survey</th>
<th>Variable</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>Perceived usefulness (PU)</td>
<td>H4, 4a, 4b</td>
</tr>
<tr>
<td>5-8</td>
<td>Perceived ease (PE)</td>
<td>H5, 5a, 5b</td>
</tr>
<tr>
<td>9-12</td>
<td>Social influence (SI)</td>
<td>H6</td>
</tr>
<tr>
<td>13-16</td>
<td>Facilitating conditions (FC)</td>
<td>H7</td>
</tr>
<tr>
<td>17-21</td>
<td>Behavior in conducting research (B_research)</td>
<td>H1</td>
</tr>
<tr>
<td>22-31</td>
<td>Marker variable (Social desirability-SD)</td>
<td>-</td>
</tr>
<tr>
<td>32-38</td>
<td>(Demographic data)</td>
<td>-</td>
</tr>
<tr>
<td>(Retrieved from item-37)</td>
<td>Teaching loads (TL)</td>
<td>H8</td>
</tr>
<tr>
<td>(Retrieved from item-34)</td>
<td>Degree level (DL)</td>
<td>H9</td>
</tr>
</tbody>
</table>

Note. Hypotheses 2 and 3 will depend on data obtained from a secondary source.

The questionnaire items were adapted based on items used in studies from the scholarly journal literature to apply to the particular topic of this study. The behavior in conducting research measure was adapted from a research engagement measure (Clarke, 2010) and a faculty productivity measure (Fairweather, 2002). The measures of PU and PE of conducting research in this study were adapted from the PU and PE scales of TAM 2 (Venkatesh & Davis, 2000), respectively. The measures of SI and FC were adapted from the SI and FC scales of UTAUT (Venkatesh et al., 2003), respectively. The measure of socially desirable scale (SD) was applied from the Gender-Free Inventory of Desirable Responding, GFIDR (Becker & Cherny, 1994). Table 5 illustrates the sources of all 10 measures of this study.
Table 5

Sources of the Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Variable type</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_research</td>
<td>Dependent</td>
<td>Developed from the research engagement measure of Clarke (2010) and the faculty productivity measure of Fairweather (2002)</td>
</tr>
<tr>
<td>PU</td>
<td>Level-1 independent</td>
<td>Developed from the PU scale of TAM2 (Venkatesh &amp; Davis, 2000)</td>
</tr>
<tr>
<td>PE</td>
<td>Level-1 independent</td>
<td>Developed from the PE scale of TAM2 (Venkatesh &amp; Davis, 2000) and the</td>
</tr>
<tr>
<td>SI</td>
<td>Level-1 independent</td>
<td>Developed from the SI scale of UTAUT (Venkatesh, et al., 2003)</td>
</tr>
<tr>
<td>FC</td>
<td>Level-1 independent</td>
<td>Developed from the FC scale of UTAUT (Venkatesh, et al., 2003)</td>
</tr>
<tr>
<td>TL</td>
<td>Level-1 independent</td>
<td>Researcher developed</td>
</tr>
<tr>
<td>DL</td>
<td>Level-1 independent</td>
<td>Researcher developed</td>
</tr>
<tr>
<td>PROF</td>
<td>Level-2 independent</td>
<td>Researcher developed</td>
</tr>
<tr>
<td>DOCT</td>
<td>Level-2 independent</td>
<td>Researcher developed</td>
</tr>
<tr>
<td>SD</td>
<td>Marker variable</td>
<td>Applied from GFIDR (Becker &amp; Cherny, 1994)</td>
</tr>
</tbody>
</table>

Note. B_research = behavior in conducting research (dependent variable), PU= perceived usefulness, PE= perceived ease, SI= social influence, FC = facilitating conditions, TL=teaching loads, DL=degree level, PROF = percent of instructors holding academic ranks at the university level, DOCT= percent of instructors holding doctoral degrees at the university level, SD = social desirability.
Behavior in Conducting Research


Mainly following Clarke (2010) and Fairweather (2002), this study measured the behavior in conducting research by counting the items of research that an instructor has produced over past five years from 2010 to 2014: research article in peer-reviewed journal, university sponsored research, book or textbook, chapter in edited book, and conference paper, in either Thai or English versions. Selecting different weights for different forms of research can result in misleading conclusions about their relative values (Fairweather, 2000). Although Clarke and Fairweather have used a 2-year period to measure the produced research in their studies, many studies mentioned above have used more than two years. Thus, to allow more time for the instructors in the new public university of this study, this study has opted to apply to a 5-year period for the measure of behavior in conducting research (e.g., Borokhovich, Bricker, Brunarski, & Simkins, 1995; Ramsden, 1994). The university sponsored research item is
added after the pilot test has been conducted. Table 6 illustrates the selected items of the conducting research measure.

Table 6

*Selected Items of the Behavior in Conducting Research Measure*

<table>
<thead>
<tr>
<th>Source</th>
<th>Variable/Theory</th>
<th>Method/Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fairweather (2002)</td>
<td>Faculty productivity/ The review of literature</td>
<td>Counting the number of refereed articles, reviews of books, books, textbooks, monographs, and chapters in edited volume.</td>
</tr>
<tr>
<td>This study</td>
<td>Behavior in conducting research/ Technology acceptance model (TAM/TAM 2) and the Unified theory of acceptance and use of technology (UTAUT)</td>
<td>Counting the number of research articles in peer-reviewed journals, university sponsored research, books or textbooks, chapters in edited books, and conference papers.</td>
</tr>
</tbody>
</table>
Perceived Usefulness (PU) and Perceived Ease (PE)

The items of the PU and PE scales originally developed by Davis (1989) have had their reliability and validity confirmed by many studies over many decades. For example, the study testing the original TAM on behavior in using PROFS electronic mail, XEDIT file editor, and two IBM PC-based graphics systems obtained Cronbach’s alpha values of PU at .98 and PE at .94 (Davis, 1989). Another example is the study testing the original TAM on behavior in using electronic and voice mail and WordPerfect, Lotus 1-2-3, and Harvard graphics, which obtained PU at .94 and PE at .88 (Adams, Nelson, & Todd, 1992). The number of items for each of the original constructs, PU and PE (TAM), was condensed from six to four (TAM 2), and the wordings of the original items were adjusted; for example, one of the PU items ‘using CHART-MASTER would improve my job performance’ was altered to become ‘using the system improves my performance in my job.’ This study applies the PU and PE constructs from TAM 2 instead of those from the original TAM because they are more updated and their item contents are likely to be more general.

A study testing TAM 2 with behavior in using a proprietary system, a Windows-based environment, a Windows-based customer account management system, and a custom-built DOS-based system resulted in the PU items’ Cronbach’s alpha ranging from .87 to .98 and the PE items’ Cronbach’s alpha ranging from .86 to .98 across studies and time periods (Venkatesh & Davis, 2000). The validity tests assessed by using the Multitrait, Multimethod (MTMM), described by Campbell and Fiske in 1959, showed strong values as well (Adams et al., 1992). Other supportive evidence for the validity and reliability of the PU and PE scale items is also
found in Doll, Hendrickson, and Deng (1998), Lee et al. (2003), and Venkatash and Bala (2008). There are four items in the PU and PE scales of TAM 2 respectively.

**PU modification.** In the modified model, the perceived usefulness of conducting research measure (PU) still includes four items. According to TAM 2 (Venkatesh & Davis, 2000), the item loadings (construct loadings) of the PU items were .89, .88, .93, and .91 respectively. The higher values of construct loadings generally parallel internal consistency reliability (ICR) and convergent and discriminant validity (construct validity) because standard errors decrease when loadings increase (Fornell & Larcker, 1981; Hair et al., 2010). The concept of ‘using the system’ is modified to become ‘conducting research.’ In other words, the behavior regarding using a technology system is reinterpreted as the behavior regarding conducting research. In the PU4 item, ‘the system’ refers to the object that the individual is dealing with. Thus, it is modified to become ‘my research.’ The term ‘my’ is used instead of ‘the’ because this formulation would be clearer for the participant readers. Table 7 presents the modification of the PU items of TAM 2 into the PU measure of this study.

Table 7

*Modified Items of the PU Measure*

<table>
<thead>
<tr>
<th>PU Measure</th>
<th>Original item</th>
<th>Modified item</th>
</tr>
</thead>
<tbody>
<tr>
<td>**PU</td>
<td>Using the system improves my performance in my job.</td>
<td>Conducting research improves my performance in my job.</td>
</tr>
<tr>
<td>**PU1</td>
<td>Using the system in my job increases my productivity.</td>
<td>Conducting research in my job increases my productivity.</td>
</tr>
</tbody>
</table>
Using the system enhances my effectiveness in my job. Conducting research enhances my effectiveness in my job.

I find the system to be useful in my job. I find my research to be useful in my job.

**PE modification.** In the modification model, the perceived ease of conducting research measure (PE) still retains four items. According to TAM 2 (Venkatesh & Davis, 2000), the item loadings of the PE items were .91, .93, .96, and .82 respectively. The term ‘the system’ in PE is equal to that in PU; thus, it is replaced by ‘my research.’ The term ‘do’ in PE4 is replaced by ‘answer’ to make it compatible with the conducting research context. Table 8 illustrates the modification of the PE items of TAM 2 into the PE measure of this study.

Table 8

*Modified Items of the PE Measure*

<table>
<thead>
<tr>
<th>PE Measure</th>
<th>Original item (TAM 2-Venkatesh &amp; Davis, 2000)</th>
<th>Modified item (This study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE1</td>
<td>My interaction with the system is clear and understandable.</td>
<td>My interaction with my research is clear and understandable.</td>
</tr>
<tr>
<td>PE2</td>
<td>Interacting with the system does not require a lot of my mental effort.</td>
<td>Interacting with my research does not require a lot of my mental effort.</td>
</tr>
<tr>
<td>PE3</td>
<td>I find the system to be easy to use.</td>
<td>I find my research to be easy to do.</td>
</tr>
<tr>
<td>PE4</td>
<td>I find it easy to get the system to do what I want it to do.</td>
<td>I find it easy to get my research to answer what I want it to answer.</td>
</tr>
</tbody>
</table>
Social Influence (SI) and Facilitating Conditions (FC)

The study proposing UTAUT for use in explaining the behavior in using of a new technology by employees in four organizations found that the internal consistency reliability (ICR) of the SI and FC items were ranged from .88 to .94 and .83 to .87, respectively across the three time periods studies (Venkatesh et al., 2003). The composite reliability (CR) of SI and FC confirmed were .94 and .82 respectively (Wang & Shih, 2009). Other supportive evidence for strong internal consistency reliability and construct validity is presented in Oshlyansky, Cairns, and Thimbleby (2007), Venkatesh and Davis (2000), and Wang and Shih (2009). Each construct of the SI and FC scales of UTAUT contains four items.

SI modification. The modification model of the social influence measure (SI) is still composed of four items. As averaged from three time periods studies, the item loadings of SI were .86 (.82, .85, .90), .84 (.83, .85, .84), .85 (.84, .80, .90), and .82 (.80, .82, .84) respectively. The expression ‘use the system’ is modified to become ‘conduct research,’ and ‘the use of the system’ is modified into ‘the conducting of research’. The terms ‘business’ in SI3 and ‘organization’ in SI4 are changed to become ‘university.’ The verb ‘has been helpful’ in SI3 cannot be applied effectively regarding the behavior in conducting research because the senior management such as dean or president may not be able to help in the conducting of research, but rather may encourage faculty to conduct research instead. Table 9 illustrates the modification of the SI items of UTAUT into the SI measure of this study.
Table 9

**Modified Items of the SI Measure**

<table>
<thead>
<tr>
<th>SI Measure</th>
<th>Original Item</th>
<th>Modified Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SI1</strong></td>
<td>People who influence my behavior think that I should <em>use the system.</em></td>
<td>People who influence my behavior think that I should <em>conduct research.</em></td>
</tr>
<tr>
<td><strong>SI2</strong></td>
<td>People who are important to me think that I should <em>use the system.</em></td>
<td>People who are important to me think that I should <em>conduct research.</em></td>
</tr>
<tr>
<td><strong>SI3</strong></td>
<td>The senior management of this <em>business</em> has been helpful in the use of the system.</td>
<td>The senior management of this <em>university</em> has encouraged me in the conducting of research.</td>
</tr>
<tr>
<td><strong>SI4</strong></td>
<td>In general, the <em>organization</em> has supported the use of the system.</td>
<td>In general, the <em>university</em> has supported the conducting of research.</td>
</tr>
</tbody>
</table>

**FC modification.** In the modified, model of the facilitating conditions measure (FC) retains four items. As averaged from three time periods studies, the item loadings of FC were .82 (.84, .81, .80), .81 (.81, .81, .82), .81 (.80, .82, .80), and .81 (.80, .80, .82) respectively. Just as with the other individual belief measures, the words ‘use the system’ are modified to become ‘conduct research.’ The word ‘systems’ in FC3 is changed to become ‘jobs’ to make it compatible with the modified item and still keep the original concept. The words ‘system difficulties’ in FC4 are adjusted to become ‘difficulties in conducting research,’ which still
expresses the same concept as was expressed by the original item. Table 10 illustrates the modification of the FC items of UTAUT into those of the FC measure for this study.

Table 10

*Modified Items of the FC Measure*

<table>
<thead>
<tr>
<th>FC Measure</th>
<th>Original item</th>
<th>Modified item</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC1</td>
<td>I have resources necessary to <em>use the</em> system.</td>
<td>I have resources necessary to <em>conduct research</em>.</td>
</tr>
<tr>
<td>FC2</td>
<td>I have the knowledge necessary to <em>use the</em> system.</td>
<td>I have the knowledge necessary to <em>conduct research</em>.</td>
</tr>
<tr>
<td>FC3</td>
<td>The <em>system</em> is not compatible with the other <em>systems</em> that I <em>use</em>.</td>
<td>Conducting research is not compatible with the other <em>jobs</em> that I <em>do</em>.</td>
</tr>
<tr>
<td>FC4</td>
<td>A specific person (or group) is available for assistance with <em>system difficulties</em>.</td>
<td>A specific person (or group) is available for assistance with <em>difficulties in conducting research</em>.</td>
</tr>
</tbody>
</table>

**Teaching Loads**

The numbers of teaching hours per week of the individual instructors in the faculty of Management Science at the Rajabhat Universities are unequal. It may range from 12 to 24 hours per week. Teaching loads or workloads have been suggested to relate negatively to the number of publications that instructors produced, but this was not measured directly in previous studies (Borg, 2007; Hassan et al., 2008; Kirtikara, 2012; Sangnapabowarn, 2003)
because most of those studies are conceptual. One empirical study (Hassan et al., 2008) referred to percent time teaching as a teaching load. Thus, this is measured simply by asking the participant how many average hours per week that he/she has taught.

**Degree Level**

This variable refers to the highest academic degree of an individual instructor. There are four levels: level 1, bachelor degree; level 2, Master degree; and level 3, Doctoral degree, and level 4, Postdoctoral degree. Studies suggested that a person who gains a higher academic degree is probably able to produce more research (Clarke, 2010; Clemente, 1994; Hassan et al., 2008; Hasselback et al., 2012; MatichonOnline, 2011; Sangnapaboworn, 2003; Su, 2011). This variable was treated as a categorical variable, and the meaning of the obtained number would be the subject of interpretation, in the context of its category.

**Percent of Instructors Holding Academic Ranks at the University Level**

This variable is measured by summing the percent of assistant, associate, and full professors in each Rajabhat University. The studies indicated that an instructor needs to submit quality research or textbooks in order to gain promotion in academic position (Sangnapaboworn, 2003; Sinlarat, 2004; Sinthunava, 2011); therefore, the percent of the instructors who held the ranks of assistant professor, associate professor, and professor at the university may be able to moderate the relationship between perceived usefulness of conducting research and behavior in conducting research. The data were retrieved from a secondary source (see Appendix D) that is available at the website of OHEC, Thailand regarding National Academic Positions (2013), Thailand. The percent of the instructors holding the ranks
of assistant professor, associate professor, and professor at the 37 Rajabhat Universities ranges from 3.96% to 100%.

**Percent of Instructors Holding Doctoral Degrees at the University Level**

This variable is measured by summing the number of doctoral instructors in each Rajabhat University (a level-2 variable). The evidence from Clarke (2010), Clemente (1994), Hassan et al. (2008), Hasselback et al. (2012), MatichonOnline (2003), Sangnapaboworn (2003), and Su (2011) showed that people who hold a doctoral degree probably produce more research; therefore, the number of the doctoral instructors at the institution may be able to moderate the relationship between perceived ease of conducting research and behavior in conducting research. The data have been retrieved from a secondary source (see Appendix D) that is available at the website of National Academic Positions (2013), Thailand. The percent of the instructors having completed doctoral degrees at the 37 Rajabhat Universities ranges from 5.45% to 26.79%.

**Social Desirability**

This variable is applied from the Gender-Free Inventory of Desirable Responding or GFIDR (Becker & Cherny, 1994). Becker and Cherny concerned that the difference on gender may impact on a measure of socially desirable responding (SDR). They tested 73 items obtained from the 33-item MC scale created by Crowne and Marlowe in 1960 and the 40-item Balanced Inventory Desirable Responding or BIDR created by Paulhus in 1984. The 73 items were measured by using a 5-point scale with 316 participants that included 158 males and 158 females. The results suggested two types of the scale: the 12-item Gender-Balanced Inventory of Desirable Responding (GBIDR) and the 10-item Gender-Free Inventory of Desirable
Responding (GFIDR). The 10-item GFIDR is selected to apply to this study because of its smaller number (see Appendix C). The score of GFIDR can be summed, and the high value presents the high socially desirable responding. Five items out of 10 (2, 3, 4, 6, and 7) are negative items and need to have their scores reversed before summing. The convergent reliability of GFIDR was .68. In this study, this variable was used as a marker variable in the measurement model or CFA to control common method variance or CMV (Reio, 2010; Williams, Hartman, & Cavazotte, 2010); thus, it was not summed. Rather, it was averaged and treated as a latent variable for a use in a CFA model.

**Data Collection**

To ensure that the survey items are applicable, this study conducted the pilot test with 30 instructors. The current items in the survey have been improved after the pilot testing. This study collected data from the instructors in the faculty of Management Science of the 37 Rajabhat Universities by administering the Thai version of a questionnaire that has been approved by the UNT Institutional Review Board (IRB). The researcher requested assistance in the data collection process from the Research and Development Institute of Udon Thani Rajabhat University (UDRU), the university for which the researcher is currently working. The Research and Development Institute, which has connections for research cooperation with the Rajabhat Universities, provided a cover letter addressed to the dean of the faculty of Management Science of each university site. Then the researcher sent this cover letter with the paper survey package attached, including the consent form (see Appendix B), which was put on the first page of the survey, to the faculty of each institution site. The researcher sent the questionnaire surveys as the total population number of each site (Table 2) at one time.
Usually, the secretary of the faculty is assigned to assist for this job. The secretary of each site distributed the survey to all instructors in the faculty. Then the instructors who participated in this survey returned the completed survey to the secretary.

Due to voluntary nature of participation in the survey, the researcher tried to request the minimum number of participants per university site necessary for the making of precise estimations in the data analysis process. Each university site was given a total of four weeks to gather the completed survey from the respondents. Subsequently, the secretary of each site sent the completed survey package back to the Research and Development Institute of UDRU. The researcher received the completed survey packages from the Research and Development Institute of UDRU. Thai instructors commonly keep the consent form when participating a survey as stated in the consent form that the participants ‘may keep this form’. If it was not removed from the survey by the participants, the researcher removed it by hand and kept it in a safe place. The completed surveys were used for the further step of data analysis. The RUDU students were hired to input the data into an electronic file.

Data Analysis

This data analysis section is threefold: data screening, measurement model analysis, and maximum likelihood analysis of hierarchical linear models. In the data screening, the data were explored to find missing values, outliers, and the assumptions such as normality. Also, the key variables and demographic data were described using descriptive statistics and frequency. Measurement model analysis, the assessment of confirmatory factor analysis (CFA), is to confirm the validity and reliability of the constructs (Schreiber, Nora, Stage, Barlow, & King, 2006) of this study. The maximum likelihood analysis of hierarchical linear models with the use
of the lme function in R language is to test the direct effects and the cross-level interactions of
the predictors developed into this study.

Data Screening

Firstly, the data collected were explored to find missing values and outliers and to check
the assumptions necessary for multilevel data. There are three types of missingness: missing
completely at random (MCAR), missing at random (MAR), and missing not at random (MNAR).
The missingness of data may possibly lead to loss of some power because less data are
obtained. However, the first two types can be ignored because the estimates are not biased if
the maximum likelihood method is used (Ciarleglio & Makuch, 2007). Moreover, various
imputation techniques also are available for use in SPSS for the alternative resolutions. The
problem of MNAR cannot be ignored because it may result in biased estimates (Ciarleglio &
Makuch, 2007). Therefore, for this study, if the missingness is MCAR or MAR, the data were
imputed (Larsen, 2011). If it is MNAR, the datum that contains missing data was deleted.
Outliers can be detected by many types of graphs such as boxplots. The outliers were fixed if
their cause was from data entry error. The inspection of graphs and the values of skewness and
kurtosis can also examine normality and linearity assumptions; they are standard tools in
regression analysis and can be used in HLM analysis (Kim, Kavanaugh, & Hult, 2011). Yet, while
a regressions model makes the assumption of independence, a multilevel model or HLM makes
the assumption of dependence instead (Ciarleglio & Makuch, 2007).

Therefore, to detect the dependence assumption, the degree of data dependence was
checked through the intraclass correlation coefficient (ICC) (Warne et al., 2012). ICC is defined
as the percentage of variance explained by clusters, and it ranges from 0 to 1, where the
number of ‘0’ reflects perfect independence of subjects and the number ‘1’ means that all
subjects are the same (Warne et al., 2012). Thus the ICC value was analyzed and reported in
Chapter 4.

The ICC formula is presented in many scholarly publications such as Raudenbush and
Bryk (2002) and Warne et al. (2012) as shown below:

\[
\text{ICC} \text{ or } \hat{\rho} = \frac{\tau_{00}}{\tau_{00} + \sigma^2}
\]

where \( \tau_{00} \) is the variance between level-2 units, and \( \sigma^2 \) is the variance within level-1
units.

**Measurement Model Analysis**

Confirmatory factor analysis (CFA) is presented as a measurement model which can be
used to examine the latent structure of an instrument or questionnaire (Brown, 2006). The
latent variable or construct refers to something that we want to measure but cannot do so
directly; thus, it is indirectly measured through observed variables such as questionnaire items
(Etchegaray & Fischer, 2010). Conducting CFA assists verification of the number of factors and
factor loadings of this study. With CFA, the method effects such as common method bias are
specified and adjusted so that they are a part of the measurement error; thus, the model fit of
CFA can verify that the constructs are appropriate (Brown, 2006). In this study, the fit criteria
presenting the good fit included five indices: (1) the ratio of chi-square to degree of freedom,
(2) comparative fit index (CFI), (3) goodness of fit (GFI), (4) root-mean-square error of
approximation (RMSEA), and (5) standardized root mean square residual (SRMR). Table 11
provides the criteria of CFA model fit and the acceptable levels put forward by Kline (2005) and
the good levels by Hu and Bentler (1999).
Table 1

**Model Fit Criteria of the CFA Model**

<table>
<thead>
<tr>
<th>Model fit criteria</th>
<th>Acceptable level</th>
<th>Good level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio of Chi-square ($\chi^2$)/degree of freedom (df)</td>
<td>&lt; 3.0</td>
<td>-</td>
</tr>
<tr>
<td>Comparative fit index (CFI)</td>
<td>&gt; .90</td>
<td>&gt; .95</td>
</tr>
<tr>
<td>Goodness-of-fit (GFI)</td>
<td>&gt; .90</td>
<td>&gt; .95</td>
</tr>
<tr>
<td>Root-mean-square error of approximation (RMSEA)</td>
<td>&lt; .07</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Standardized root mean square residual (SRMR)</td>
<td>&lt; .08</td>
<td>&lt; .05</td>
</tr>
</tbody>
</table>

*Note.* Chi-square is the statistical test of significance for testing the theoretical model. The acceptable and good levels are from Kline (2005) and Hu and Bentler (1999).

**Initial Measurement Model**

In this study, the initial CFA model included four constructs of the substantive predictors: the construct of perceived usefulness (PU), the construct of perceived ease (PE), the construct of social influence (SI), and the construct of facilitating conditions (FC) to examine the model fit. Each of them was constructed from observed variables or the questionnaire items as the indicators of the particular construct. The initial measurement model of this study began with a basic form with factor correlations but no error terms. The PU construct was created from the four items of PU1, PU2, PU3, and PU4 (see Table 7 above). The PE construct was created from the four items of PE1, PE2, PE3, and PE4 (see Table 8 above). The SI construct was created from the four items of SI1, SI2, SI3, and SI4 (see Table 9 above). The FC construct was created from the four items of FC1, FC2, FC3, and FC4 (see Table 10 above). Figure 7 illustrates the initial model of this study. The fit indices of the initial model were reported in Chapter 4.
Revised Measurement Model

As some of the fit indices of the initial measurement model provided a moderate level of model fit, the initial measurement model would be revised to improve the model fit. The SI4 and FC3 items were dropped off from the initial measurement model because their standardized factor loadings were lower than an acceptable level. Hair et al. (2010) suggested that the variables with factor loadings of less than the acceptable level of .60 should be eliminated. In fact, a standardized factor loading between .60 and .70 is acceptable (Hair, Anderson, Tatham, and Black, 2010). Etchegaray and Fischer (2010) also stated that a reasonable rule of thumb is that a researcher may use four or five items for a construct and then narrow them down to less items based on pilot testing. Figure 8 illustrates the revised
measurement model of this study. The fit indices of the revised measurement model were reported in Chapter 4.

According to Brown (2006), the result of CFA good fit can also be taken as evidence of convergent and discriminant validity of constructs. However, to confirm the reliability and validity of the substantive factors, the composite reliability, convergent validity, and discriminant validity were analyzed as well. Bagozzi (1978) suggested that finding a significant degree of discriminant validity be done before introducing a method factor.

Controlling for Common Method Variance Bias

Much of recent research (e.g., Bagozzi, 1990; Lindell & Whitney, 2001; Podsakoff et al., 2003; Reio, 2010; Widaman, 1985) have concerned about and pointed out the threat of
common method variance (CMV) bias on research results and theory building. Lindell and Whitney (2001) asserted that when respondents were asked to report their behavior and provided rating of characteristics relate to their behavior, it was possible that method variance might inflate the observed correlations of the variables the researcher was focusing on. Similarly, Reio (2010) stated that CMV may deflate or inflate the correlations among research variables. However, there has been the argument between using same measurement methods and different measurement methods for the constructs. Both same and different measurement methods may lead to different types of errors. While using same measurement methods may result in overestimation on relationships of variables, using different measurement methods may result in underestimation on relationships of variables (Conway & Lance, 2010).

One of the first attempt regarding the approaches to controlling the common method bias in this study was to follow the suggestions by Podsakoff et al. (2003) and Reio (2010), which are to state ‘your answers are confidential and there are no right or wrong answers,’ to allow the respondents to be comfortable and answer honestly, to avoid ambiguous wordings, and to use simple and brief words. It has been used in many studies such as Williams, Pillai, Lowe, Jung, and Herst (2009) and Yang and Mossholder (2009).

While much empirical research with cross-sectional collection provided evidences that the results were free of CMV at the first place, few empirical studies conceded presence of CMV (e. g., Vodosek, 2007). In Vodosek’s study (2007), to define if the results were still valid, all item loadings were examined if they were significant. Vodosek (2007, p. 366) found 47 out of 51 items were significant and concluded that the parameters were still valid although CMV was presented in the data. He stated that ‘Thus, while the fit of the model improved, indicating the
presence of a common method factor, the parameter estimates suggest that the results and conclusion are still valid. This outcome is consistent with other research on common method variance that has concluded that while method bias may be present, it may not necessarily affect results or conclusion (Crampton and Wagner, 1994; Doty and Glick, 1998; Spector and Brannick, 1995). The significant test, however, may be a function of sample size.

To determine if the presence of CMV in this study, I conducted three tests. Initially, the method variance bias can be defined by using Harman’s single-factor test as one of the widely used techniques to define the presence of CMV (Podsakoff et al., 2003; Reio, 2010). All of the observed variables (items in the initial model) were loaded into an exploratory factor analysis with selecting one factor extraction and no rotation. If this unrotated factor solution reveals that one general factor does not explain most of the shared variance among the measures, the method variance is not likely a significant problem (Podsakoff et al., 2003; Reio, 2010).

Another test that can examine presence of CMV and also control method bias was to use a single unmeasured latent method factor’ or ‘single-method-factor (Lindell & Whitney, 2001; Podsakoff et al., 2003). This technique has been adopted in many studies such as Carlson and Kacmar (2000) and was applied into this study. This test generated a CMV variable in the model. Lindell and Whitney (2001) suggested building a CMV model (a model with CMV variable) to understand the method variance problem. This similar idea was presented in Podsakoff et al. (2003). This model assumed that all manifest observed variables are contaminated by method bias (Lindell & Whitney, 2001). Because of including all measures as indicators, it is also presented as ‘a first-order factor’. This technique does not require a specific method bias; thus, the variance represents general method bias. An advantage of this
approach is that the individual method effects are not constrained. By this technique, another latent variable (e.g., named CMV) is added into the revised model and linked it to all observed variables. Figure 9 illustrates the revised measurement model with CMV variable to control common method bias.

![Figure 9. The revised model with CMV variable/ a single-method-factor approach.](image)

The third test was to test a specific source of CMV by using a social desirability as a marker variable. The marker variable technique is more advance test for controlling common method variance than the first two tests above. This technique is similar the model with the CMV variable except that it applies a specific method bias (e.g., social desirability) as a single unmeasured latent method factor. It requires that the researcher identify and measure the specific variable possible to be a source of method bias. This variable is also called a ‘marker variable’. This technique also was used in this study.
Marker variable technique. The recommended statistic for examining the method effects is CFA (Podsakoff et al., 2003; Podsakoff et al., 2012; Reio, 2010) along with the conducting of a marker variable technique (Williams et al., 2010). The marker variable can be tested if the result is contaminated by a specific type of common method bias (Williams et al., 2010). Therefore, in this study the social desirability scale was used as a marker variable to inspect the common method variance (CMV), which was extracted through conducting CFA (Reio, 2010). Like the procedure of the revised model with CMV variable presented above, the SD variable as a marker variable was loaded into the model (replace the CMV variable).

In order to create the SD construct, the 10 questionnaire items of SD1-SD10 were used as its indicators (see Appendix C). The scores of SD2, SD3, SD4, SD6, and SD7 were reversed because they are negative statements before the marker variable (SD) replaced the CMV variable. Three of the SD observed variables, however, were deleted because they provided a negative sign. Bagozzi and Yi (1990, p. 553) asserted that “If method effects yield both positive and negative loadings on the same method factor, they are typically uninterpretable. Browne (1984, p. 7) called these wastebasket parameters to indicate that they are introduced to achieve satisfactory goodness of fit but do not have a substantive interpretation...” Hence, these three observed variables were deleted. Figure 10 illustrates using the SD variable as a marker variable to control method bias.
The fit indices of the revised model both with CMV and the marker variable (SD) were reported in Chapter 4 and compared with those of the initial model (Bagozzi & Yi, 1990; Carlson & Kacmar, 2000; Widaman, 1985).

Although the researcher made efforts to control CMV at the beginning, the analyses found the presence of CMV. However, the argument by Conway and Lance (2010) pointed out that post hoc statistical control of CMV or many techniques proposed by Podsakoff et al (2003) and Lindell and Whitney’s (2001), including the statistical tests mentioned above should not be used to eliminate the CMV. They argued that those statistical approaches have been ineffective.
Testing for Construct Validation

While CMV was concerned in this current study, the statistical tests for eliminating CMV to obtain factor scores was not recommended also (Conway and Lance, 2010). Following Grice (2001)’s approach, I examined the squared multiple correlation and multiple correlation values of the observed variables in the measurement models. The procedure to make the constructs more accurate was done through considering multiple correlations. Grice (2001) suggested that low values of multiple correlations and squared multiple correlation can lead to a problem of factor-score indeterminacy. In other words, higher values of multiple correlation or squared multiple correlation suggest greater validity evidence (DiStefano, Zhu, & Mindrila, 2009). Grice (2001) also suggested examining two indeterminacy indices: (1) the multiple correlation ($\rho \leq .707$, at least 50% indeterminacy) as well as the squared multiple correlation ($\rho^2$) and (2) the minimum possible correlation between two sets of competing factor scores ($2\rho^2 -1$). The multiple correlation ($\rho$) represents the maximum degree of determinacy. The squared multiple correlation values ($\rho^2$) were directly obtained from the AMOS output; thus, the multiple correlation values ($\rho$) were simply calculated by applying square root to the squared multiple correlation. The high positive values of the second indeterminacy index ($2\rho^2 -1$) are desirable. The observed variables/items with the multiple correlations lower than .707 were deleted. Consequently, the fit indices of the model with the remaining variables/items were examined if they meet the acceptable or good levels. Furthermore, the fit criteria were compared among three measurement models: initial model, revised model, and new model with the remaining variables/items.
Retesting for CMV in the New Measurement Model

To ensure that the new model with the remaining variables/items had no longer the contamination of CMV, this model should be retested for CMV by repeating the second test for CMV. The unmeasured CMV variable was added into the new model. The fit indices were examined to check the good fit. Furthermore, all items corresponding to the CMV factor were checked if they were statistically significant. If the proposed model is not contaminated by CMV, the CMV variable should not be pervasive and all items corresponding to the CMV factor should not be statistically significant. Additionally, the multiple correlations of the items were rechecked. The multiple correlation values should not be lower than .707 (Grice, 2001).

Final Measurement Model

The new model with nine remaining variables/items was presented as a ‘final measurement model’. At this point, the final measurement could be confirmed that it was not contaminated by CMV as the CMV was already excluded. The fit indices of the final measurement model were comparatively reported in Chapter 4, including the significant p-values multiple correlations of the items. Figure 11 illustrates the final measurement model.
Figure 11. The final measurement model.

To make sure that the final measurement model was correct, the reliability and validity of the substantive constructs were presented in Chapter 4 to confirm that they all were sufficient.

**Reliability and Validity**

All of the four constructs of PU, PE, SI, and FC provided sufficiency of composite reliability, convergent validity, and discriminant validity (see Table 18-19 in Chapter 4).

Reliability is the consideration of the extent to which responses to questionnaire items are consistent, and the typical measure of internally consistency reliability is Cronbach’s alpha (Etchegaray & Fischer, 2010). Validity is the consideration as to whether the survey items measure what we want to measure; construct validity is focused on whether we are measuring what we want to measure, and it can be verified by a good fit of CFA (Etchegaray & Fischer,
The term construct validity refers to both convergent validity and discriminant validity together. “Convergent validity and discriminant validity involve the evaluation of measures against each other instead of against an external criterion.” (Kline, 2005, p. 60). DiStefano and Hess (2005) informed that CFA is a statistical method which is popularly used for providing support of construct validation.

**Composite reliability.** In a CFA model, the composite reliability can be checked through the CR value. A high value of CR shows the evidence for the existence of internal consistency. The recommended value of CR for each construct should not be lower than .50 (Hair et al., 2010). The AMOS software does not directly provide CR values; however, it can be computed by employing this formula:

\[
CR = \frac{(\text{sum of standardized loading})^2}{(\text{sum of standardized loading})^2 + \text{sum of indicator measurement error}}
\]

**Convergent validity.** Average variance extracted evaluation (AVE) are commonly reported in an assessment of measurement model or CFA model. The AMOS software does not directly provide AVE values as well; however, it can be computed by applying this formula:

\[
AVE = \frac{\text{sum of the squared standardized factor loadings}}{\text{sum of the squared standardized factor loadings} + \text{sum of indicator measurement error}}
\]

The recommended value of AVE for each construct should not be lower than .50 (Hair et al., 2010).

**Discriminant validity.** One of ways to evaluate the discriminant validity is to define if the square root of each construct’s AVE is greater than its correlation with all corresponding constructs (Fornell & Larcker, 1981). The AMOS output provides the inner-construct correlations. If the value of AVE is higher than the value of the inner-construct correlations, this
indicates good discriminant validity. Another way is to evaluate the AVE value along with the squared correlations (Hair et al., 2010).

To confirm a presence of convergent and discriminant validity and composite reliability, the average variance extracted (AVE), composite reliability (CR), and squared correlations were reported in Chapter 4. The final measurement model that provided the best of the acceptable/good levels for fit indices was selected to use for further analysis of maximum likelihood for hierarchical linear models.

**Maximum Likelihood Analysis**

The final model with confirmations of validity and reliability, including elimination of common bias would remain nine items. The factor scores of each substantive predictors (PU, PE, SI, and FC) were averaged for the further analysis (see Table 20). The five questionnaire items regarding the behavior in conducting research (see Appendix C) were summed to create the scale of behavior in conducting research (B_research) as the dependent variable.

The analysis of maximum likelihood in this study applied a Top-down technique (West et al., 2007) by first testing the full model and then testing the four competing models to examine which model is the best fit. The top-down technique was selected since the current study was supported by strong theoretical knowledge. Hox (2010) supported the top-down technique, compared to using a bottom-up technique, when studies are supported by strong theories from the literature. The scores of level-1 and level-2 predictors were centered to grand mean so that they could be compared (Raudenbush & Bryk, 2002). To compare the four models, three general criteria to evaluate the goodness of fit of the final hierarchical linear model, (1) likelihood ratio test or deviance test, (2) Akaike Information Criterion (AIC), and (3) Bayesian
Information Criterion (BIC), were measured and compared (Ciarleglio & Makuch, 2007; Guo, 2005). Lower values of AIC and BIC reflect the better fit of the model (Guo, 2005; West et al., 2007). The BIC is more conservative (West et al., 2007). The deviance is tested by using the chi-square significant test. The three criteria of all four models were reported. The four models are the following:

**Model 1: Full model.** This model fully includes all six level-1 predictors: perceived usefulness (PU), perceived ease (PE), social influence (SI), facilitating conditions (FC), teachings loads (TL), and degree level (DL), two level-2 predictors: percent of instructors holding the ranks of assistant professors, associate professors, and professor at the university (PROF) and percent of instructors holding doctoral degrees at the university (DOCT), and two cross-level interactions: PROF, moderating the PU direct effect on the behavior in conducting research (B_research), and DOCT, moderating the PE direct effect on B_research.

**Level 1:**

\[ B_{research_{ij}} = \beta_{0j} + \beta_{1j}(PU_{c_{ij}}) + \beta_{2j}(PE_{c_{ij}}) + \beta_{3j}(SI_{c_{ij}}) + \beta_{4j}(FC_{c_{ij}}) + \beta_{5j}(TL_{c_{ij}}) + \beta_{6j}(DL_{c_{ij}}) + e_{ij} \]

**Level 2:**

\[ \beta_{0j} = \gamma_{00} + U_{0j} \]

\[ \beta_{1j} = \gamma_{10} + \gamma_{11}(PROF_{c_{j}}) + U_{1j} \]

\[ \beta_{2j} = \gamma_{20} + \gamma_{21}(DOCT_{c_{j}}) + U_{2j} \]

\[ \beta_{3j} = \gamma_{30} \]

\[ \beta_{4j} = \gamma_{40} \]

\[ \beta_{5j} = \gamma_{50} \]

\[ \beta_{6j} = \gamma_{60} \]
Combined:  \[ B_{research_{ij}} = \gamma_{00} + U_{0j} + \gamma_{10}(PUc)_{ij} + \gamma_{11}(PROFc)_{ij} \times (PUc)_{ij} +
U_{1j}(PUc)_{ij} + \gamma_{20}(PEc)_{ij} + \gamma_{21}(DOCTc)_{ij} \times (PEc)_{ij} + U_{2j}(PEc)_{ij} + \gamma_{30}(Slc)_{ij} +
\gamma_{40}(FCc)_{ij} + \gamma_{50}(Tlc)_{ij} + \gamma_{60}(Dlc)_{ij} + e_{ij} \]

R command: \[ m1<-lme(B_{research} \sim PUc + PEc + Slc + FCc + TLC + Dlc + PROFc + DOCTc + (PROFc*PUc) + (DOCTc*PEc), random=\sim PUc \text{ PEc} | \text{ universityid, method='ML'} \)

**Model 2: No cross-level interactions.** This model has no cross-level interactions due to the two cross-level interactions taken out of model 1. Consequently, model 2 retains six level-1 predictors and two level-2 predictors, and the slopes of PU and PE are still allowed to be random (showing the random effects of PU and PE), including the random intercept.

**Level 1:**  \[ B_{research_{ij}} = \beta_{0j} + \beta_{1j}(PUc)_{ij} + \beta_{2j}(PEc)_{ij} + \beta_{3j}(Slc)_{ij} + \beta_{4j}(FCc)_{ij} + \beta_{5j}(TLC)_{ij} + \beta_{6j}(DLC)_{ij} + e_{ij} \]

**Level 2:**  \[ \beta_{0j} = \gamma_{00} + \gamma_{01}(PROFc)_{ij} + \gamma_{02}(DOCTc)_{ij} + U_{0j} \]
\[ \beta_{1j} = \gamma_{10} + U_{1j} \]
\[ \beta_{2j} = \gamma_{20} + U_{2j} \]
\[ \beta_{3j} = \gamma_{30} \]
\[ \beta_{4j} = \gamma_{40} \]
\[ \beta_{5j} = \gamma_{50} \]
\[ \beta_{6j} = \gamma_{60} \]

Combined:  \[ B_{research_{ij}} = \gamma_{00} + U_{0j} + \gamma_{10}(PUc)_{ij} + U_{1j}(PUc)_{ij} + \gamma_{20}(PEc)_{ij} + U_{2j}(PEc)_{ij} + \gamma_{30}(Slc)_{ij} + \gamma_{40}(FCc)_{ij} + \gamma_{50}(TLC)_{ij} + \gamma_{60}(DLC)_{ij} + \gamma_{01}(PROFc)_{ij} + \gamma_{02}(DOCTc)_{ij} + e_{ij} \]
R command: m2<- lme (B_Research ~ PUc +PEc +SIc +FCc +TLc +DLc +PROFc +DOCTc, random=˜PUc PEc | universityid, method= ‘ML’)

**Model 3: No random effect.** This model has no random effect because the random effects of PU and PE at level 2 have been partialed out of model 2. As a result, model 3 retains the intercept random only at level 2 with six fixed effects of individual predictors at level 1 and two fixed effects of university predictors.

Level 1: 
\[ B_{\text{Research}}_{ij} = \beta_0 + \beta_{1j}(PUc)_{ij} + \beta_{2j}(PEc)_{ij} + \beta_{3j}(SIc)_{ij} + \beta_{4j}(FCc)_{ij} + \beta_{5j}(TLc)_{ij} + \beta_{6j}(DLc)_{ij} + e_{ij} \]

Level 2: 
\[ \beta_{0j} = \gamma_{00} + \gamma_{01}(PROFc)_{ij} + \gamma_{02}(DOCTc)_{ij} + U_{0j} \]
\[ \beta_{1j} = \gamma_{10} \]
\[ \beta_{2j} = \gamma_{20} \]
\[ \beta_{3j} = \gamma_{30} \]
\[ \beta_{4j} = \gamma_{40} \]
\[ \beta_{5j} = \gamma_{50} \]
\[ \beta_{6j} = \gamma_{60} \]

Combined: 
\[ B_{\text{Research}}_{ij} = \gamma_{00} + U_{0j} + \gamma_{10}(PUc)_{ij} + \gamma_{10}(PEc)_{ij} + \gamma_{30}(SIc)_{ij} + \gamma_{40}(FCc)_{ij} + \gamma_{50}(TLc)_{ij} + \gamma_{60}(DLc)_{ij} + \gamma_{01}(PROFc)_{ij} + \gamma_{02}(DOCTc)_{ij} + e_{ij} \]

R command: m3<- lme (B_Research ~ PUc +PEc +SIc +FCc +TLc +DLc +PROFc +DOCTc, random=˜1 | universityid, method= ‘ML’)

**Model 4: Random intercept (Null model).** This model retains the random intercept only because all fixed effects of the predictors are partialed out of model 3. The intercept is allowed to vary across the universities.
Level 1: \[ B_{\text{Research}_ij} = \beta_{0j} + e_{ij} \]

Level 2: \[ \beta_{0j} = \gamma_{00} + U_{0j} \]

Combined: \[ B_{\text{Research}_ij} = \gamma_{00} + U_{0j} + e_{ij} \]

R command: `m4<- lme (Research ~1 |universityid, method= ‘ML’)`

**Summary**

The method chapter has presented information on the methodology of this study. The chapter discusses the following topics: research design, population, sample, and power analysis. The instrumentation sections provide readers with understanding regarding the methods that were employed for processing the data collection and data analysis. Chapter 4 presents the results of this research.
CHAPTER 4

RESULTS

The purpose of this study was to investigate the key factors, at the individual and university levels, which affect instructors’ behavior in conducting research. The current study will help explain how and why the instructors accept or refuse to conduct research and provide insight into the salient factors motivating the instructors to produce more research. The current study utilized the technology acceptance model theory 2 (TAM 2) and the unified theory of acceptance and use of technology (UTAUT) as the framework, that perceived use (PU) of conducting research, perceived ease (PE) of conducting research, social influence (SI), and facilitating conditions (FC), including teaching loads and degree level explain behavior in conducting research for instructors in the faculty of Management Science at the Rajabhat Universities, Thailand; and to test whether the percent of instructors holding academic ranks and the percent of instructors holding doctoral degrees at the university level have direct and moderating effects on the PU and PE respectively, by conducting hierarchical linear modeling (HLM).

This chapter reports the results in three sections. The prior assessment section presents the results obtained from exploring and dealing with missing values, outliers, and the assumptions important to multilevel data. As well, the demographic data are reported in this section. The next section reports the results of factor loadings, reliability and validity, and the model fit for the measurement models or CFA models. The results of the test for common method variance (CMV) are reported both before and after using the SD construct as a marker variable technique. The last section reports the results from maximum likelihood analysis with
conducting hierarchical linear modeling for the comparison of four models. The descriptive
statistics for key variables were reported before the test of hypotheses with the analysis of
maximum likelihood.

Data Screening

The initial data collected from 697 respondents were explored to detect missing values,
outliers, and normality by using AMOS 21 software. Table 12 illustrates the sources of cluster
sample; the frequency and percent of the cluster sizes from the 37 Rajabhat universities. There
were 3 responding data set containing the missingness of MNAR (Missing not at random), and
they were deleted. No other datum contained the missingness of MAR (Missing at random). As
a result, a total 694 of data sets remained. No extreme outliers were found.

Table 12

Frequency and Percent of the Cluster Sizes from 37 Institutions

<table>
<thead>
<tr>
<th>University ID</th>
<th>N= 697</th>
<th>N= 694</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>01</td>
<td>12</td>
<td>1.7</td>
</tr>
<tr>
<td>02</td>
<td>24</td>
<td>3.4</td>
</tr>
<tr>
<td>03</td>
<td>33</td>
<td>4.7</td>
</tr>
<tr>
<td>04</td>
<td>19</td>
<td>2.7</td>
</tr>
<tr>
<td>05</td>
<td>11</td>
<td>1.6</td>
</tr>
<tr>
<td>06</td>
<td>17</td>
<td>2.4</td>
</tr>
<tr>
<td>07</td>
<td>8</td>
<td>1.1</td>
</tr>
<tr>
<td>08</td>
<td>20</td>
<td>2.9</td>
</tr>
<tr>
<td>09</td>
<td>25</td>
<td>3.6</td>
</tr>
<tr>
<td>10</td>
<td>21</td>
<td>3.0</td>
</tr>
<tr>
<td>11</td>
<td>13</td>
<td>1.9</td>
</tr>
<tr>
<td>12</td>
<td>11</td>
<td>1.6</td>
</tr>
<tr>
<td>13</td>
<td>16</td>
<td>2.3</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>2.9</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
<td>2.9</td>
</tr>
<tr>
<td>16</td>
<td>10</td>
<td>1.4</td>
</tr>
<tr>
<td>17</td>
<td>19</td>
<td>2.7</td>
</tr>
<tr>
<td>18</td>
<td>38</td>
<td>5.5</td>
</tr>
</tbody>
</table>
The 694 completed surveys showed a 30% response rate from the total 2,295 surveys of the population sent out. The response rate was lower than 50% of the population; however, the data of 694 exceeded the minimum sample size that had been calculated earlier and were sufficient to gain statistical power in this study.

The exploration of demographic data revealed that the instructor respondents were 67.7% female and 32.3% male. Their average age was about 38 years. The largest proportions of the instructors were instructors who had graduated with a Master degree (84.1%), and they typically held the rank of lecturer (84.4%). The majority groups for teaching experience: 67.6% between 6 and 10 years. Table 13 presents the demographic data.
### Table 13

#### Demographic Data

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>224</td>
<td>32.3</td>
</tr>
<tr>
<td>Female</td>
<td>470</td>
<td>67.7</td>
</tr>
<tr>
<td><strong>Age (range = 22-60 years, average = 37.84/SD = 7.52)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor</td>
<td>15</td>
<td>2.2</td>
</tr>
<tr>
<td>Master</td>
<td>584</td>
<td>84.1</td>
</tr>
<tr>
<td>Doctoral</td>
<td>89</td>
<td>12.8</td>
</tr>
<tr>
<td>Postdoctoral</td>
<td>6</td>
<td>.9</td>
</tr>
<tr>
<td><strong>Rank</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecturer</td>
<td>586</td>
<td>84.4</td>
</tr>
<tr>
<td>Assistant prof</td>
<td>95</td>
<td>13.7</td>
</tr>
<tr>
<td>Associate prof</td>
<td>9</td>
<td>1.3</td>
</tr>
<tr>
<td>Professor</td>
<td>4</td>
<td>.6</td>
</tr>
<tr>
<td><strong>Teaching Loads (range = 9-34 hours/wk, average = 14.96/SD = 4.38)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Teaching experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 years</td>
<td>25</td>
<td>3.6</td>
</tr>
<tr>
<td>6-10 years</td>
<td>469</td>
<td>67.6</td>
</tr>
<tr>
<td>Time Category</td>
<td>Count</td>
<td>Average Time (hours/week)</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>11-15 years</td>
<td>86</td>
<td>12.4</td>
</tr>
<tr>
<td>More than 15 years</td>
<td>114</td>
<td>16.4</td>
</tr>
</tbody>
</table>

**Average time for research**

<table>
<thead>
<tr>
<th>Time Category</th>
<th>Count</th>
<th>Average Time (hours/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 9 hours/week</td>
<td>568</td>
<td>81.8</td>
</tr>
<tr>
<td>9-15 hours/week</td>
<td>108</td>
<td>15.6</td>
</tr>
<tr>
<td>16-21 hours/week</td>
<td>16</td>
<td>2.3</td>
</tr>
<tr>
<td>More than 21 hours/week</td>
<td>2</td>
<td>0.3</td>
</tr>
</tbody>
</table>

The assumption of normality was inspected from p-p plots and the values of skewness and kurtosis. Ryu (2011) suggested that skewness not be more than 2 and that kurtosis not be more than 7, based on normal theory. The results show that there were no violations of the normality assumption for key variables. The descriptive statistics for key variables were presented in Table 20. The assumption of dependency was checked through ICC. The SPSS output resulting from using a syntax command provided the values of $\tau_{00}$ and $\sigma^2$ for the random intercept model. The obtained ICC value indicated that 2% of the variance of the dependent variable could be explained by university. However, the ICC value can reflect only the variation in intercepts but not the variation in slopes (Roberts, 2007). The assumption of dependency exists.

\[
\text{ICC or } \hat{\rho} = \frac{\tau_{00}}{\tau_{00} + \sigma^2} = \frac{.46}{.46 + 23.7} = .02
\]

\[
\text{ICC or } \hat{\rho} = \frac{.46}{24.16} = .02
\]

\[
\text{ICC or } \hat{\rho} = 2\%
\]
The ICC was low as the value of the variance between level-2 units ($\tau_{00}$) was limited at the highest value of 37 universities (level-2 units or $j$). For the current study, it focused on all instructors in the faculty of Management Science of all Rajabhat Universities. This resulted in a total of 37 universities for the current study.

In addition to ICC, the design effect (DEFF; Snijders & Bosker, 2012) measures the difference in standard errors indicating whether or not the complex sampling design is equal to a simple random sample. The DEFF of this study is:

\[
\text{DEFF} = 1 + (n-1)\times ICC
\]

\[
\text{DEFF} = 1 + (694/37)\times0.02
\]

\[
\text{DEFF} = 1 + (18.8\times0.02)
\]

\[
\text{DEFF} = 1.38
\]

Some scholars have provided different cutout values of DEFF. This study followed Stapleton and Thomas (2008); when the DEFF value is larger than 1, it means that using multilevel analysis would be acceptable.

**Assessment of the Measurement Model**

Initially, the four constructs of the independent variables, perceived usefulness (PU), perceived ease (PE), social influence (SI), and facilitating (FC), were set to conduct CFA with AMOS 21 (see Figure 7 above).

**Initial Measurement Model**

**Factor loadings.** In initial measurement model, the PU construct was created from the four items of perceived usefulness (PU1-PU4). The PE construct was created from the four items of perceived ease (PE1-PE4). The SI construct was created from the four items of social
influence (SI1-SI4). The FC construct was created from the four items of facilitating conditions (FC1-FC4). The findings found that the initial measurement model included lower factor loadings than an acceptable level. In fact, the factor loadings of SI4 and FC3 were less than .60 (.58 and -.09, respectively). The negative sign of FC3 is consistent with the negative statement. Reversing the score of FC3 to be positive did not change its factor loading value. The standardized factor loadings of the initial measurement model were presented in Table 14.

**Model fit.** The fit indices of the initial measurement model provided poor fit ($\chi^2$/df = 8.760, CFI = .871, GFI = .857, RMSEA = .106, and SRMR = .081). The initial measurement model was revised and presented as the revised measurement model.

**Revised Measurement Model**

**Factor loadings.** As the standardized factor loadings of lower than .60 should be eliminated (Hair et al., 2010), the revised measurement model was to drop off the two observed variables (SI4 and FC3) that provided lower factor loadings than an acceptable level (.60). Thus, in the revised measurement model, the SI construct contained three items of social influence (SI1, SI2, and SI3), and the FC construct included three items of facilitating conditions (FC1, FC2, and FC4). After the elimination of SI4 and FC3, the standardized factor loadings were ranged from .62 to .91 (Table 14 below). Additionally, the modification indices (MI) provided by the AMOS program suggested two correlations of error terms: PU2-PU3 and PE2-PE3 as they have a similarity of wordings (see Appendix).

**Model fit.** The fit indices of the revised model were improved ($\chi^2$/df = 4.986, CFI = .948, GFI = .933, RMSEA = .076, and SRMR = .067). The results indicated moderate fit of the revised model.
Table 14

Factor Loadings of the Initial and Revised Measurement Models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor loadings</th>
<th>Initial</th>
<th>Revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU1</td>
<td>.84</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>PU2</td>
<td>.69</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>PU3</td>
<td>.90</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>PU4</td>
<td>.78</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>Perceived Ease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE1</td>
<td>.65</td>
<td>.65</td>
<td></td>
</tr>
<tr>
<td>PE2</td>
<td>.72</td>
<td>.72</td>
<td></td>
</tr>
<tr>
<td>PE3</td>
<td>.84</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>PE4</td>
<td>.77</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Social Influence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI1</td>
<td>.88</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>SI2</td>
<td>.89</td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>SI3</td>
<td>.67</td>
<td>.62</td>
<td></td>
</tr>
<tr>
<td>SI4</td>
<td>.58</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC1</td>
<td>.85</td>
<td>.84</td>
<td></td>
</tr>
<tr>
<td>FC2</td>
<td>.67</td>
<td>.67</td>
<td></td>
</tr>
<tr>
<td>FC3</td>
<td>-.09</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>FC4</td>
<td>.71</td>
<td>.71</td>
<td></td>
</tr>
</tbody>
</table>

Tests for Common Method Bias

Most of the studies with survey methodology, however, consider an effect of common method bias or CMV (e.g., Gorrell, Ford, Madden, Holdridge, & Eaglestone, 2011; Rijn, Yang, & Sanders, 2013; Vodosek, 2007). The cross-sectional data collection made the results vulnerable to CMV (Rijn, Yang, & Sanders, 2013) as using a same way to measure different variables can make their relationships carry CMV (Conway & Lance, 2010; Gorrell et al., 2011; Podsakoff et al., 2003; Vodosek, 2007). CMV may inflate interrelationships among observed variables and when the CMV remedies were applied, the relationships of the constructs were altered...
(Johnson, Rosen, & Djurdjevic, 2011). Furthermore, uniformly high values of Cronbach’s alpha can be function of CMV (Gorrell et al., 2011). To determine the presence of CMV in this study, I conducted three tests.

The initial test was a Harman’s single-factor test (Podsakoff et al., 2003; Reio, 2010). All manifest observed variables in the revised model were loaded into an exploratory factor analysis with an unrotated factor solution. If the extracted variance does not present a single major factor, the method variance is not likely a significant problem (Carlson & Kacmar, 2000; Podsakoff et al., 2003; Reio, 2010). Indeed, if it accounts for 20%-25% of total variance, CMV should not be a great concern (Tansky & Cohen, 2001). The result found that the first factor accounted for 37% of variance. This suggested a presence of CMV; however, Gorrell et al. (2011) argued that this approach should not be used because if a single or general factor model conducted back to CFA provides a good fit for the data. This issue was not relevant to the presence of CMV.

**Revised model with adding a CMV variable.** The approach with adding CMV variable was known as a single unmeasured latent method factor’ or ‘single-method-factor (Lindell & Whitney, 2001; Podsakoff et al., 2003). This technique has been adopted in many studies such as Carlson and Kacmar (2000). Johnson, Rosen, and Djurdjevic (2011) expressed that with common statistical remedies, if CMV does not play a significant role, model parameters such as loadings will have minimal changes. Also, the unmeasured CMV variable should not be presenting as a pervasive factor (all observed variables significantly correlated with the unmeasured CMV variable) (Gorrell et al., 2011). Figure 12 below presents a comparison of the model parameters before and after adding the unmeasured CMV variable.
Figure 12. Comparing parameters from the revised model before and after adding CMV variable. Values outside parentheses are from the revised model. Values inside parentheses are from the model after adding CMV.

According to the Figure 12, changes of the factor loadings and the correlations were obvious. The results of the model with CMV indicated significantly improved fit ($\chi^2/df = 2.762$, CFI = .982, GFI = .970, RMSEA = .050, and SRMR = .029). Thus, this suggested that CMV was presented in the data. A supportive evidence for the presence of CMV in this study was that the unmeasured CMV variable presenting as a pervasive factor (all 14 observed variables/items significantly correlated with the unmeasured CMV variable at $p < .001$) (Gorrell et al., 2011).

Comparing with the original revised model, the fit indices of the revised model with CMV notably improved. The $\chi^2/df$ changed from 4.986 to 2.762. The difference of the chi-square before and after adding CMV factor was notable. However, the chi-square statistic
significant is sensitive to large sample size (e.g., more than 500); as a result, a trial change can result of chi-square significant (Weston & Gore, 2006). The CFI increased from .948 to .982. The GFI improved from .933 to .970. The CFI and GFI statistic tests directly refer to how well the model fits the observed data (Weston & Gore, 2006). The original revised model achieved the acceptable level while the revised model with CMV achieved the good level. The RMSEA and SRMR related to the error of the model and they decreased from .076 to .050 and from .067 to .029 respectively. Therefore, the results indicated that the model fit indices of the original revised model were sensitive to general common method bias.

**Revised model with marker variable (SD).** Due to the fact that the second test is for general CMV bias, I conducted a marker variable technique as the third test to check a specific source of CMV (Podsakoff et al., 2003). A social desirability (SD) was assumed that it may be a potential bias due to nature of question items. As explained in Chapter 3, the procedure for this technique was similar to that of the CMV model except that the CMV variable was replaced by the social desirability (SD) as marker variable. The SD construct was built from 10 observed variables as mentioned in Chapter 3. However, the SD2 (rev), SD6 (rev), and SD7 (rev) presented a negative sign. Thus, they were deleted as they could not be interpreted.

The fit indices of the revised model with SD were: $x^2/df = 3.46$, CFI = .928, GFI = .926, RMSEA = .060, and SRMR = .050. These findings implied the results in this study might be limited by social desirability; however, the social desirability was not a potential source of bias in this study.

Table 15 presents the fit indices of three measurement models: the (original) revised model, the revised model with CMV, and the revised model with SD as a marker variable.
Table 15

*Goodness of Fit of the Revised Measurement Models with Bias Testing*

<table>
<thead>
<tr>
<th>Goodness-of-fit criteria</th>
<th>Acceptable/Good value</th>
<th>Revised Model</th>
<th>Revised model with CMV</th>
<th>Revised model with marker variable (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$/df</td>
<td>&lt;3.00 / -</td>
<td>4.986</td>
<td>2.762</td>
<td>3.460</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt;.90 /.95</td>
<td>.948</td>
<td>.982</td>
<td>.928</td>
</tr>
<tr>
<td>GFI</td>
<td>&gt;.90 /.95</td>
<td>.933</td>
<td>.970</td>
<td>.926</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;.07 /.05</td>
<td>.076</td>
<td>.050</td>
<td>.060</td>
</tr>
<tr>
<td>SRMR</td>
<td>&lt;.08 /.05</td>
<td>.067</td>
<td>.029</td>
<td>.050</td>
</tr>
</tbody>
</table>

The results showed that the revised model with CMV provided the best fit; therefore, it was accepted that there was a presence of general common bias in this study.

**Final Measurement Model**

The CMV was concerned in the measurement model. Grice (2010)'s approach suggested determining the problematic variables by examining the multiple correlation values. Consequently, the (original) revised model was examined. Although the AMOS output does not directly provide multiple correlation values ($\rho$), it provides squared multiple correlation values ($\rho^2$) instead. Therefore, these correlations were shown below:
Table 16

*Squared Multiple Correlation (\(\rho^2\)) and Multiple Correlation (\(\rho\)) from the Revised Measurement Model*

<table>
<thead>
<tr>
<th>Factor</th>
<th>Observed Variable (Item)</th>
<th>(\rho^2)</th>
<th>(\rho)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td>PU1</td>
<td>.734</td>
<td>.857</td>
</tr>
<tr>
<td></td>
<td>PU2</td>
<td>.427</td>
<td>.653</td>
</tr>
<tr>
<td></td>
<td>PU3</td>
<td>.775</td>
<td>.880</td>
</tr>
<tr>
<td></td>
<td>PU4</td>
<td>.633</td>
<td>.796</td>
</tr>
<tr>
<td>Perceived ease</td>
<td>PE1</td>
<td>.483</td>
<td>.695</td>
</tr>
<tr>
<td></td>
<td>PE2</td>
<td>.360</td>
<td>.600</td>
</tr>
<tr>
<td></td>
<td>PE3</td>
<td>.557</td>
<td>.746</td>
</tr>
<tr>
<td></td>
<td>PE4</td>
<td>.678</td>
<td>.823</td>
</tr>
<tr>
<td>Social influence</td>
<td>SI1</td>
<td>.831</td>
<td>.912</td>
</tr>
<tr>
<td></td>
<td>SI2</td>
<td>.814</td>
<td>.902</td>
</tr>
<tr>
<td></td>
<td>SI3</td>
<td>.383</td>
<td>.619</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>FC1</td>
<td>.712</td>
<td>.844</td>
</tr>
<tr>
<td></td>
<td>FC2</td>
<td>.452</td>
<td>.672</td>
</tr>
<tr>
<td></td>
<td>FC4</td>
<td>.508</td>
<td>.713</td>
</tr>
</tbody>
</table>

*Note.* The underlined values were particularly problematic as they showed at least 50% indeterminacy.

Although the approach of examining squared multiple correlations and multiple correlations by Grice (2001) did not provide a direct way to eliminate CMV, it obviously resulted in minimization of CMV and led to higher validation of the constructs. The problematic variables/items (PU2, PE1, PE2, SI3, and FC2) were deleted; as a result, the model remained nine variables. The result of the fit indices for the final measurement model showed in Table 17. The regression weights of all nine manifest observed variables/items in the model were statistically significant at \(p < .001\). All nine-factor loadings were higher than .60 (Hair et al., 2010). Additionally, the multiple correlations of the remaining nine variables exceeded .70. The new model with remaining nine variables was presented as ‘final measurement model’.
Table 17

Comparing the Fit Indices between the Revised and Final Measurement Models

<table>
<thead>
<tr>
<th>Goodness-of-fit criteria</th>
<th>Acceptable/ Good value</th>
<th>Revised</th>
<th>Final (nine variables)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$/df</td>
<td>&lt; 3.00 / -</td>
<td>4.986</td>
<td>2.337</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt;.90 / .95</td>
<td>.948</td>
<td>.991</td>
</tr>
<tr>
<td>GFI</td>
<td>&gt;.90 / .95</td>
<td>.933</td>
<td>.985</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt;.07 / .05</td>
<td>.076</td>
<td>.044</td>
</tr>
<tr>
<td>SRMR</td>
<td>&lt;.08 / .05</td>
<td>.067</td>
<td>.027</td>
</tr>
</tbody>
</table>

Retesting for CMV. The test for CMV was repeated to confirm that there was no longer a contamination of CMV. The fit indices were compared between before and after adding an unmeasured CMV variable. When adding the unmeasured latent CMV variable into the final model, the fit indices seems to be improved ($\chi^2$/df = 1.526, CFI = .998, GFI = .994, RMSEA = .028, and SRMR = (N/A); however, the SRMR could not be calculated and the summary model output stated that the model included negative error variance of PE4. Moreover, the CMV factor was not pervasive as all items corresponding to the CMV factor were not statistically significant at the $p$ values ranged from .556 to .658. Therefore, these evidences suggested this CMV model was incorrect. The findings found that there was no proof of the CMV presence in the final measurement model; therefore, CMV was no longer concerned. Conway and Lance (2010) suggested researchers as well as reviewers focus on providing reasonable evidences for construct validity regarding CMV. Therefore, to confirm the reliability and validity of the final model, the AVE, and CR values of the factors should be sufficient.
Reliability and Validity

**Composite reliability.** The composite reliability (CR) can be calculated from the formula presented in Chapter 3 above. Hair et al. (2010) recommended that in order to indicate the presence of composite reliability, the CR value should higher than .50. The CR values obtained for the constructs in this study were higher than .50. Thus, the constructed that were analyzed in this study provided a good level for composite reliability; ranged between .79-.91 (see Table 18).

**Construct reliability.** To maintain compatibility with the original prior research of TAM and UTAUT regarding reliability, The Cronbach’s alpha values were reported in Table 18. Both CR and Cronbach’s alpha provided confirmation for construct reliability except that they applied different estimation. The CR is computed based on the standardized factor loadings while the Cronbach’s alpha weights equally for every item in the composite load. The Cronbach’s alpha values of the constructs in this study ranged from .78-.91 (see Table 18). Therefore, the reliability of the constructs was achieved.

**Convergent validity.** The convergent validity can be checked through the average variance extracted (AVE). The calculation of AVE values is by applying the formula presented in Chapter 3. To achieve an acceptable level of convergent validity, The AVE should not less than .50 (Hair et al., 2010). The AVE results for the constructs in this study provided sufficient convergent validity; ranged between .66-.83 (see Table 18).

**Discriminant validity.** To indicate that discriminant validity is acceptable, the AVE value of each construct should more than the value of the squared (inner-construct) correlations. The discriminant validity evaluation in this study showed that the square correlations between
factors were lower than the obtained AVE values. Therefore, the results indicate a sufficient presence of the discriminant validity. Table 19 presents the discriminant validity of the measurement model.

Table 18

*Factor Loadings, Reliability, and Validity of the Final Measurement Model*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor Loadings</th>
<th>Sq multiple correlations</th>
<th>AVE</th>
<th>CR</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td></td>
<td></td>
<td>.71</td>
<td>.88</td>
<td>.88</td>
</tr>
<tr>
<td>PU1</td>
<td>.858</td>
<td>.736</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU3</td>
<td>.880</td>
<td>.775</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU4</td>
<td>.794</td>
<td>.631</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Ease</td>
<td></td>
<td>.67</td>
<td>.80</td>
<td>.80</td>
<td></td>
</tr>
<tr>
<td>PE3</td>
<td>.762</td>
<td>.581</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE4</td>
<td>.866</td>
<td>.750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Influence</td>
<td></td>
<td>.83</td>
<td>.91</td>
<td>.91</td>
<td></td>
</tr>
<tr>
<td>SI1</td>
<td>.906</td>
<td>.821</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SI2</td>
<td>.916</td>
<td>.840</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td></td>
<td>.66</td>
<td>.79</td>
<td>.78</td>
<td></td>
</tr>
<tr>
<td>FC1</td>
<td>.915</td>
<td>.837</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FC4</td>
<td>.699</td>
<td>.489</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 19

*Average Variance Extracted and Discriminant Validity for the Final Measurement Model*

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td>.71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived ease</td>
<td>.14</td>
<td>.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social influence</td>
<td>.10</td>
<td>.19</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>.10</td>
<td>.30</td>
<td>.38</td>
<td>.66</td>
</tr>
</tbody>
</table>

*Note.* Diagonal elements are the average variance extracted. Off diagonal elements are the squared correlations between factors.
Hierarchical Linear Modeling and Hypothesis Testing

The four constructs with the confirmations of composited reliability, construct reliability, convergent validity, and discriminant validity obtained from the assessment of the measurement model were used for the hypothesis testing, including the other predictors in this study. The hypotheses regarding the six individual-level predictors and two university-level predictors were tested through hierarchical linear modeling using R software with a top-down technique resulting in a total of four models that were tested. Residual Maximum Likelihood or Restricted Maximum Likelihood (REML) estimators were used, producing unbiased estimations. The three criteria (AIC, BIC, and Deviance test) for comparing the four hierarchical linear modeling (HLM) models were presented in Chapter 3. Table 20 illustrates the descriptive statistics for key variables.

Descriptive Statistics for Key Variables

The behavior in conducting research as the dependent variable was scaled by summing the scores from five items (see Appendix C). At the individual level there were six predictors: perceived usefulness (PU), perceived ease (PE), social influence (SI), facilitating conditions (FC), teaching loads (TL), and degree level (DL). The first four predictors were the scores from the final model with the best fit. Teaching loads (TL) and degree level (DL) were the scores from the demographic section. At the university level, there were two predictors: the percent of instructors holding academic ranks at the university (PROF) and the percent of instructors holding doctoral degrees at the university (DOCT). The assumption of normality was met. There was no violation of normality on skewness and kurtosis.
Table 20

Descriptive Statistics for Key Variables (N=694)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>SD</th>
<th>Skewness</th>
<th>SE</th>
<th>Kurtosis</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B_research</td>
<td>0.00</td>
<td>28</td>
<td>4.28</td>
<td>4.91</td>
<td>1.91</td>
<td>.09</td>
<td>4.14</td>
<td>.18</td>
</tr>
<tr>
<td><strong>Independent variables (Level 1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>1.00</td>
<td>6.00</td>
<td>4.47</td>
<td>1.01</td>
<td>-.56</td>
<td>.09</td>
<td>.14</td>
<td>.18</td>
</tr>
<tr>
<td>PE</td>
<td>1.00</td>
<td>6.00</td>
<td>3.42</td>
<td>1.10</td>
<td>-.01</td>
<td>.09</td>
<td>-.18</td>
<td>.18</td>
</tr>
<tr>
<td>SI</td>
<td>1.00</td>
<td>6.00</td>
<td>4.00</td>
<td>1.03</td>
<td>-.27</td>
<td>.09</td>
<td>-.01</td>
<td>.18</td>
</tr>
<tr>
<td>FC</td>
<td>1.00</td>
<td>6.00</td>
<td>3.59</td>
<td>.93</td>
<td>-.08</td>
<td>.09</td>
<td>.17</td>
<td>.18</td>
</tr>
<tr>
<td>TL</td>
<td>9.00</td>
<td>34.00</td>
<td>14.96</td>
<td>4.38</td>
<td>1.21</td>
<td>.09</td>
<td>1.79</td>
<td>.18</td>
</tr>
<tr>
<td>DL*</td>
<td>1.00</td>
<td>4.00</td>
<td>2.00</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Independent variables (Level 2)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF</td>
<td>3.96</td>
<td>100.00</td>
<td>39.45</td>
<td>28.09</td>
<td>1.31</td>
<td>.09</td>
<td>.43</td>
<td>.18</td>
</tr>
<tr>
<td>DOCT</td>
<td>5.45</td>
<td>26.79</td>
<td>14.65</td>
<td>5.01</td>
<td>.65</td>
<td>.09</td>
<td>-.44</td>
<td>.18</td>
</tr>
</tbody>
</table>

*Note. B_research = behavior in conducting research, PU= perceived usefulness, PE= perceived ease, SI= social influence, FC = facilitating conditions, TL=teaching loads, DL=degree level, PROF = percent of instructors holding academic ranks at the university level, DOCT= percent of instructors holding doctoral degrees at the university level. DL* is analyzed as a categorical variable; thus, the number of mode (2) was used instead of that of the mean. All predictors were grand mean centered before testing. Although centering is not suggested for use for a categorical variable, the large proportion of the respondents held Master degrees (84.3%). Therefore, centering the degree level at 2 (Master degree) made interpretation appropriate. Table 21 presents the comparison of the four hierarchical linear modeling models.*
### Table 21

**Comparison of Hierarchical Linear Modeling Models**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed Effect</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>4.12(.21)</td>
<td>4.16(.21)</td>
<td>4.16(.22)</td>
<td>4.33(.22)</td>
</tr>
<tr>
<td>PU</td>
<td>.75(.37)</td>
<td>.74(.37)</td>
<td>.79(.29)</td>
<td>-</td>
</tr>
<tr>
<td>PE</td>
<td>.73(.25)</td>
<td>.72(.25)</td>
<td>.63(.19)</td>
<td>-</td>
</tr>
<tr>
<td>SI</td>
<td>1.39(.22)</td>
<td>1.39(.23)</td>
<td>1.67(.23)</td>
<td>-</td>
</tr>
<tr>
<td>FC</td>
<td>2.76(.27)</td>
<td>2.76(.27)</td>
<td>2.98(.27)</td>
<td>-</td>
</tr>
<tr>
<td>TL</td>
<td>-.04(.03)</td>
<td>-.05(.03)</td>
<td>-.06(.03)</td>
<td>-</td>
</tr>
<tr>
<td>DL</td>
<td>1.84(.33)</td>
<td>1.84(.33)</td>
<td>2.02(.34)</td>
<td>-</td>
</tr>
<tr>
<td>PROF</td>
<td>.01(.00)</td>
<td>.01(.01)</td>
<td>.01(.01)</td>
<td>-</td>
</tr>
<tr>
<td>DOCT</td>
<td>-.03(.04)</td>
<td>-.03(.04)</td>
<td>-.03(.04)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Random Component</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.81</td>
<td>.84</td>
<td>.96</td>
<td>.46</td>
</tr>
<tr>
<td>(\tau_{PU})</td>
<td>1.75</td>
<td>1.75</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(\tau_{PE})</td>
<td>.93</td>
<td>.87</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(\sigma^2)</td>
<td>12.32</td>
<td>12.31</td>
<td>12.83</td>
<td>23.73</td>
</tr>
<tr>
<td><strong>Cross-level Interaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF*PU</td>
<td>-.01(.01)</td>
<td>-.32</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DOCT*PE</td>
<td>.02(.04)</td>
<td>.56*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Criteria fit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIC</td>
<td>3787.2</td>
<td>3783.9</td>
<td>3784.1</td>
<td>4183.3</td>
</tr>
<tr>
<td>BIC</td>
<td>3869.0</td>
<td>3856.6</td>
<td>3834.1</td>
<td>4197.0</td>
</tr>
<tr>
<td>LogLik</td>
<td>-1875.6</td>
<td>-1875.9</td>
<td>-1881.1</td>
<td>-2088.7</td>
</tr>
</tbody>
</table>

*Note. Note that all predictors were grand mean centered before conducting HLM. Model 1 is full model. Model 2 is no cross-level interactions. Model 3 is no random effect. Model 4 or the null model is random intercept. The estimate method is REML. *p < .05. **p < .01. ***p < .001.*
Comparison for Selected Model

As mentioned in Chapter 3, three best-fit estimators (AIC, BIC, and Deviance test) were compared among four models and the lower values would be preferred:

**AIC.** The results showed that the best fit based on the lowest value of the AIC criterion (3783.9) was model 2, according to Table 21.

**BIC.** The results showed that the best fit based on the lowest value of BIC criterion (3834.1) was model 3. McCoach and Black (2008) provided comparative categories for the differences in BIC values ($\Delta \text{BIC}$) as shown below:

- $\Delta \text{BIC} = 0-2$ weak evidence
- $\Delta \text{BIC} = 2-6$ positive evidence
- $\Delta \text{BIC} = 6-10$ strong evidence
- $\Delta \text{BIC} = >10$ very strong evidence

Thus, comparisons between models in the BIC difference can confirm which model has stronger evidence.

Model 2-model 1, $\Delta \text{BIC} = 3856.60-3869.00 = -12.40$ (model 2 better than model 1)
Model 3-model 2, $\Delta \text{BIC} = 3834.10-3856.60 = -22.50$ (model 3 better than model 2)
Model 4-model 3, $\Delta \text{BIC} = 4197.00-3834.10 = 362.90$ (model 3 better than model 4)
Model 3-model 1, $\Delta \text{BIC} = 3834.10-3869.00 = -34.90$ (model 3 better than model 1)

Based on the BIC criteria, model 3 was supported and identified as being the best-fitting model resulting in model 3 providing very strong evidence compared to models 1, 2, and 4.

**Deviance test.** The deviance is tested using the chi-square significant test. The difference of (-2 times) the LogLiklihood value (-2*ll) is equal to the difference in chi-square
\( \Delta x^2 \); see Table 21). The critical values were obtained from a chi-square distribution table and are provided below:

- Model 2-model 1, \( \Delta x^2 = .64, \Delta df=2 \) ---> Critical value = 5.991, at \( p = .05 \)
- Model 3-model 2, \( \Delta x^2 = 10.26, \Delta df=5 \) ---> Critical value = 11.070, at \( p = .05 \)
- Model 4-model 3, \( \Delta x^2 = 415.19, \Delta df=8 \) ---> Critical value = 15.507, at \( p = .05 \)
- Model 3-model 1, \( \Delta x^2 = 11.00, \Delta df=7 \) ---> Critical value = 14.067, at \( p = .05 \)

Based on AIC, model 2 was chosen while based on BIC and deviance test, model 3 was selected. When compared with the AIC, the BIC is more conservative as it applies a larger penalty on models with more parameters (West, Welch, & Galecki, 2007).

Therefore, model 3 was selected as the best model for the data, and that was appropriate to use for the further analysis in this study.

The hypothesis testing was performed based on model 3. As described in Chapter 3, model 3 was the model that excluded the two cross-level interactions and two random effects of the PU and PE variables. It simply included eight fixed direct effects of six individual-level predictors (PU, PE, SI, FC, TL, and DL) and two university-level predictors (PROF and DOCT). All predictors were grand mean centered. The decomposed equation of model 3 (no random effects) is:

\[
B_{research} = 4.16 + .79PUc + .63PEc + 1.67Sic + 2.98FCc + (-.06)TLc + 2.02Dlc + .01PROFc + (-.03)DOCTc
\]

Residual (\( e_{ij} \)) = 12.83,

Intercept variance (\( U_{0j} \)) = .96
Hypothesis Testing Based on the Selected Model (Model 3)

The $p$-significance for t-value of the coefficients both the intercept and slopes (fixed effects) were tested. In this study, there are two levels for hypotheses in this study. The hypotheses 1, 2, and 3 assumed the results at the university level. The hypotheses 4-9 assumed the results at the individual levels. In addition, the hypotheses 4a-b and 5a-b assumed the explanation for the variation among the Rajabhat Universities. However, note that the hypotheses 4a, 4b, 5a, and 5b were not part of the selected model 3. Therefore, these four hypotheses were rejected as well (see Table 21).

Hypothesis 1: Behavior in conducting research will vary among the universities.

There was not a statistically significant difference among the university means; the intercept variance was equal to .96, $p = .06$. Hypothesis 1 was not supported. The results revealed that the behavior in conducting research of the Management Science instructors based on the research forms mentioned in this study (see Table 6 above and Appendix C) was not different among the Rajabhat Universities. The intercept variance was not significant; however, the individual variance was statistically significant (12.83, $p < .001$). The fixed intercept was statistically significant; $\beta = .4.16$, $p < .001$. The results found that there was difference among the individual level, not university level.

Raudenbush and Bryk (2002) suggested comparing the variance estimates across the two models to define the proportion reduction in variance or so called ‘variance explained’ or ‘effect size’. The effect size in this study can be calculated through the proportion of variance explained by the independent variables (predictors) in model 3. The formula for the variance explained at level 1 is:
Proportion of explained variance \[ \frac{\sigma^2(\text{unconditional model}) - \sigma^2(\text{conditional model})}{\sigma^2(\text{unconditional model})} \]

In this study, the residual variance estimates between model 3 and model 4 can be calculated to find the proportion reduction. Model 4 is presented as unconditional model/null model; the residual variance is equal to 23.73. Model 3 is presented as conditional model; the residual variance is equal to 12.83.

\[
\text{Proportion of explained variance} = \frac{23.73 - 12.83}{23.73} = \frac{10.90}{23.73} = .46 = 46\%
\]

Comparing the change of variance between model 3 and model 4 (null model), the variance in model 4 reduced 46%, from 23.73 to 12.83 (see Table 21). In other words, the addition of six predictors: PU, PE, SI, FC, TL, and DL could explain 46% of the instructor (within-university) variance. The existing level-1 variance of 12.83 in model 3 may be explained by other variables that were not included in this study.

*Hypothesis 2: The percent of instructors holding academic ranks at the university level will have a positive direct effect on behavior in conducting research at the university.*

There was not a statistically significant effect of the percent of instructors holding academic ranks at the university level (PROF) on the dependent variable; \( \beta = .01, p = .63 \). Hypothesis 2 was not supported. The effect of .01 means that when the percent of instructors holding academic ranks at the university level increases by one unit, the increase in research was negligible with an increase in .01. This level-2 predictor was assumed to have explained the
variation of the dependent variable in this study. Unfortunately, results for hypothesis 2 were consistent with those of the hypothesis 1, non-significant.

Hypothesis 3: The percent of instructors holding doctoral degrees at the university level will have a positive direct effect on behavior in conducting research at the university.

There was not a statistically significant effect of the percent of instructors holding doctoral degrees at the university level (DOCT) on the dependent variable; $\beta = -.03$, $p = .55$. Hypothesis 3 was not supported. The -.03 value equates to a one unit increase in the percent of instructors holding doctoral degrees at the university level results in .03 unit decrease in the dependent variable. This level-2 predictor was also assumed to explain the variation of the dependent variable in this study; thus, the results of this hypothesis 3 were consistent with those of the hypothesis 1.

Hypothesis 4: Perceived usefulness will have a positive direct effect on behavior in conducting research.

There was a statistically significant effect of perceived usefulness (PU) of conducting research on the dependent variable; $\beta = .79$, $p < .001$. Hypothesis 4 was supported. The .79 value indicates that a one unit increase of PU results in .79 unit increase of the dependent variable.

Hypothesis 4a: The effect of perceived usefulness will vary among the universities.

The selected model 3 excluded the variation of the effect of perceived usefulness (PU). According to model 1 and model 2, the variance of $\tau_{PU}$ is equal to 1.75 at $p = .79$. The null hypothesis 4a was accepted, not supporting hypothesis 4a.
Hypothesis 4b: There will be a cross-level interaction between perceived usefulness and the percent of instructors holding academic ranks at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding all academic ranks.

The selected model 3 excluded the cross-level interaction between the percent of instructors holding academic ranks at the university level (PROF) and the perceived usefulness (PU) at the individual level. According to model 1, the variance of PROF*PU is equal to -.01 at \( p = .74 \). Model 2 excluded the cross-level interaction of PROF*PU. Hypothesis 4b was not supported.

Hypothesis 5: Perceived ease will have a positive direct effect on behavior in conducting research.

There was a statistically significant effect of perceived ease (PE) on the dependent variable. Hypothesis 5 was supported; \( \beta = .63, p < .001 \). The effect of .63 represents that for every one unit increase in perceived ease (PE) an estimated increase of .63 will be realized in research.

Hypothesis 5a: The effect of perceived ease will vary among the universities.

The selected model 3 excluded the variation of the effect of perceived ease (PE). According to model 1, the variance of \( \tau_{PE} \) is equal to .93 at \( p = .50 \). According to model 2, the variance of \( \tau_{PE} \) is equal to .87 at \( p = .09 \). Hypothesis 5a was not supported.

Hypothesis 5b: There will be a cross-level interaction between the perceived ease and the percent of instructors holding doctoral degrees at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding doctoral degrees.
The selected model 3 excluded the cross-level interaction between the percent of instructors holding doctoral degrees at the university level (DOCT) and the perceived usefulness (PE) at the individual level. According to model 1, the variance of DOCT*PE is equal to .02 at \( p < .05 \). The hypothesis 5b was supported in model 1. Model 2 excluded the cross-level interaction of DOCT*PE either.

**Hypothesis 6: Social influence will have a positive direct effect on behavior in conducting research.**

There was a statistically significant effect of social influence (SI) on the dependent variable; \( \beta = 1.67, p\text{-value} < .001 \). Hypothesis 6 was supported. An effect of 1.67 means that when SI increases by one unit, the amount of research will increase 1.67 units.

**Hypothesis 7: Facilitating conditions will have a positive direct effect on behavior in conducting research.**

There was a statistically significant effect of facilitating conditions (FC) on the dependent variable; \( \beta = 2.98, p < .001 \). Hypothesis 7 was supported. The 2.98 value indicates that one unit increase in FC results in an increase of 2.98 units for the dependent variable.

**Hypothesis 8: Teaching loads will have a negative direct effect on behavior in conducting research.**

There was not a statistically significant effect of teaching load (TL) on the dependent variable; \( \beta = -.06, p = .05 \). Hypothesis 8 was not supported. However, the negative sign of the zero-order correlation (-.06) between the behavior in conducting research and teaching loads reflects a reversed relationship as expected. The -.06 value indicates that one unit increase of TL results in .06 unit increase in the dependent variable.
Hypothesis 9: Degree level will have a positive direct effect on behavior in conducting research.

There was a statistically significant effect of degree level (DL) on the dependent variable; \( \beta = 2.02, p < .001 \). Hypothesis 9 was supported. The 2.02 value implies that one unit increase of degree level resulted in 2.02 unit increase of the dependent variable.

In sum, the findings indicated that on average characteristics of explanatory variables (predictors), a Management Science instructor who held Master degree (DLC) at the Rajabhat University system produced approximately 4 research items during past five years (2010-2014). The Facilitating Conditions (FC) and Academic degree level (DL) made the largest positive effect, \( \beta = 2.98 \) and 2.02 respectively) on their behavior in conducting research as reflected by their productivity in producing research. The Social influence (SI) also positively influenced their behavior in conducting research (\( \beta = 1.67 \)). Additionally, the perceived usefulness (PU) and perceived ease (PE) also had smaller effects on the behavior in conducting research, \( \beta = .79 \) and .63 respectively. Five predictors found statistically significant effects. Hence, it can be concluded that these predictors account for about 46% of the individual-level variance. Note that the TL and two university-level predictors (PROF and DOCT) were not statistically significant.

Summary

This chapter presents the findings of the study. The first section reports the assessment of prior analysis: the exploring and handling of data. The results of CFA analysis as well as a marker variable technique are presented in the second section. The last section compares four hierarchical linear models in R using lme functions and its results are reported. Table 22 below
illustrates the summary of hypothesis results. Chapter 5 will interpret the meaning and summarize the findings in the context of this study.

Table 22

**Summary of Hypothesis Results**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Path/Effect</th>
<th>$\beta$, p-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 (vary)</td>
<td>-</td>
<td>-</td>
<td>[Not supported]</td>
</tr>
<tr>
<td><strong>University-level predictors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H2</td>
<td>PROF --&gt;B (Fixed)</td>
<td>.01, $p = .63$</td>
<td>Not supported</td>
</tr>
<tr>
<td>H3</td>
<td>DOCT--&gt;B (Fixed)</td>
<td>-.03, $p = .55$</td>
<td>Not supported</td>
</tr>
<tr>
<td><strong>Individual-level predictors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>PU--&gt;B (Fixed)</td>
<td>.79, $p &lt; .01$</td>
<td>Supported</td>
</tr>
<tr>
<td>H4a</td>
<td>PU--&gt;B (Random)</td>
<td>1.75, $p = .79$</td>
<td>[Not supported]</td>
</tr>
<tr>
<td>H4b</td>
<td>PROF--&gt; (PU--&gt;B) (Interaction)</td>
<td>-.01, $p = .74$</td>
<td>[Not supported]</td>
</tr>
<tr>
<td>H5</td>
<td>PE--&gt;B (Fixed)</td>
<td>.63, $p &lt; .01$</td>
<td>Supported</td>
</tr>
<tr>
<td>H5a</td>
<td>PE--&gt;B (Random)</td>
<td>.87, $p = .09$</td>
<td>[Not supported]</td>
</tr>
<tr>
<td>H5b</td>
<td>DOCT--&gt; (PE--&gt;B) (Interaction)</td>
<td>.56, $p &lt; .05$</td>
<td>[*Supported]</td>
</tr>
<tr>
<td>H6</td>
<td>SI --&gt;B (Fixed)</td>
<td>1.67, $p &lt; .01$</td>
<td>Supported</td>
</tr>
<tr>
<td>H7</td>
<td>FC--&gt;B (Fixed)</td>
<td>2.98, $p &lt; .01$</td>
<td>Supported</td>
</tr>
<tr>
<td>H8</td>
<td>TL--&gt;B (Fixed)</td>
<td>-.06, $p = .05$</td>
<td>Not supported</td>
</tr>
<tr>
<td>H9</td>
<td>DL--&gt;B (Fixed)</td>
<td>2.02, $p &lt; .01$</td>
<td>Supported</td>
</tr>
</tbody>
</table>

*Note.* The cross-level interaction of DOCT*PE was supported in model 1 (full model). The results in [-] were excluded from model 3 (selected model).
CHAPTER 5

FINDING, CONCLUSION, AND RECOMMENDATIONS

This chapter aims to interpret and discuss the findings in the context of this study. There are three sections in this chapter. The first section is the summary of the study. The second section discusses the conclusion with hypothesis testing, and the last section presents the recommendations for future research.

Summary of the Study

The purpose of this study was to investigate the key factors, at the individual and university levels, which affect instructors’ behavior in conducting research. The current study will help explain how and why the instructors accept or refuse to conduct research and provide insight into the salient factors motivating the instructors to produce more research by using the technology acceptance model theory 2 (TAM 2) and the unified theory of acceptance and use of technology (UTAUT) as the framework, so that the results would be useful for the instructors and the institutions that the instructors belong to.

As few empirical studies regarding the factors affecting behavior in conducting research on the part of Thai instructors exist, the researcher wished to investigate the salient factors by applying the key factors from the technology acceptance model 2 (TAM 2): perceived usefulness (PU) and perceived ease (PE), and the unified theory of acceptance and use of technology (UTAUT): social influence (SI) and facilitating conditions (FC), in addition to two other demographic variables: teaching loads (TL) and degree level (DL), and two university-level variables: the percent of instructors holding academic ranks at the university (PROF) and the...
percent of instructors holding doctoral degrees at the university (DOCT). The hypothesis testing on the explanatory variables (predictors) in this study included both direct and moderating effects. The direct effects included fixed and random effects. These key variables were applied to the context of the instructors in the Management Science faculty of the Rajabhat Universities. The dependent variable in this study was the behavior in conducting research.

Conclusions

In this study, four models with hierarchical linear modeling analysis were compared by using step down technique. The first model is the full model that including fixed, random, and interaction effects. The second model excluded interaction effects. The third model excluded random effects. The last model excluded fixed effects, and that remain only the intercept that was allowed to vary (null model). The results found that the third model containing only fixed effects as well as random intercept had best fit to the data in this study, and it was the selected model (model 3).

Based on the selected model 3, there was the total of eight variables taken into the account. The six variables were level-1 predictors (PU, PE, SI, FC, TL, and DL) while the two variables were level-2 predictors (PROF and DOCT). In sum, five out of the total of eight variables (PU, PE, SI, FC, and DL) were significantly supported. Three out of eight variables (TL, PROF, and DOCT) were not supported.

The first three hypotheses (Hypothesis 1, 2, and 3) provided insight into the university level.
Hypothesis 1: Behavior in conducting research will vary among the universities.

This study found that the Hypothesis 1 was not supported because the intercept variance or random intercept was not statistically significant at \( p \)-value = .06.

This result indicated that the behavior in conducting research as the dependent variable did not vary among the 37 Rajabhat Universities. This dependent variable was measured by summing the number of research forms that the instructors had produced during the preceding five years (2010-2014), such as articles or textbooks (Clarke, 2010; Fairweather, 2002). In other words, the average number of research items that each institution had produced during the five years was not significantly different from university to university.

However, although there were no statistically significant differences in the number of research forms among the universities, the range of the number of research forms obtained from this study was large. The minimum was equal to zero while the maximum was equal to 28. The mean is equal to 4.28 while the standard deviation is equal to 4.91, larger than the mean (see Table 20). This implied that the differences between some universities maybe exist. The future research should find if there are the differences in some university groups (e.g., regions).

The results additionally found that while random intercept was not significant, the fixed intercept was; the effect of 4.16 at \( p \)-value < .001. The quantity of research forms they conducted was approximately 4 items (4.16), when all explanatory variables were grand mean centered. The descriptive statistic (Table 20) showed that the mean of the number of research forms (the behavior in conducting research) was 4.28, which close to the fixed intercept.
This research supports Boonsong’s (2013) research on online learning with the instructors in the Faculty of Education, found that there was no difference among the Rajabhat universities in Thailand.

**Hypothesis 2:** The percent of instructors holding academic ranks at the university level will have a positive direct effect on behavior in conducting research at the university-PROF.

**Hypothesis 3:** The percent of instructors holding doctoral degrees at the university level will have a positive direct effect on behavior in conducting research at the university-DOCT.

This study found that the Hypothesis 2 and 3 were not supported. When Hypothesis 1 was not supported, it is not surprising that the Hypothesis 2 and Hypothesis 3 were not supported as well. The findings of the Hypothesis 1 are consistent with the results from the hypothesis testing (non-significant) of the Hypothesis 2 and Hypothesis 3 on two university-level predictors: percent of instructors holding academic ranks at the university and percent of instructors holding doctoral degrees at the university.

The results of the Hypotheses 2 and 3 suggested that the percent of instructors holding academic ranks at the university level (PROF) and that the percent of instructors holding doctoral degrees at the university level (DOCT) did not directly affect the behavior in conducting research at the individual level. These university-level predictors could not explain the variation that does not exist. If the Hypothesis 1 had been supported, the Hypothesis 2 or Hypothesis 3 should be the reasons of that variation. In sum, these two variables could not explain the behavior in conducting research in the context of Rajabhat Universities in Thailand.
This adds new research to the context of Rajabhat Universities in Thailand as the empirical studies regarding the university-level factors. As the literature review process, the differences within the Rajabhat University system (the RU system) regarding the behavior in conducting research (the number of research forms) of the instructors in the Faculty of Management Science have not been found. The Hypotheses 2 and 3 do not provide the salient factors at the university level; therefore, future research should be done to find new university-level solutions.

The results regarding the Hypothesis 1-3 mean that the explanation for the behavior in conducting research was from the individual-level factors, not university-level factors. These findings represent information useful for the Rajabhat University leaders. Due to the fact that the Hypothesis 1-3 do not explain the behavior in conducting research, the university leaders should be more focused on the individual factors, which directly affect the instructors.

**Hypothesis 4: Perceived usefulness will have a positive direct effect on behavior in conducting research-PU.**

This study found that the Hypothesis 4 was supported.

The result of the Hypothesis 4 indicated that PU had a significant direct effect on the behavior in conducting research on the part of the instructors in the 37 Rajabhat Universities. In other words, if the instructors perceive that conducting research is useful for them, then they will produce more research.

This study supports the theory of TAM 2 (Venkatesh & Davis, 2000) used in this study and much research (e.g., Abdalla, 2007; Lee, Kozar, & Larsen, 2003).
However, such most relevant research found that PU has been a salient factor for behavior explanation while this current study found that the effect of PU is not strong. It is important to discuss the possible reason for this result. The factor loadings of the PU construct were examined. The construct of PU showed that when comparing to the other PU items, the PU2 provided the lowest factor loading. The PU2 item stated that ‘Conducting research in my job increases my productivity.’ The findings suggested that the PU2 case was probably the problematic case.

The data distribution was closely explored, and the data relating to PU2 revealed that many instructors provided notably low scores for PU2 while giving high scores for PU1, PU3, and PU4 items. This suggested that many instructors held the view that conducting research could reduce their (teaching) productivity. These findings would be useful for creating the criteria of the evaluation for the instructors and providing the motivation or reinforcement for the instructor supporting them to produce more research. The scores revealed that many instructors did not agree that conducting research could help increase their (teaching) productivity.

This result regarding the low PU scores supports the study by Friedrich and Michalak, 1983. Their study found that the nature of research and that of teaching productivity might be different. It bears pointing out that as teaching productivity is assessed every semester or academic year, one research study can consume time greater than that of one evaluation period. If research productivity cannot be counted as a part of teaching productivity, then it is hard for the instructors to view conducting research as useful. Future research should provide
insight into the relationship between research productivity and teaching productivity, including the assessment criteria of teaching productivity related to research productivity.

**Hypothesis 4a:** The effect of perceived usefulness will vary among the universities.

**Hypothesis 4b:** There will be a cross-level interaction between perceived usefulness and the percent of instructors holding academic ranks at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding all academic ranks.

This study found that the Hypothesis 4a and Hypothesis 4b were not supported. This PU variable/factor did not vary among the universities. As well, the relationship between the PU and the behavior in conducting research was not been moderated by the percent of instructors holding academic rank at the university level. The selected model 3 excluded the variation (H4a) and the cross-level interaction (H4b) of the PU.

The result of the Hypothesis 4a suggested that the usefulness was not significantly different among the Rajabhat Universities. In other words, the usefulness that the instructors of the Management Science faculty perceived was similar from university to university. Also, The result of the Hypothesis 4b indicated that the relationship between the usefulness that the instructors perceived (PU) and the behavior in conducting research was not been moderated by the percent of instructors holding academic rank at the university level. Although some universities where had the high percent of the instructors holding academic rank or other universities where had the low percent of the instructors holding academic rank, the usefulness that the instructors perceived was not significantly different.
The results of the Hypothesis 4a and Hypothesis 4b were consistent with the non-significance of the chi square test comparing model 1 and model 2 in Table 21. The full model (model 1) with two cross-level interactions was initially rejected according to Table 21. The model 2 that excluded two cross-level interactions had better fit than model 1. Also, the results of the Hypotheses 4a and 4b were consistent to the result of the Hypothesis 1, 2, and 3.

This adds new research to the context of Rajabhat Universities in Thailand as the empirical studies regarding the variation and the cross-level interaction. As the literature review process, the variation and the interaction relationship between the individual level and university level of the Rajabhat University instructors have not been found. The Hypotheses 4a and 4b do not provide the variation and interaction effect of the usefulness (PU) at the individual and university levels; therefore, future research should be done to find new solutions.

**Hypothesis 5: Perceived ease will have a positive direct effect on behavior in conducting research-PE.**

This study found that the Hypothesis 5 testing was supported, and this revealed that the perceived ease (PE) had a significantly effect on behavior in conducting research on the part of the instructors. The finding on the PE in this study suggests that providing the Management Science instructors with research or statistic programs may be an effective way to encourage them to produce more research.

However, the effect of PE was significant but smaller than the other effects; thus, the deep investigation into the data set is done. It appears that some instructors have conducted
research even though they perceived that research is not easy to do, while other instructors refused to conduct research even though they perceived that research is easy to do. Over many years, the Rajabhat Universities have made serious efforts to provide research and statistics workshops for their staff in order to reinforce their conducting of research, yet the results were unsatisfactory.

Large budgets have been spent for such training programs. Statistics tools for research are various and broad. Perhaps, the needs for research and statistic training programs may be necessary. Additionally, the level of ease that each individual perceives is hard to measure. In Thai culture, being humble is commonly accepted as part of good and polite manners; therefore, an individual may not complain about the difficulty an assigned task even if she or he perceives it as difficult.

This study supports the theory of TAM 2 and the empirical research (e.g., Naeini & BalaKrishnam, 2012; Saade & Bahli; 2005; Smith, 2008). The result suggested that the ease that the instructors of the Management Science faculty perceived positively impacted on the amount of research they produced. In other words, the instructors will produce more research if they perceived that research is easy to do or conduct. In addition, the finding that the effect of PE is smaller than the PU’s supports the empirical research above. Such relevant research found that PU has been more salient than PE, and that seems to be compatible to the situation in real practice.
Hypothesis 5a: The effect of perceived ease will vary among the universities.

Hypothesis 5b: There will be a cross-level interaction between the perceived ease and the percent of instructors holding doctoral degrees at the university level, such that the relationship will be stronger under a high percent than a low percent of instructors holding doctoral degrees.

This study found that the Hypothesis 5a was not supported, and this result suggested that the ease that the instructors of the Management Science faculty perceived was similar among the Rajabhat Universities. The Hypothesis 5b also was not supported. That indicated that the relationship between the PE and the behavior in conducting research was not been moderated by the percent of instructors holding academic degree at the university level. The selected model 3 excluded the variation (H5a) and the cross-level interaction (H5b) of the PE.

The results of the Hypothesis 5a and 5b were consistent with the non-significance of the chi square test comparing model 1 and model 2 in Table 21. The full model (model 1) with two cross-level interactions was previously rejected according to Table 21.

These add new research to the context of Rajabhat Universities in Thailand as the empirical studies regarding the variation and the cross-level interaction. As the literature review process, the variation and the interaction relationship between the individual level and university level of the Rajabhat University instructors have not been found. The Hypotheses 5a and 5b do not provide the variation and interaction effect of the usefulness (PE) at the individual and university levels; therefore, future research should be done to find new solutions.
Hypothesis 6: Social influence will have a positive direct effect on behavior in conducting research - SI.

This study found that the hypothesis testing regarding social influence (SI) was supported. This factor significantly affected behavior in conducting research on the part of the instructors. The result suggested that the social influence of the instructors of the Management Science faculty had a positive impact on the amount of research they produced.

The final measurement model revealed that the construct of SI remained two items: SI1 and SI2. Those items referred to people who influence behavior and who are important to the instructors had strong influence on the instructors. Interestingly, the SI3 as well as SI4 were excluded from the final measurement model. Those related to the influence by senior management and university and that means that they had no statistically significant influence on the instructors regarding the behavior in conducting research.

Among the Thai people, these influencing people are commonly parents and/or family members. In the context of Thai instructors, the findings suggest that the influence from family members is stronger than that from the leaders or the university. The findings would be useful for understanding in the true motivation of the instructors. The SI3 and SI4 explain the SI factor in details; therefore, future research should investigate the importance of the subordinates’ family on the behavior in conducting research.

This supports the theory of UTAUT (Venkatesh et al., 2003) that found that the SI influences human behavior and belief. This also supports the study by Hassan, Tymms, and Ismail (2008), which found that marital status had a direct impact on academic productivity of
Malaysian academics. In fact, the married Malaysian academics reported higher research productivity when compared to single and widowed.

**Hypothesis 7: Facilitating conditions will have a positive direct effect on behavior in conducting research-FC.**

This study found the positive effect of the FC factor on the behavior in conducting research. The results indicated that the facilitating conditions (FC) that the instructors of the Management Science faculty perceived had the largest positive impact on their behavior in conducting research. It implied that the more the instructors are given the facilitating conditions for conducting research, the more they will conduct research.

The results also suggested that providing the necessary resources for conducting research would be the key solution. To better understand the facilitating conditions that the instructors perceived, the items related to this predictor should be deeply examined. The FC2 item “I have the knowledge necessary to conduct research.” and the FC3 item ‘Conducting research is not compatible with other jobs that I do.’ were removed from the final model. Specially, the factor loading of the FC3 was extremely low. Interestingly, this result was consistent with the low factor loading of PU2 (Conducting research in my job increases my productivity).

As mentioned in Chapter 1 and Chapter 2 Thailand’s universities, especially the new universities, have focused on teaching, the main criteria of productivity have been teaching hours and the holding of positions such as dean or head of department, respectively. Moreover, the lower factor loading of FC4 reflected that the instructors held the view that assistance with
difficulties in conducting research from a university staff member or group was not readily available. As the Hypothesis 7 revealed that the facilitating conditions are the key to support the instructors to produce more research, the university should accept this guideline. As well, future research should focus on different types of facilitating conditions.

This supports the UTAUT (Venkatesh et al., 2008) and the research by Sinthunava (2011) and Sangnapabowarn (2003), which found that conducting research required supportive human resources and infrastructures. The resources and infrastructures was a part of the facilitating conditions as its definition (see Chapter 1).

**Hypothesis 8: Teaching loads will have a negative direct effect on behavior in conducting research-TL.**

This study found that there was no effect of the teaching loads factor (TL) on the behavior in conducting research. The result indicated that teaching load or the number of teaching hours per week of the instructors did not affect behavior in conducting research. The teaching hours in this study ranged from 9 to 34 hours per week. The average teaching hours are about 15 hours (14.96, see Table 20). Indeed, the instructors in the Rajabhat Universities teach not only on weekdays but also on weekends. The instructors holding positions such as head of department typically devote a minimum of 9 additional hours per week as part of their workload.

This is the important information for the Rajabhat Universities. Some Universities believe that reducing teaching loads will results in gaining more research forms from their instructors. Although presently most Rajabhat Universities try to fource the instructors not to
teach more than their minimum workloads by recruiting more instructors as one of the solutions, the Hypothesis 8 do not support this solution.

This supports the empirical study by Friedrich and Michalak (1983) provided evidence that research and teaching have no effects on each other, because they are both related to intelligence (or a same variable). Friedrich and Michalak (1983) stated that the expectations of the relationship between research and teaching and the evidence found in empirical studies are often in conflict. This is because the variables of teaching effectiveness and being good researchers are assessed by means of different criteria. (This is consistent with the discussion of the issues related to PU2 and FC4 as well.)

In the other hand, the finding refused the study by Borg (2007), which studies on American teachers and found that the main reasons teachers not engage in research is that they have no time to do.

Additionally, although teaching loads had no effect on the behavior in conducting research measured by number of research items produced, their negative relationship was confirmed. A previous study (Mitchell & Rebne, 1995) tested the effects of time spent on teaching on the research productivity of academicians. The study found that if teaching loads were more than 8 hours, they would negatively impact research productivity. The teaching loads in this study were more than 8 hours as well.
Hypothesis 9: Degree level will have a positive direct effect on behavior in conducting research-DL.

This study found the effect of the degree level on the behavior in conducting research. The results of the hypothesis testing indicated that academic degree level (DL) also had a strongly positive direct effect on behavior in conducting research or on the amount of research they produced. The instructors who held Master degrees (Grand mean centering) had conducted approximately 4 research items during the previous 5 years, and the instructors who held doctoral degrees (one unit increase) had produced 2.02 units more.

Eighty four percent (84%) of the instructors in this study held master degrees and about thirteen percent (13%) held doctoral degrees (see Table 13); thus, they need to pursue further academic degrees. As the Hypothesis 9 revealed that the academic degree level variable is the key factor impacting the research behavior, the Universities should encourage and promote the instructors to gain doctoral degrees or post-doctoral degrees.

This study supports the studies by Clarke (2010), Edem (1994), and Su (2011) that the faculty members who complete doctoral degrees tend to produce more research than those who held master degrees or lower degrees.

**Recommendations for Institutions**

Conducting research plays an increasingly important role in the Rajabhat Universities. This current study makes it possible to distribute recommendations based on the findings to the Management Science faculty, the Rajabhat University system in Thailand. The following are recommendations, based on the findings:
1. The significant effect of perceived usefulness on behavior in conducting research suggests that the recognition of the universities of the usefulness of conducting research may encourage them to produce more research. It is important that they truly believe that conducting research will be useful for them. The empirical evidence from this study shows that many instructors hold the view that conducting research may not help their job performance improve; rather, it may negatively affect their teaching productivity. Given that teaching is a primary task, this study suggests that conducting research be officially added as one of the criteria for teaching productivity. Additional workshops may necessary to make this understanding clearer and more vivid.

2. The importance of facilitating conditions and perceived ease were supported by the results in this study. In fact, the facilitating conditions made the largest impact. The results suggested that beside devote some budgets to providing research or statistics programs, the universities also provide a person or group team who can guide instructors in how and where to find the necessary resources that a researcher (instructor) needs to achieve his/her research study. The ease or difficulty in the process of conducting research may not much be the matter; rather, the relevant factor may be whether resources necessary for conducting research are available or not (such as databases and sources of available grants/funds). It is important that the universities provide the instructors with necessary resources for producing research. In addition, this empirical study reveals that teaching load did not affect the number of research items the instructors produced. Thus, only forcing the instructors to have fewer teaching hours without the implementing of other supporting policies may not be an effective solution. The
university leaders can use the evidence from relevant research studies to make decisions on university policies.

3. The statistically significant effect of academic degree level confirmed its importance on behavior in conducting research. It is important for the developing of new universities like the Rajabhat Universities. The statistical evidence revealed that the majority of the Management Science instructors in the Rajabhat Universities held Master degrees. Since the Rajabhat institutes were upgraded to be ‘universities,’ new instructors have been employed there. Obviously, support for the further education of the instructors is still necessary.

**Implications for Future Research**

Frequently, some of the expectations based on theories and evidence found in research may not be compatible with each other; however, such research provides resources which can lead to improvement of future research. It is imperative that theories be developed to various contexts. Three groups of explanatory variables can be identified.

The first group consists of the predictors from the technology acceptance model 2 (TAM 2). As in the context of using technology systems in organizations, in the context of conducting research in universities, it is clear that perceived usefulness is a more likely salient predictor than perceived ease. However, the indicator of PU2 might not appropriate to an understanding of the conducting of research by teachers or instructors because research and teaching may have no direct relationships to each other or may have only a spurious relationship (Friedrich and Michalak, 1983). This issue should be considered in future research.
The second predictor group is that of social influence and facilitating conditions from the unified theory and acceptance and use of technology (UTAUT). Social influence and facilitating conditions appeared as good predictors in the context of this study. However, the indicators from both the social influence and the facilitating conditions constructs were modified. Future research should pay attention to unparalleled/paralleled relationships among the factor indicators based on a particular context of study. Moreover, the significant effect of social influence can be linked to the importance of family members in influencing behavior in conducting research on the part of instructors. Researchers may further investigate the significance of married status and number of children. This may also vary between cultures such as Asian or American cultures. Additionally, the facilitating conditions such as supportive available resources necessary for conducting research may be notably different among countries. It is important that researchers recognize their particular context as well.

The third group is related to the demographic data. The personal academic qualification seems to have a large impact on the behavior in conducting research of the instructors. Clearly, this characteristic is always necessary for instructors or teachers and has been approved from many previous empirical studies. After all, at individual level, the instructors need to develop themselves regarding their specific academic domains and research.
APPENDIX A

IRB APPROVAL LETTER
April 16, 2014

Dr. Kim Nimon  
Student Investigator: Benchamat Laksaniyanon  
Department of Learning Technologies  
University of North Texas  
RE: Human Subjects Application No. 14-130

Dear Dr. Nimon:

In accordance with 45 CFR Part 46 Section 46.101, your study titled “Acceptance Theories for Behavior in Conducting Research: Instructors in the Rajabhat University System, Thailand” has been determined to qualify for an exemption from further review by the UNT Institutional Review Board (IRB).

Enclosed are the consent documents with stamped IRB approval. Please copy and use this form only for your study subjects.

No changes may be made to your study’s procedures or forms without prior written approval from the UNT IRB. Please contact Jordan Harmon, Research Compliance Analyst, ext. 4643, if you wish to make any such changes. Any changes to your procedures or forms after 3 years will require completion of a new IRB application.

We wish you success with your study.

Sincerely,

Patricia L. Kaminski, Ph.D.  
Associate Professor  
Chair, Institutional Review Board  

PK: jh
APPENDIX B

INFORMED CONSENT FORM
University of North Texas Institutional Review Board

Informed Consent Form

You may keep this form for your records.
Participation in this survey is voluntary.

Participants must be 18 years of age or older to participate in this study.

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, procedures, risks, and benefits of the study.

**Title of Study:** Acceptance theories for behavior in conducting research: Instructors in the Rajabhat University System, Thailand

**Purpose of the Study:** The purpose of this study is to test the technology acceptance model theory (TAM 2, proposed by Venkatesh & Davis, 2000) and the unified theory of acceptance and use of technology (UTAUT, proposed by Venkatesh et al., 2003), that perceived use (PU) of conducting research, perceived ease (PE) of conducting research, social influence (SI), and facilitating conditions (FC), including teaching load and degree level relate to behavior in conducting research for instructors in the faculty of Management Science at the Rajabhat Universities, Thailand; and to test whether the percent of instructors holding the ranks of assistant professor, associate professor, and professor together and the percent of instructors holding doctoral degrees have direct and moderating effects on the perceived usefulness and perceived ease of conducting research respectively.

**Study Procedures:** The survey lists a set of thirty-eight statements and you will be asked to indicate to what extent you agree with each statement. There is no right or wrong answers in this survey. The estimated time duration for completion of the survey is about 7-10 minutes.

**Foreseeable Risks:** There are no foreseeable risks to participate in this survey.

**Benefits to the Subjects or Others:** This study is expected to gain benefits for the Rajabhat Universities as the results and findings would be the recommendations important to promote the conducting of research and provide research training programs appropriate for their instructors.

**Compensation for Participants:** The participation in this survey is voluntary and no any compensation.

**Procedures for Maintaining Confidentiality of Research Records:** The data records will be stored on the secure locations. You are assured of complete confidentiality and please do not enter your name in this survey.

**Questions about the Study:** If you have any questions regarding this survey, please contact Benchamart Laksaniyanon, a doctoral candidate in Applied Technology and Performance Improvement (ATPI), Department of Learning Technologies, University of North Texas (UNT)
at bl0092@unt.edu or her advisor Associate professor Kim Forrest Nimon at
Kim.Nimon@unt.edu.

Review for the Protection of Participants: This research study has been reviewed and
approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at
(940) 565-3040 with any questions regarding the rights of research subjects.

Research Participants’ Rights: Your signature below indicates that you have read or
have had read to you all of the above and that you confirm all of the following:

- You have been told that your decision to participate or to withdraw from
  the study will have no effect on your annual performance review or
  employment at Ragabhat Universities.
- You have been told the possible benefits and the potential risks and/or
  discomforts of the study.
- You understand that you do not have to take part in this study, and your
  refusal to participate or your decision to withdraw will involve no penalty
  or loss of rights or benefits.
- You understand why the study is being conducted and how it will be
  performed.
- You understand your rights as a research participant and you voluntarily
  consent to participate in this study.
- You have been told you will receive a copy of this form.
- You may keep this form for your records.

[Signature]

APPROVED BY THE UNT IRB
DATE 4/16/14
หนังสือแสดงเจตนาริยาของเข้าร่วมตอบแบบสอบถามเพื่อการวิจัย (Informed Consent Form)
การร่วมตอบแบบสอบถามในครั้งนี้เป็นความสมัครใจ
ผู้ร่วมตอบแบบสอบถามต้องมีอายุตั้งแต่ 18 ปีขึ้นไป

ก่อนที่ท่านจะตอบแบบสอบถาม ท่านได้ทราบและทำความเข้าใจเกี่ยวกับ วัตถุประสงค์ ขั้นตอนการวิจัย ความเสี่ยงและประโยชน์ของการวิจัย ตามที่เจ้าหน้าที่เป็นที่เรียบร้อยแล้ว

หัวข้องานวิจัย: การยอมรับกับพฤติกรรมในการทำวิจัยของอาจารย์ในระบบมหาวิทยาลัยราชภัฏทุกแห่ง

วัตถุประสงค์ของการทำวิจัย: วัตถุประสงค์ของการทำวิจัยนี้คือเพื่อทดสอบมิติ morality in the technology acceptance model theory (TAM 2) และโมเดล the unified theory of acceptance and use of technology (UTAUT) ว่าการรับรู้ความมีประโยชน์ในการทำวิจัย การรับรู้ความต้องการในการทำวิจัย สมรรถภาพของการที่จะเห็นผลและระดับพฤติกรรมการศึกษา มีผลต่อการทำผลงานการวิจัยของอาจารย์ประจำแผนกวิชาการจัดการ มหาวิทยาลัยราชภัฏทุกแห่ง ซึ่งทั้งหมดจะทำการวิจัยของอาจารย์ที่มีผลงานทางวิชาการและร้อยละของอาจารย์ที่มีการเปรียบเทียบอาจารย์ที่มีมิติของการใช้เทคโนโลยีด้วยตรงต่อพฤติกรรมการทำผลงานวิจัยที่ระดับมหาวิทยาลัย และมีมิติของการให้ความเห็นแก่พฤติกรรมโดยมีปฏิสัมพันธ์กับการรับรู้ความมีประโยชน์และการรับรู้ความต้องการในการทำผลงานวิจัยตามลำดับ

ขั้นตอนการทำวิจัย: การวิจัยเก็บข้อมูลโดยใช้แบบสอบถาม ขอให้ท่านสื่อสารความเห็นของท่าน เห็นความต้องการจะได้รับ: ไม่มีความเสี่ยงใดๆที่จะได้รับในการร่วมตอบแบบสอบถามเพื่อการวิจัยนี้

ประโยชน์ที่คาดว่าจะได้รับ: งานวิจัยนี้คาดว่าจะเป็นประโยชน์ต่อมหาวิทยาลัยราชภัฏ และการศึกษาที่ได้จะนำไปใช้เป็นแนวทางที่สำคัญในการสนับสนุนการทำวิจัยของอาจารย์ในแนวทางที่ถูกต้อง เช่น การจัดทำโปรแกรมการสอนและแนวทางการวิจัยที่เหมาะสมต่ออาจารย์ของมหาวิทยาลัยราชภัฏ

คำแนะนำในการร่วมตอบแบบสอบถามเพื่อการวิจัย: ไม่มีค่าตอบแทนในการตอบแบบสอบถาม และการร่วมตอบแบบสอบถามนี้เป็นไปได้โดยความสมัครใจ.
ขั้นตอนการเก็บรักษาข้อมูลไม่เป็นความลับ: ข้อมูลในการตอบแบบสอบถามของท่านจะถูกเก็บเป็นความลับที่สุด

ข้อมูลเกี่ยวกับการวิจัย: หากท่านมีข้อคำถามเกี่ยวกับการวิจัยนี้โปรดติดต่อผู้ช่วยวิจัย นางนฤทัย สิริพิทยานุญาต สาขาวิชา Applied Technology and Performance Improvement (ATPT) ภาควิชา Learning Technologies มหาวิทยาลัย University of North Texas (UNT) ไดที่ b0902@unt.edu หรืออาจารย์ที่ปรึกษาของผู้ช่วยวิจัย Dr. Kim Forrest Nimond ที่ Kim.Nimon@unt.edu

การตรวจสอบเพื่อพิจารณาข้อมูลของผู้ตอบแบบสอบถาม: แบบสอบถามเพื่อการวิจัยนี้ได้รับการตรวจสอบและอนุมัติโดย UNT Institutional Review Board (IRB) หากท่านมีคำถามเกี่ยวกับสิทธิและวิธีการคุ้มครองข้อมูลของผู้ตอบแบบสอบถาม สามารถติดต่อ UNT IRB ได้ที่ (940) 565-3940

สิทธิของผู้ตอบแบบสอบถาม: การเชื่อมต่อในแบบสอบถามนี้ยินยอมให้ผู้ตอบแบบสอบถามนี้เป็นการตอบว่าท่านได้รับข้อมูลที่สุจริตที่ก้าวตามและเป็นยินดีต่อไปนี้

- ท่านได้รับทราบว่าการร่วมตอบแบบสอบถามเพื่อการวิจัยนี้เป็นความสมัครใจ และท่านสามารถยกเลิกการตอบแบบสอบถามได้ตลอดเวลา โดยไม่มีผลกระทบต่อการจ้างงานและการประเมินผลงาน โครงการของทางนักการศึกษา
- ท่านได้รับทราบข้อมูลและความเสี่ยงที่อาจเกิดจากการตอบแบบสอบถามนี้
- ท่านได้รับทราบว่าการปฏิเสธข้อมูลและจากการร่วมตอบแบบสอบถามจะไม่ให้ท่านสูญเสียสิทธิประโยชน์ใดๆที่ทางนักการศึกษาได้รับ
- ท่านได้รับทราบในข้อมูลที่ต้องมีที่ควรทราบ เกี่ยวกับการวิจัยนี้
- ท่านได้รับทราบจากท่านในฐานะผู้ตอบแบบสอบถาม และสิทธิ์ที่จะร่วมตอบแบบสอบถามเพื่อการวิจัยนี้
- ท่านได้รับทราบว่าท่านสามารถขอสิทธิ์ของแบบฟอร์มนี้
- ท่านสามารถเก็บแบบฟอร์มนี้เป็นข้อมูลของท่านได้

APPROVED BY THE UNT IRB
DATE: 4/10/14
APPENDIX C

ACCEPTANCE THEORIES FOR BEHAVIOR IN CONDUCTING RESEARCH SURVEY
Acceptance Theories for Behavior in Conducting Research Survey

Section 1: This section includes 3 parts and they are designed to help gain a better understanding of the factors that affect behavior in conducting research of the instructors. Your answers are confidential and there are no right or wrong answers in this survey.

Part I: Please mark **only one** of the six responses in one column on the right side as the most match with your opinion for each item.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Somewhat Disagree</td>
<td>Somewhat Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

1. Conducting research improves my performance in my job.
2. Conducting research in my job increases my productivity.
3. Conducting research enhances my effectiveness in my job.
4. I find my research to be useful in my job.
5. My interaction with my research is clear and understandable.
6. Interacting with my research does not require a lot of my mental effort.
7. I find my research to be easy to do.
8. I find it easy to get my research to answer what I want it to answer.
9. People who influence my behavior think that I should conduct research.
10. People who are important to me think that I should conduct research.
11. The senior management of this university has encouraged me in the conducting of research.
12. In general, the university has supported the conducting of research.
13. I have resources necessary to conduct research.
14. I have the knowledge necessary to conduct research.
15. Conducting research is not compatible with the other jobs that I do.
16. A specific person (or group) is available for assistance with difficulties in conducting research.
Part II: Please indicate the number \((0, 1, 2, 3,...)\) of each item that you have produced over the past 5 years (2010-2014). They may be Thai or English versions.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Research article in a peer-reviewed journal.</td>
</tr>
<tr>
<td>18</td>
<td>University sponsored research.</td>
</tr>
<tr>
<td>19</td>
<td>Book/Textbook.</td>
</tr>
<tr>
<td>20</td>
<td>Chapter in an edited book.</td>
</tr>
<tr>
<td>21</td>
<td>Conference paper.</td>
</tr>
</tbody>
</table>

Part III: Please mark only one of the two responses in one column on the right side as the most match with your opinion for each item.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>I am always courteous, even to people who are disagreeable.</td>
</tr>
<tr>
<td>23</td>
<td>At times I have really insisted on having things my own way.</td>
</tr>
<tr>
<td>24</td>
<td>There have been times when I was quite jealous of the good fortune of others.</td>
</tr>
<tr>
<td>25</td>
<td>I like to gossip about other people’s business.</td>
</tr>
<tr>
<td>26</td>
<td>I say only good things about my friends behind their backs.</td>
</tr>
<tr>
<td>27</td>
<td>I sometimes put things off until tomorrow what I should do today.</td>
</tr>
<tr>
<td>28</td>
<td>I have some pretty awful habits.</td>
</tr>
<tr>
<td>29</td>
<td>I always tell the truth.</td>
</tr>
<tr>
<td>30</td>
<td>I have never cheated on a test or assignment in any way.</td>
</tr>
<tr>
<td>31</td>
<td>I am always free of guilt.</td>
</tr>
</tbody>
</table>

Section 2: This section is designed to gather the demographic information regarding behavior in conducting research. Please complete all items. You are anonymous.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>32</td>
<td>Gender: ☐ Male ☐ Female</td>
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<tr>
<td>33</td>
<td>Age: ........................................years</td>
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<tr>
<td>34</td>
<td>Highest degree: ☐ Bachelor degree ☐ Master degree ☐ Doctoral degree ☐ Postdoctoral</td>
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<tr>
<td>35</td>
<td>Current academic rank: ☐ Lecturer ☐ Assistant professor ☐ Associate professor ☐ Professor</td>
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<tr>
<td>36</td>
<td>Experience in teaching: ☐ 0-5 years ☐ 6-10 years ☐ 11-15 years ☐ more than 15 years</td>
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<tr>
<td>37</td>
<td>Average hours per week you teach (teaching loads): ......................................... hours</td>
</tr>
<tr>
<td>38</td>
<td>Average hours per week you spend for research (It may be reading, writing, or collecting data): ☐ less than 9 hours ☐ 9-15 hours ☐ 16-21 hours ☐ more than 21 hours</td>
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Thank you for your time!
APPENDIX D

NUMBERS OF THE INSTRUCTORS HOLDING ACADEMIC RANKS AND DOCTORAL INSTRUCTORS IN
THE RAJABHAT UNIVERSITY SYSTEM
Numbers and Percent of Doctoral Instructors and the Instructors Holding Academic Ranks (The Rajabhat Universities Offering the Faculty of Management Science)

<table>
<thead>
<tr>
<th>Total of Instructors (100%)</th>
<th>Academic Rank</th>
<th>%</th>
<th>Doctoral Degree</th>
<th>%</th>
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Total: 8,733 2,609 1,207
Average: 236.03 70.51 32.62

REFERENCES


Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research, 18*, 382-388.


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