

**FARMERS ATTITUDE TOWARDS ADOPTION OF
AGRICULTURE TECHNOLOGY IN MYMENSINGH
DISTRICT OF BANGLADESH**

MD. MAZHARUL ISLAM

REG. NO. 12-05175

**MASTER OF SCIENCE (MS) IN AGRIBUSINESS AND
MARKETING**



DEPARTMENT OF AGRIBUSINESS AND MARKETING

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

DHAKA -1207

DECEMBER, 2018

**FARMERS ATTITUDE TOWARDS ADOPTION OF AGRICULTURE
TECHNOLOGY IN MYMENSINGH DISTRICT OF BANGLADESH**

BY

MD. MAZHARUL ISLAM

REG NO. 12-05175

A Thesis

Submitted to the Department of Agribusiness and marketing

Sher-e-Bangla Agricultural University, Dhaka,

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE (MS)

IN

AGRIBUSINESS AND MARKETING

SEMESTER: JULY- DECEMBER, 2018

Approved by

Dr. Mohammad Abdullah Mahfuz
Associate Professor
Department of Marketing
Jagannath University, Dhaka
Supervisor

Sauda Afrin Anny
Assistant Professor
Department of Agribusiness and Marketing
Sher-e-Bangla Agricultural University,
Co-Supervisor

Sauda Afrin Anny
Assistant Professor
Chairman
Examination Committee
Department of Agribusiness and Marketing
Sher-e-Bangla Agricultural University



DEPARTMENT OF AGRIBUSINESS AND MARKETING
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka-1207

CERTIFICATE

*This is to certify that the thesis entitled “**FARMERS ATTITUDE TOWARDS ADOPTION OF AGRICULTURAL TECHNOLOGY IN MYMENSINGH DISTRICT OF BANGLADESH**” submitted to the Department of Agribusiness and Marketing, Faculty of Agribusiness and Management, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **MASTERS OF SCIENCE (MS) in AGRIBUSINESS AND MARKETING**, embodies the result of a piece of bona-fide research work carried out by **MD. MAZHARUL ISLAM**, Registration No. **12-05175** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated: December, 2018

Dhaka, Bangladesh

Dr. Mohammad Abdullah Mahfuz
Associate Professor

Department of Marketing,
Jagannath University,
Dhaka

Supervisor



DEDICATED TO

MY

BELOVED PARENTS

ACKNOWLEDGEMENT

The author seems it a much privilege to express his enormous sense of gratitude to the almighty Allah for the ever ending blessings for the successful completion of the research work.

*The author wishes to express his gratitude and best regards to his respected Supervisor, **Dr. Mohammad Abdullah Mahfuz**, Associate Professor, Department of Marketing, Jagannath University, Dhaka, for his continuous direction, constructive criticism, encouragement and valuable suggestions in carrying out the research work and preparation of this thesis.*

*The author wishes to express his earnest respect, sincere appreciation and enormous indebtedness to his reverend Co-supervisor, **Sauda Afrin Anny**, Assistant Professor, Department of Agribusiness and Marketing, Sher-e-Bangla Agricultural University, Dhaka, for his scholastic supervision, helpful commentary and unvarying inspiration throughout the research work and preparation of the thesis.*

*The author feels to express his heartfelt thanks to the honorable chairman of the Department of Agribusiness and Marketing, **Bisakha Dewan**, Assistant Professor, along with all other teachers and staff of the department of Agribusiness and Marketing, Sher-e-Bangla Agricultural University, Dhaka, for their cooperation during the period of the study.*

The author feels proud to express his deepest and endless gratitude to all of his class mates and friends to cooperate and help him during taking data from the field and preparation of the thesis. The author wishes to extend his special thanks to his class mates and friends for their keen help as well as heartiest cooperation and encouragement.

The author expresses his heartfelt thanks to his beloved parents, younger sister and brother and all other family members for their prayers, encouragement, constant inspiration and moral support for his higher study. May Almighty bless and protect them.

The Author

FARMERS ATTITUDE TOWARDS ADOPTION OF AGRICULTURE TECHNOLOGY IN MYMENSINGH DISTRICT OF BANGLADESH

ABSTRACT

This paper investigates the factors influencing the adoption of technology among farmers in Bangladesh. Electronic services are one important measure for rural development and mobile phones, internet; apps are the dominating cellular technology; hence understanding the adoption of those technologies is important. The paper uses interpretive philosophy investigating adoption factors by means of survey data, participant observation and related studies on rural Bangladesh and technology acceptance. Based on a number of acceptance models from the literature, a conceptual Rural Technology Acceptance Model (RUTAM) was developed to analyze the arguments pertinent to a rural developing country context. The most salient modification, compared to earlier models, is that social influence plays a bigger role than technology at early stages of adoption. A survey was conducted on commercial farmers and agribusiness traders in Bhaluka and Trishal Upzilla of Mymensingh district using self-administered questionnaires. Data were analyzed using descriptive statistics and PLS regression method. Structural equation modeling was also used to perform confirmatory tests analyses on study variable relationships and to develop the proposed model. Findings reveal a positive significant relationship between perceived ease and behavioral intentions to use; facilitating conditions and behavioral Intentions to use; perceived usefulness and behavioral intention to use; behavioral intention to use and Adoption of mobile-based communication technologies, facilitating conditions and trust in technology are introduced as external factors which affect the behavioral intentions of an individual by means of perceived usefulness (PU) and perceived ease of use (PEU).

LIST OF CONTENTS

<i>CHAPTER</i>	<i>TITLE</i>	<i>PAGE</i>
	<i>ACKNOWLEDGEMENT</i>	<i>i</i>
	<i>ABSTRACT</i>	<i>ii</i>
	<i>CONTENTS</i>	<i>iii-iv</i>
	<i>LIST OF TABLES</i>	<i>v</i>
	<i>LIST OF FIGURES</i>	<i>vi</i>
	<i>ABBREVIATION AND ACRONYMS</i>	<i>vii</i>
<i>CHAPTER I</i>	<i>INTRODUCTION</i>	<i>1-4</i>
	<i>1.1 Background of the Study</i>	<i>2-3</i>
	<i>1.2 Research Objectives</i>	<i>3</i>
	<i>1.3 Research Questions</i>	<i>4</i>
<i>CHAPTER II</i>	<i>REVIEW OF LITERATURE</i>	<i>5-12</i>
	<i>2.1 Reason For Selecting TAM</i>	<i>6-7</i>
	<i>2.2 Perceived Usefulness (PU)</i>	<i>9</i>
	<i>2.3 Perceived Ease To Use (PEU)</i>	<i>9</i>
	<i>2.4 Facilitating Conditions</i>	<i>10</i>
	<i>2.5 Trust In Technology</i>	<i>10</i>
	<i>2.6 Behavioral Intension To Use</i>	<i>11</i>
	<i>2.7 Individual Characteristics</i>	<i>11</i>
	<i>2.8 Demographic Factors</i>	<i>11-12</i>
<i>CHAPTER III</i>	<i>MATERIALS AND METHODS</i>	<i>13-15</i>
	<i>3.1 Research Design</i>	<i>13-14</i>
	<i>3.2 Data Collection</i>	<i>14</i>
	<i>3.3 Demographic And Other Information</i>	<i>14</i>
	<i>3.4 Demographic Profile of Respondents</i>	<i>15</i>
<i>CHAPTER IV</i>	<i>RESULT AND DISCUSSION</i>	<i>16-24</i>

	<i>4.1 Assessment of the Measurement</i>	<i>16-18</i>
	<i>4.2 Assessment of the Structural Model</i>	<i>19-20</i>
	<i>4.3 Hypothesis Development</i>	<i>21</i>
	<i>4.3.1 Behavioral Intension</i>	<i>21</i>
	<i>4.3.2 Facilitating Conditions</i>	<i>22</i>
	<i>4.3.3 Perceived Usefulness</i>	<i>22</i>
	<i>4.3.4 Perceived Ease of Use</i>	<i>23</i>
	<i>4.3.5 Trust in Technology</i>	<i>24</i>
CHAPTER V	FINDINGS	25-27
	<i>5.1 Implementations</i>	<i>26</i>
	<i>5.1.1 Theoretical Implementations</i>	<i>26</i>
	<i>5.2.2 Practical Implementations</i>	<i>26</i>
	<i>5.2.3 Managerial Implementations</i>	<i>26</i>
CHAPTER VI	CONCLUSION	27
	REFERENCES	28-39
	APPENDICES	40-43

LIST OF TABLES

<i>TABLE NO.</i>	<i>TITLE</i>	<i>PAGE NO</i>
<i>1</i>	<i>Education, income, age group</i>	<i>15</i>
<i>2</i>	<i>Gender, and past experience</i>	<i>14</i>
<i>3</i>	<i>Convergent validity and reliability</i>	<i>17</i>
<i>4</i>	<i>Discriminate validity and correlations</i>	<i>18</i>
<i>5</i>	<i>Summary of Boot strapping results</i>	<i>20</i>

LIST OF FIGURE

<i>FIGURE NO.</i>	<i>TITLE</i>	<i>PAGE NO</i>
<i>1</i>	<i>Proposed technology acceptance model</i>	<i>8</i>
<i>2</i>	<i>Farmers age group using technology</i>	<i>14</i>
<i>3</i>	<i>Tested result of proposed model</i>	<i>19</i>

ABBREVIATIONS AND ACRONYMS

%	= Percentage
AEZ	= Agro-Ecological Zone
AVE	= Average Variance Extracted
BBS	= Bangladesh Bureau of Statistics
BI	= Behavioral Intention
CR	= Composite Reliability
DAE	= Department of Agricultural Extension
et al.,	= and others
FC	=Facilitating Conditions
ICT	=Information and Communication Technology
IS	=Information Systems
PEU	= Perceived Ease of Use
PU	= Perceived Usefulness
PLS	= Partial Least Square
RUTUM	= Rural Technology Acceptance Model
RUTADIM	= Rural Area Technology Acceptance and Diffusion Model
SEM	= Structural Equation Modeling
TAM	= Technology Acceptance Model
UTAUT	= Unified Theory of Acceptance and Use of Technology
WHO	= World Health Organization

CHAPTER I

INTRODUCTION

Agriculture is believed to be the world's largest industry as it employs more than one billion people and generates over \$1.3 trillion dollars' worth of food annually. In many developing countries, agriculture is being viewed as a major contributor to social and economic development given that it is the major contributor to economic growth and stability (Aker, 2010; Munyua *et al.*, 2009). Most developing countries for instance in Asia produce a wide variety of agricultural and food products such as rice, wheat, maize, potatoes, sweet potatoes, ground nuts, soya beans, sunflowers, tea, green vegetables, flowers, fruits, as well as livestock. Agriculture is also viewed as a great contributor towards reduction of poverty and hunger by 2030 in many developing countries as stated in the Sustainable development Goals of the United Nations (Loewe, 2015). Thus, sustainable poverty reduction can be possible through economic growth and development strategies with agriculture being a key driver (Awuor, 2013;Aker, 2010).

With its more than 160 million people, Bangladesh ranks as the eighth most populous country in the world. Out of 29 million households, 89% are situated in rural areas and 52% (15 million) account for agricultural farm households. According to the World Bank, "Poverty in Bangladesh is primarily a rural phenomenon with 53 percent of its rural population classified as poor, comprising about 85 percent of the country's poor. The rate of adult literacy at national level is 49%, while it is 46 % in rural areas. As surveyed by the BBS-UNESCO, around 26% of the poorest and 34% of the poor people in the rural areas have formal literacy.

Although Bangladesh ranks 147 out of 176 countries in the ICT Development Index in 2018, the penetration rate of mobile phones is remarkable compared to other ICT tools (e.g. PC, Internet etc.). Recent investigations show that around 45% of the total population, one out of (less than) three people, or at least one per family on average, has a mobile phone. As the growth of the Bangladeshi economy depends on rural development, much attention needs to be paid to the agricultural sector and the farmers who are the main, yet one of the weakest actors in the economy. In the perspective of this paper, timely adoption and appropriate use of easily and widely available technology in agricultural operations is one opportunity that may help in realizing the

digital opportunities, enhancing rural productivity and hence contribute to reducing urban-rural inequalities. Although the agricultural trade and farmers have become an important target for services. Studies of technology adoption and the diffusion process in such contexts are currently scarce. Kwon and Chidambaram (2012) find that much of the variance in the studies of technology use remains unexplained, and addressing this gap should be an important direction for future research. Kim and Garrison (2015) suggest that the researchers should add more constructs to the existing acceptance models related to mobile technology as this kind of technology is constantly evolving and new factors are emerging everytime.

Against this backdrop this paper aims primarily to investigate the factors influencing the adoption of technology among the farmers in Bangladesh. The underlying purpose of doing so is to allow a better understanding of how to provide useful services to the farmer's community.

1.1 BACKGROUND OF THE STUDY

In Bangladesh, technology adoption practice and implementation began slowly after the 1990s. Some public and private organizations such as Department of Agricultural Extension (DAE) Bangladesh Water Development Board, Bangladesh Hoar & Wet lands Development Board, Bangladesh Bureau of Statistics, Bangladesh Meteorological Department, Service Oriented Architecture, Directorate of Land Record and Survey and Local Government Engineering Department are using technology adoption system for maintaining their information system. However, the current situation in Bangladesh in terms of knowledge management practices as well as in technology and innovation is not very outstanding compared to highly developed countries. According to Global Competitiveness Report for 2014-2015, Bangladesh hold position 109" for information and technology uses, Firm-level technology absorption 111 positions, Business-to-business Internet user 130 positions, Business-to-consumer Internet user 124 positions among the 144 countries (Schwab et al., 2015). In case of individual using Internet 128 rank, these statistics indicate that Bangladesh hold below the standard of network readiness or acceptance of comparative to other less income country and economic impacts of acceptance of technology or ICT only 7.3% (Osorio et al., 2016). Siddike, Kalam, and Munshi (2012) discuss major challenges face Bangladeshi farmer for successful implementation of technology is remove psychological barriers. For that

reason, to adoption of the technology successfully for getting the benefit from this system, every farmer requires to accept the technology in Bangladesh like other developed countries (Akhavan et al., 2006). So far, there has been a few research carried out identify factor influencing on adoption of technology in less developing and developing country(Sillah et al., 2014; Kale et al., 2005). Most of the empirical research conducted in the developed country (Islam et al., 2010). However, researchers found that only one empirical research carried out on the adoption of technology in Bangladesh (Mursalin, 2012). But this research paper conducted Bangladeshi farmer perspective based on RUTAM model. Moreover, Venkateshet al. (2003) suggest that TAM's ability to explain the adoption and usage of new technology could be enhanced by extending or combining it with other theories or models to account for more potentially important factors that might affect end-users' behavioral intention (Marsan et al., 2012; Money et al., 2004). For that reason, increasing predicting power of TAM adds some external factors from Technology adoption model.

1.2 RESEARCH OBJECTIVES

This paper explores the factors influencing the adoption of Technology in developing country like Bangladesh. The second objective of the study is to develop an extension of the RATAM model for investigating farmer's acceptance of Technology. The third objectives empirically test the impacts of individual factor and organizational factor on performance expectancy of Technology usages in Bangladesh. The fourth objective is to investigate external inspiring factor, Technology characteristics on usages behavior directly. Previous study those variables showed the mediating relationship between usages behavior in the developed country. The fifth objective is to consider the perceived usefulness as an external factor with existing literature to explain employee behavioral intention to use the technology based on Bangladesh context. Finally, the findings provide awareness for the farmer in order to effectively and efficiently practice the technology intheir respective field. Also, researcher's findings help to overcome the shortcomings relating to prior studies in the area of technology adoption.

1.3 RESEARCH QUESTIONS

The following research question is formulated in this study based on objectives:

- What are the key factors influencing farmer's acceptance and diffusion of Technology in Bangladesh?
- How do Technology Acceptance Model (TAM) integrate to study those factors in Bangladesh context?
- What are the impacts of individual factors and organizational factors on performance expectancy of Technology usages in Bangladesh?
- What are the empirical findings that suggest the factors with associated variables especially relevant to rural people in developing regions?

CHAPTER II

REVIEW OF LITERATURE

Technology adoption is the decision of a group or individual to make use of an innovation. Beal and Bohlen (1967) state that people accept new ideas through a series of complex mental processes in which adoption is the final action. Rogers (2010) shows technology diffusion in a global perspective to match a classical normal distribution curve which can be explained by the demographic and psychographic characteristics of the adopter.

The Technology Acceptance Model (TAM; by Davis in 1989) as shown in Figure 1, initially developed for new end- user of information systems for organizations, is one of the most influential models in the study of technology use. TAM explains the factors influencing the behavior of an individual regarding accepting and using new technology. Perceived usefulness (PU) is the key determinant of acceptance, meaning the user's subjective probability that using a specific application system will increase his or her job performance within an organizational context. Perceived ease of use (PEU) is the degree to which the user expects the target system to be free of effort. Together, PU and PEU determine the attitude of a person towards using the system. Finally with the influence of PU and Attitude, Behavioral Intention (BI) influences the actual use of the system. However despite its robustness across populations, settings and technologies, Davis later identifies the following key limitations of TAM.

- Static, cross-sectional, snapshot-oriented (individual level of analysis and limited span across causal chain).
- Emphasis on controlled, conscious processing (exclusion of automatic processing and overlooking multitasking).
- Limited account of social processes (knowledge collaboration and collective processes).

Malhotra and Galletta (1999) argue that TAM is incomplete as it does not account for social influence in the adoption of new information systems, and therefore suggest considering the effect of social influence on the commitment of the user.

Furthermore, Mathieson et al.(1982) remarks that TAM has limitations in assuming that usage is voluntary and free of barriers that would prevent individuals from using. Inclusion of social influence was indeed the motivation for TAM-2, proposed by

Venkatesh and Davis. TAM-2 provides a detailed account of the key forces of the underlying judgments of perceived usefulness, explaining up to 60% of the variance in this important driver of usage intention.

The Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. is a further development which combines some major theories (e.g. TAM, Theory of Planned Behavior, and Innovation Diffusion Theory) from the IS literature. The model has three direct determinants of intention to use and two direct determinants of use behavior (intention and facilitating conditions). There the intention and facilitating conditions are mediated by experience, voluntariness, gender, and age. Venkatesh et al. (2013) suggest that given that UTAUT explains as much as 70 percent of the variance in intention, it is possible that we may be approaching the practical limits of our ability to explain individual acceptance and usage decisions in organizations.

2.1 REASONS FOR SELECTING TAM

TAM- A Conceptual Research Model

Based on the review of a number of theories pertinent to technology acceptance in general and mobile technology in particular, we have developed a conceptual research model for the research objectives as stated. This conceptual model which can be known as the RUTAM – Rural Technology Acceptance Model, incorporates most of the major and commonly used factors in a summarized fashion.

A simplified version of RUTAM is also presented. So far, the Rural Area Technology Acceptance and Diffusion of Innovation Model (RuTADIM) proposed by Lu and Swatman is the only model focusing on rural context, but it is devised in a developed country context. RuTADIM was developed specifically to investigate acceptance of mobile technology and the likely diffusion of a project called MobiCert in rural areas of South Australia. Although RuTADIM is not tested beyond the context in which it was developed, we have considered the two new external variables it proposes: Rural connectivity and Access and Response time under the facilitating conditions in RUTAM.

It can be noticed that RUTAM is strongly influenced by the original TAM. The prevailing models express different views of the relations among the factors we adopted. Following the most recent models, we adopted a social approach in RUTAM, assuming that social influence is more important than technology itself. This is contrary to the original TAM but consistent with most of later models. Following that assumption, we tentatively distinguished between external and individual factors influencing PU and PEU.

Next we briefly describe the conceptual model RUTAM and the factors to be analyzed under each of the proposed constructs based on the literature pertinent to the use of new technology (e.g. mobile phones, internet and apps) and system.

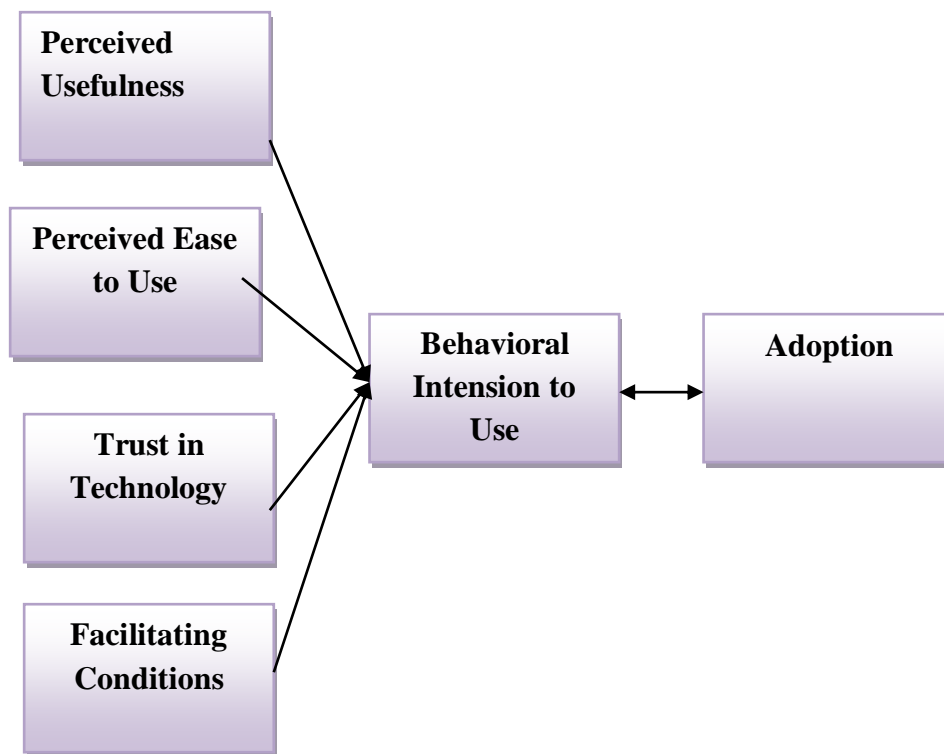


Figure 1: Proposed Technology Acceptance Model

2.2 PERCEIVED USEFULNESS (PU)

Perceived Usefulness (PU) is one of the independent constructs in the Technology Acceptance Model (TAM). It is the degree to which a person believes that using a particular system would enhance his/her job performance (Davis, 1989). One of the six key variables in the technology acceptance model. PU directly influences both attitude toward systems use and behavioral intention to use the system. PU is influenced by perceived ease of use.

Perceived usefulness (PU) is the most cited factors that influence the attitude and behavioral intentions of a person. This factor is most significant in technology service usages. The following is a list of common factors related to PU as cited by many studies technologies:

- Job relevance
- Mobility
- New possibilities
- Enjoyment
- Convenient/time saver
- Productivity (save money and make more money)
- Indispensable for business

2.3 PERCEIVED EASE OF USE (PEU)

Perceived ease-of-use (PEU) – Davis defined this as the degree to which a person believes that using a particular system would be free from effort" (Davis 1989). If the technology is easy to use, then the barriers conquered. If it's not easy to use and the interface is complicated, no one has positive attitudes towards it.

With regard to the usage of technology. Kwon and Chidambaram (2010) find that PEU has significant effects on users' extrinsic and intrinsic motivations, while apprehensiveness has a negative effect on intrinsic motivations. Gefen and Straub argue that the importance of PEU is related to the nature of the task an individual is facing. PEU, therefore, directly affects the adoption of technology, such as a mobile phone, internet when the person's primary task is to be done via such device. It is

therefore also suggested that PEU is affected by actual use of the technology (i.e. after adoption), though the effect diminishes with the frequency of usages over time.

2.4 FACILITATING CONDITIONS

Facilitating Conditions (FC) is the degree to which an individual believes that an organizational and technical infrastructure exist to support the use of a system (Venkatesh et al., 2003). Seneler et al., (2009) describe FC as the support given to the users while interacting with the technologies, like learning the technology from a friend. Jain and Hundal (2006) argue that the choice of service provider is affected by the facilitating factors such as network coverage, service quality, easy availability of subscriptions and bill payment centers. The following list of variables is commonly found relevant to technology which can broadly be categorized as the facilitating conditions.

- Rural connectivity & access time
- Technological infrastructure
- Quality and availability of support services
- Market structure and mechanism
- Tax policy and distribution channel
- Modes of payments

2.5 TRUST IN TECHNOLOGY

Trust is defined as the willingness of a party to be vulnerable to the actions of another party based on the expectation that the latter one will perform particular actions . After having identified the concept of trust as a key success factor in technology acceptance, it makes trust become a much concerned forefront direction in the area of acceptance research. Bélanger (2011) explored trust in technology services and Gefen et al. studied the role of trust in on adoption. Further, Watzdorf et al., (1998) found that the impact of trust on intention to use is insignificant in mobile and smart device applications. Last but not least, Chandra (2008) illustrated that building sufficient trust in mobile payment system is imperative for its adoption. The difference in results probably attributes to different samples and objects. In this research, we would like to further explore the importance of trust towards technology services adoption in Bangladesh.

2.6 BEHAVIORAL INTENTION AND USE

Attitude, as a significant factor in the process of adoption, is found in the original studies of TRA and TAM but has been excluded from many other studies, even the later versions of TAM.

Where social norms and perceived usefulness are strong, a person's innate unfavorable attitude may disappear and behavioral intentions will become more consistent with the social trends in a certain time and context. As subsequent action for adoption is concerned, Sarker and Wells (2003) find continuity of use over time and resource commitment as the two outcomes, while some other studies describe these two as actual use.

2.7 INDIVIDUAL CHARACTERISTICS

Sultan and Chan (2000) argue that individual characteristics are more significant than technology properties in the technology adoption process in general. On the other hand, Wei and Zhang find that in the rural context psychological factors in adopting a new technology and mobile phones in particular are less significant than behavioral factors. Such a phenomenon in a rural setting is probably the social influence on the adoption process which is stronger than individual characteristics. Gatignon and Robertson (1985) suggest that information processing capability is a factor that separates the adopters from the non-adopters. This capability is framed by the individual's extent of observe ability or awareness innovativeness and past adoption or usages experience. Compatibility or apprehensiveness which is also an important determining factor, depends not only on a person's age, education and income but also on the relevance of the new technology with the task or job in a given time and place.

2.8 DEMOGRAPHIC FACTORS

There are a good number of studies describing the importance of the demographic context in use and adoption of new technology.

According to those studies, variables that are important in this category are:

- Gender

- Age group (years)
- Education
- Income (BDT/Month)
- Past experience

Age is one of the most discussed demographic factors in the technology adoption literature. However, Mallenius suggests that the keyword should not be age, but rather, functional capacity which addresses the capacity to use technology and services. Richardson et al. find, in a study on a Village in Bangladesh, that higher expenditures for better service are more likely to come from younger users aged 20 to 30, an age group that would more likely be receptive to a wider range of services. Similarly, the Jain and Hundal (2007) study among the rural people of India reveals that the majority of the users (62 %) of technology are within the age group of 20 to 40. Considering the impact of culture on human behavior, Phillips et al. argue that cultural affinity has a positive influence on technology adoption through perceived ease of technology use and therefore it is highly correlated with demand for products and services. On the other hand, Biljon and Renaud find that mobile phone technology uses have a unique set of cultural dimensions that do not necessarily correspond to the culture that exist in human-human relations.

DiMaggio and Cohen (2005) explain the positive correlation between the level of income and timing of adoption of new technology. He finds that availability of a technology infrastructure shapes inequality by place of location (urban versus rural) that makes income more important. Similarly, Kalba argues that adoption of certain technology attributes or alternatives depends on the level of household income over time. Furthermore, the rate of income depends on the type of occupation and therefore it is an important factor for the urgency and relevance of adopting a technology at a given time and within a specific cultural framework.

Education and income are closely related the more educated a person is, the greater is the likelihood of a high income. Also, more educated people are better able to learn and use new technology and hence they are more likely to be innovative. With respect to farmers, Fuglie and Kascak (2001) find that diffusion of new technology among this community is relatively slow due to their low education level. Yet, the Jain and Hundal (2006) study on rural India exhibits that a majority of the technology adopters have education level below class 10.

CHAPTER III

MATERIALS AND METHODS

3.1 RESEARCH DESIGN

This is an interpretive study aiming to investigate the factors influencing adoption of technology among the farmers in Bangladesh for a broader purpose of offering a better understanding of how to provide useful information services to the rural communities in the developing regions as part of the process of overall rural development. This approach is particularly relevant to this study as it is aimed at producing an understanding of the context of the information system i.e. using and adopting technology and the process whereby the information system influences and is influenced by the context. Furthermore, the inductive thinking process in interpretive research provides a hypothesis with a goal not only to conclude a study but to develop ideas for further study.

This paper investigates the situation by means of a mix of qualitative and quantitative data where the researchers are, as required, directly involved in the process of collecting and analyzing the data. In this case, one of the researchers was a passionate participant while the other one was a distant observer. This participant observation approach with a sense of detachment helped to achieve comprehensive insights about the social settings of the farmers in Bangladesh.

3.2 DATA COLLECTION

Secondary data was collected by means of a literature search and by analyzing the contexts and existing theories as advised by Walsham. In this case, both academic and general search engines were used. A “snowball” approach for locating relevant papers was also employed by checking the lists of references of the relevant papers found. For the empirical part of the study, we conducted several surveys over the period between August, 2019 and September, 2019 in rural Bangladesh, primarily to understand the agricultural market information systems and the use of technology by the rural inhabitants, particularly the farmers. Survey was aimed at an overall understanding about farmers and agricultural marketing channels of Bangladesh and at evaluating the effectiveness of agricultural market information and technology. The technology based agriculture market information system (AMIS) designed for the farmers in two remote

villages in Bhaluka and Trishal Upzila of Mymensingh district of Bangladesh. The questionnaires used had sections on demographic characteristics, perceived usefulness, perceived ease to use, behavioral intention to use, trust in technology including methods and produce, information and market needs and habits, and views and preferences regarding media and communication technology. There were structured as well as open-ended questions. To allow comparison, several questions were identical across the surveys. As many farmers are illiterate, the questionnaires were completed by the interviewers. In addition to the questionnaires, data was collected by the first author by means of observations, interviews and conversations with the farmers, and face to face discussions with the relevant actors in natural and formal settings resident closely acquainted with the farmers in Bangladesh.

3.3 DEMOGRAPHIC AND OTHER INFORMATION

The demographic characteristics of the respondents (n=70) have been reported below 80% respondent’s male and 20% respondent female who engaged in this study. The majority of respondents have read and writes level education qualification. The graph shows that the average ranges of the respondent’s age were 25 to 35 that indicates middle age employee using Technology more than an elder employee. The respondents have no previous experience of taking this type of survey.

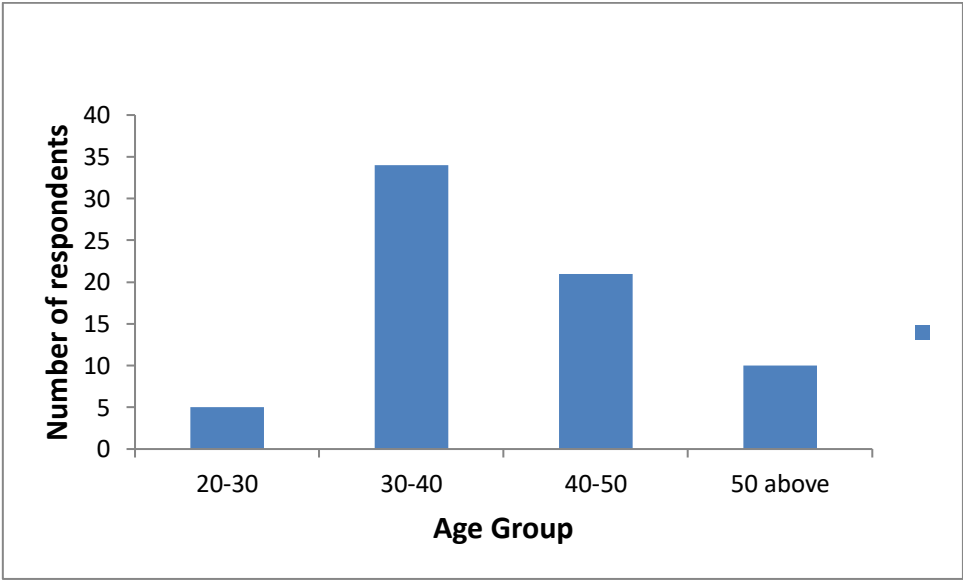


Figure 2: Farmers age group using technology

3.4 DEMOGRAPHIC PROFILE OF THE RESPONDENTS

Table 1: Education, Income, Age group frequency and percentage

Education			Income:(BDT/Month)			Age Group(years)		
Aspects	Frequency	%	Aspects	Frequency	%	Aspects	Frequency	%
No read or write	12	17.14	10000-20000	9		20-30	5	7.14
Read only	23	32.86	20000-30000	42		30-40	34	48.67
Read and Write	33	47.14	30000-50000	13		40-50	21	30
Read up to class 10	2	2.86	50000 above	16		50 above	10	14.29

Table 2: Gender and past experience frequency and percentage

Gender			Past experience		
Aspects	Frequency	%	Aspects	Frequency	%
Female	14	20	First time visitors	100	100
Male	56	80	Repeat visitors	000	000

CHAPTER IV

RESULTS AND DISCUSSION

Prior researchers proposed two steps analytical method of SEM or PLS, which are

Step I: Assessment of the measurement model and

Step II: Assessment of the structural model Analysis of the Measurement Model.

4.1 ASSESSMENT OF THE MEASUREMENT

A PLS model is assessing the measurement properties actually to test item reliability, internal consistency and discriminant validity. Hair *et al.*, (2016) prescribed that convergent validity can be checked by calculating outer loading. Outer factor loadings value above 0.70 or higher are preferred, for exploratory research design, lower thresholds are acceptable but values must not be lower than 0.60 (Henseler *et al.*, 2009). Then again run PLS algorithm then get tested result as shown in Table 3, Composite Reliability values for this study were satisfactory because all values were above 0.70. Recently, researchers used the composite reliability (CR) and Cronbach's alpha for estimating reliability or internal consistency based on latent variables in PLS structural equation models(Wong, 2013). Henseler *et al.*, (2009) suggested that in experimental research, 0.60 to 0.70 is considered acceptable values. The tested result showed that composite reliability (CR) value above 0.70. The calculated value CR (range from 0.809 to 0.910) and Cronbach's Alpha CA ((range from 0.653 to 0.856) which are more than the accepted values.

TABLE 3: CONVERGENT VALIDITY AND RELIABILITY

Items	Cronbach's Alpha	Composite Reliability(CR)	Average Variance Extracted (AVE)
Adoption	0.748	0.856	0.666
Behavioral Intention	0.645	0.809	0.591
Facilitating Conditions	0.804	0.910	0.835
Perceived Usefulness	0.784	0.862	0.612
Perceived Ease	0.747	0.840	0.572
Trust in Technology	0.653	0.852	0.742

Consequently, Convergent validity can also be checked by calculating average variance extracted (AVE). Ahlemann (2010) recommended that each constructs' average variance extracted (AVE) is 0.50 or higher are acceptable for evaluating convergent validity. AVE values our study stands from 0.572 to 0.742 which are more than 0.50. Therefore, both validity and reliability analyses suggest that these constructs are valid and reliable for further advanced study.

TABLE 4: DISCRIMINATE VALIDITY AND CORRELATIONS (FORNELL-LARKER CRITERION)

Items	Adoption	Behavioral Intention	Facilitating Conditions	Perceived usefulness	Perceived Ease	Trust in Technology
Adoption	0.816					
Behavioral Intention	0.667	0.769				
Facilitating Conditions	0.633	0.637	0.914			
Perceived Usefulness	0.568	0.677	0.450	0.782		
Perceived Ease	0.630	0.707	0.645	0.524	0.757	
Trust in Technology	0.364	0.371	0.482	0.352	0.556	0.861

Hair, Black, Babin, Anderson, and Tatham (2007) refers to discriminant validity is a measurement that verifies whether each construct is unique. Evaluating discriminant validity result for empirical study, the AVE for each construct should be greater than the squared correlations of the construct and other constructs in the model. Table III, showed that, their items all load higher on their own construct than on other constructs in the model. Therefore, discriminant validity result indicates that the further strength of discriminant validity presence our current studies. All correlation coefficients are the positive value and it more than 0.70 and significant at level 0.01. Moreover, it validates that the constructs met the criteria.

4.2 ASSESSMENT OF THE STRUCTURAL MODEL

PLS have developed two nonparametric approaches to test the relationship between variables: either jackknife or bootstrap techniques (Goodhue et al., 2006). In this study, the bootstrap technique is used for data analysis. The results of the study reveal that tested the extended TAM model explain 66.9% of the variance in intention to use technology and 44.5 % of the variance in actual use of technology by the farmer.

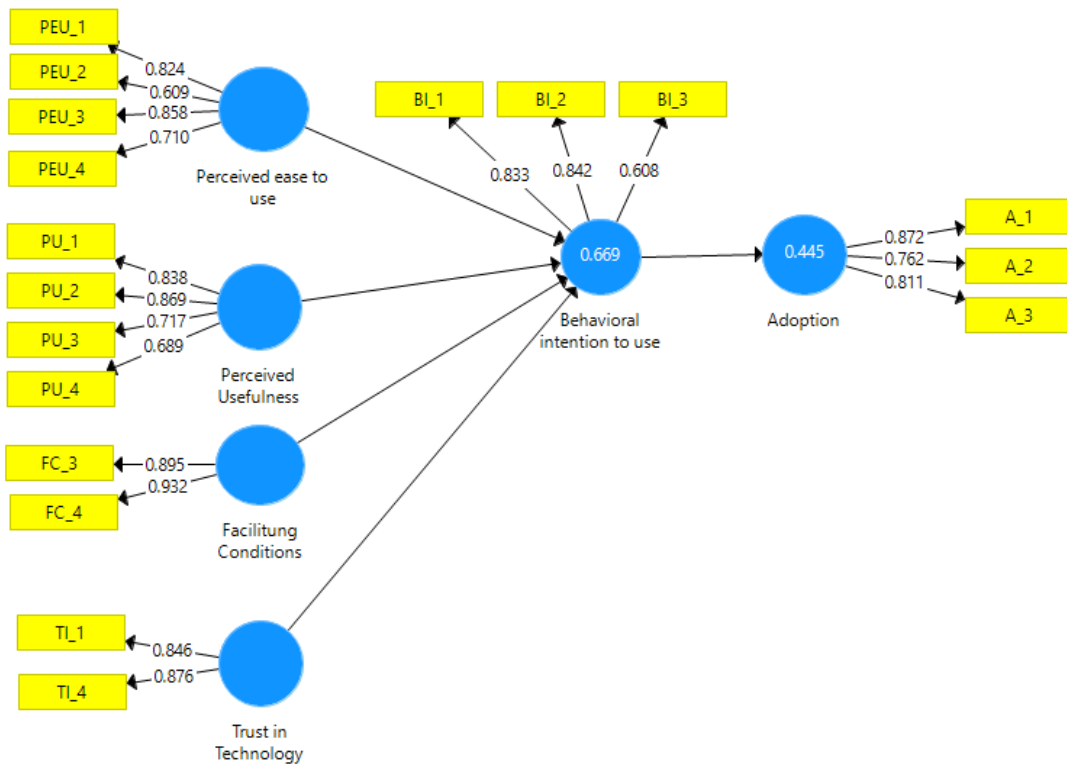


Figure 3: Tested result of proposed model

Wong (2013) noted that path coefficient valued at approximately .670 substantial, values around 0.333 average, and values of 0.190 acceptable and lower weak. Therefore, our proposed model path coefficient valued averagely acceptable. On the other hand, in the extended model, our study has found that supported Hypothesis 1, 2 4 and others Hypothesis 3, 5 were found not supported. The summary of the study bootstrapping analysis presented in the Table -4 and presented the figure- 3 PLS analysis results of the extended model.

Table 5: Summary of Bootstrapping Results (BeTa)

No.	Hypothesis Path	Path Coefficient (SD)	T Values	P Values	Result
H1	Behavioral Intention -> Adoption	0.088	7.594	0.000	Supported
H2	Facilitating Conditions -> Behavioral Intention	0.109	2.363	0.019	Supported
H3	Perceived Usefulness -> Behavioral Intention	0.099	3.948	0.000	Supported
H4	Perceived Ease -> Behavioral Intention	0.117	3.404	0.001	Supported
H5	Trust in Technology -> Behavioral Intention	0.104	1.709	0.281	Not supported

$p < 0.05^*$ ($t > 1.645$) significant, $P < 0.01^{**}$ ($t > 1.96$) Very significant, $P < 0.001^{***}$ ($t > 2.58$) Extremely significant.

4.3 HYPOTHESIS DEVELOPMENT

A conceptual model for the current study was developed with the help of UTAUT model and TAM model. Proposed model includes four factors as predictors of farmer's behavior intention to use Technology and one factor as predictors of farmer's adoption of technology

4.3.1 BEHAVIORAL INTENTION

Behavioral intention is defined as the degree to which a person has formulated conscious plans to perform or not to perform some specified future behavior (Warshaw & Davis, 1985), and there might appear a lot of factors possibly influencing farmer's behavioral intention to use the Technology in their firm.

Understanding the farmer's behavioral intention to use the technology appears as a critical issue not only to enhance the use of the technology, but also to demonstrate their possible effects. According to Yi and Hwang (2003), self-efficacy operates at two distinct levels: (a) the general computing level and (b) the specific application level, which could be exemplified with the utilization of the technology. When this system useful in their job.

In this study, the research result supports the hypothesis H1 that states that effect of Behavioral Intension (BI) on Adoption was significant and strong and that definitely reflects the perceived benefits obtained from using Technology by the Farmers. The relationship between Behavior intention (BI) and Adoption has supported the cases of extending model ($\beta = 0.088$, $p = 0.000$). This study suggests that they the employees intent to usage more Technology.

Hypothesis 1: Behavioral intension will have a significant positive influence on adoption and usages technology.

4.3.2 FACILITATING CONDITIONS

Facilitating conditions means the degree to which an individual believes that an organization have enough technical support and infrastructural facility for using the new information system (Venkatesh et al., 2003). Facilitating conditions this construct contains four items which come from the PC Utilizations 3 items, the Theory of Planned Behaviour 1 item. Mosweu, Bwalya, and Mutshewa (2016) summarized that the availability of enough resources smooth to exercise more technology. Several studies have revealed that facility condition directly influences on usages behavior (Alazzam et al., 2015; Alhirz et al., 2015; Lescevic et al., 2013; Venkatesh et al., 2003). Even though, the researcher found no experimental study based on how facilitating conditions influence on usages behavior of Technology in Bangladesh (Mursalin, 2012) .Thus, our second hypothesis is:

Hypothesis 2: Facilitating conditions will have a significant positive influence on usages technology.

4.3.3 PERCEIVED USEFULNESS (PU)

Perceived Usefulness (PU) is one of the independent constructs in the Technology Acceptance Model (TAM). It is the degree to which a person believes that using a particular system would enhance his/her job performance (Davis, 1989).

One of the six key variables in the technology acceptance model. PU directly influences both attitude toward systems use and behavioral intention to use the system. PU is influenced by perceived ease of use.

Akbar (2013) suggests that a Technology must ensure that farmers can do what they want to do with the system for achieving their target. Oye et al. (2012) indicated that using technology improve users working performance and efficiency. Xu and Quaddus (2013) suggested that technology reduces cost, enhance farmers performance. Previous many research reports that perceived usefulness was a significant forecaster of behavioral intention for using information system (Xu et al., 2013, 2012; Keong et al., 2012; Oye et al., 2012; Surendran, 2012). But, few researchers conducted the study

based on developing country like Bangladesh (Mursalin, 2012). Therefore, we developed the third hypothesis for our proposed model is:

Hypothesis 3: Perceived Usefulness will have a significant positive influence on behavioral intention to use technology.

4.3.4 PERCEIVED EASE OF USE (PEU)

Perceived ease-of-use (PEU) – Davis defined this as the degree to which a person believes that using a particular system would be free from effort" (Davis 1989).

Perceived ease of use (PEU) is characterized as how much the user utilizes a specific tool, and it is free of effort. Past research has demonstrated that perceived ease of use (PEU) impacts aim in two ways: direct and indirect impact through usefulness of the technology. As indicated by Davis, PEU has impact on behavioral intension to utilize in light of the fact that PU intervene its impact. PEU affect straightforwardly on user's behavioral intention to use the technology. Interacting with the system not require a lot of my mental effort and it find easy to get the system. our findings of the result showed that perceived ease is significant for predicting behavioral intension of the farmers. This outcome ($\beta = 0.117, p = 0.001$). of the result is consistent with the study conducted by who Venkatesh et al. (2003) justified the significant influence of perceived ease on usage's behavioral intention to use technology.

Hypothesis 4: Perceived Usefulness will have a significant positive influence on behavioral intention to use technology.

4.3.5 TRUST IN TECHNOLOGY

The study of trust in the context of technology adoption is one of initial trust formation. Due to the lack of complete information, an individual must make a leap of faith when committing to the new technology. This leap of faith is trust. This study uses institution-based TAM model to link the characteristics of a new technology to the trusting stance of the potential adopter. This trusting stance is then linked to the technology adoption decision to the farmer.

Bélanger explored trust in technology services and Gefen et al. (2005) studied the role of trust in on adoption. Further, Watzdorf et al. (1998) found that the impact of trust on intention to use is insignificant in mobile and smart device applications. Last but not least, Chandra illustrated that building sufficient trust in mobile payment system is imperative for its adoption. Study finds that farmers have incapability to trust the security of the internet. Legal/technical infrastructure is insufficient in protecting information. Furthermore trust computers when use them in farming purpose are not satisfactory.

Hypothesis 5: Trust in technology will have an insignificant negative influence on behavioral intention to use and adopt the technology.

CHAPTER V

FINDINGS

This section has discussed the results of the proposed research model presented by extending TAM model. The major aim of this study investigates the factors influencing on the usages behavior of Technology. In this study, the research result supports the hypothesis H1 that states that effect of Behavioral Intension (BI) on Adoption was significant and strong and that definitely reflects the perceived benefits obtained from using Technology by the Farmers. The relationship between Behavior intention (BI) and Adoption has supported the cases of extending model ($\beta = 0.088$, $p = 0.000$). This study suggests that the employees intent to usage more Technology when this system useful in their job (Xu & Quaddus, 2012). The result indicates that facilitating conditions has a positive and significant relationship with behavioral intentions to usage Technology by the farmers in Bangladesh ($\beta = 0.109$, $p = 0.019$). This result was also supported by various previous research findings and models to identify end-users' usage intention in the field of technology acceptance by the employees (Krstic & Petrovic, 2012). This study indicates that the relationship between trust in technology and behavior intention was not supported by the data ($\beta = 0.104$, $p = 0.281$). This study has shown that farmer's adoption of technology is higher when they feel they are getting the better benefit, doing their task effectively. The further finding also revealed insignificant impact perceived usefulness on behavioral intention by the farmers in Bangladesh. This result perceived usefulness on behavioral intention ($\beta = 0.099$, $p = 0.000$) also contradicts with the model's Theory of Planned Behavior and TAM. In addition, our findings of the result showed that perceived ease is significant for predicting behavioral intension of the farmers. This outcome ($\beta = 0.117$, $p = 0.001$). of the result is consistent with the study conducted by who Venkatesh *et al.*, (2003) justified the significant influence of perceived ease on usage's behavioral intension. Furthermore, the result showed that organizational factor no influential power on performance of technology, which was consistent with the finding of Xu and Quaddus (2000). The findings suggest that a knowledge-friendly culture enriches the predictive power of usages technology by the farmers in Bangladesh. On the other side, the outcome of analysis found that behavioral intention has a significant influence on usages behavior of the employees also supported by previous studies.

5.1 IMPLEMENTATIONS

5.1.1 THEORETICAL IMPLEMENTATIONS

The present study aims to integrate two behavioral intentional models into a unified theoretical model that captures the essential elements of both models. This research developed and tested a comprehensive integrated model of UTAUT model and TAM model for predict employee usages behavior of Technology in the context of Bangladesh. In addition, this study first time identifies individual factors relationship with Adoption. On the other hand, the tested result indicated the partial validity of TAM model. From TAM model facilitating conditions and perceived ease to use have significant influence on behavior intention of usage technology. In addition, adoption and behavior intention positively influence on Technology usage behavior.

5.1.2 PRACTICAL IMPLICATIONS

To be best of author knowledge UTAUT model and TAM model factor tested separately in the different developed country. Therefore, this model provides guideline for empirically test this model in the developing country to predict the farmer's adoption of technology. The tested result indicates social influence have no influence on behavioral intent of using Technology in Bangladesh. Organizational factor has less important on adoption in context of developing country. Moreover, external pressure and perceived risk play no significant role in using technology.

5.1.3 MANAGERIAL IMPLICATIONS

Our result from proposed model also gives managerial implication for farmers. The tested result proved that farmers usages behavior influence by the technology. The empirical result showed the convergent validity and discriminate validity all latent variables. For that, reason integrated UTAUT and TAM model factors can successfully utilize for identifying factor-influencing adoption of new technology in their organization. Moreover, this study helps farmers to set up policies for ensuring continues technology in their agricultural land and reduce shortcoming of technology acceptance perceived risk barrier.

CHAPTER VI

CONCLUSION

This paper has explored earlier theories and models on technology adoption, perception and diffusion and summarized them into a conceptual research model, which has not been done before so comprehensively. We have detailed and rationalized the factors by means of empirical data and studies related to rural Bangladesh. The conceptual model populated with some factors as presented here can be useful for policy makers, service and technology designers and marketers, and researchers having particular interest to serve rural communities in developing regions. This research proposed to explain the factors of farmer's adoption behavior of technology by using integrated UTAUT model with the TAM model in Bangladesh. This study identified behavioral intention to use, facilitating conditions, and perceived ease to use variables that are more dominant than other factors on technology adoption by the farmers in Bangladesh. However, the findings present a support to the existing theoretical links of UTAUT model and TAM model, as well as to the ones that were newly hypothesis in this study. These studies provide new effective assessment measures of adoption of technology by the farmers. To provide a practical contribution to organizations and farmers by offering a tool that enables the farmers to plan of adoption both effectively and successfully, to improve performance, competitive advantage and to enhance their work.

LIMITATION AND DIRECTION OF FUTURE RESEARCH PERSPECTIVE

Limitation of our study is of course that we have not provided any formal testing of the TAM. We have provided empirical findings to validate the contents and the logic of it based on relatively a small sample size. In fact, the present version of RUTAM is a hypothesis which can be considered as the first step of extending the prevailing TAM, specially fitted for rural people in poor countries. However, this study has offered the valuable contribution to Technology adoption behavior literature; there are some limitations as most field surveys suffered.

In this case, a formal testing in a larger sample would be one direction of future research. Strictly speaking we are not generalizing the results, but we still believe that the findings can be used, with caution, in other countries having similar socio-economic and technological contexts.

REFERENCES

- A. D. Andrade, (2009). "Interpretive Research Aiming at Theory Building: Adopting and Adapting the Case Study Design". *The Qualitative Report*, vol. 14, no. 1, pp. 42-60.
- A. Jain and B. S. Hundal, (2007) "Factors Influencing Mobile Services Adoption in Rural India". *Asia Pacific Journal of Rural Development*, vol. 17, no. 1, pp. 17-28.
- A. R. Khan, R. W. Rochat, F. A. Jahan, and S. F. Begum, (1986) "Induced abortion in a rural area of Bangladesh". *Studies in Family Planning*, vol. 17, no. 2, pp. 95-99.
- A.A. Adesina and J. Baidu-Forson, (1995) "Farmers perceptions and adoption of new agricultural technology: evidence from analysis in Burkina Faso and Guinea". *West Africa Agricultural Economics*, vol. 13, pp. 1-9.
- A.K. Kalba, (2006) "The Adoption of Mobile Phones in Emerging Markets: Global Diffusion
- Abiagam, B., &Uoro, A. (2012). Knowledge Management Adoption and Culture in the Hospitality Industry of Nigeria. *Computing & Information Systems*, 16(1), 1-16.
- Abubakar, F. M., & Ahmad, H. B. (2013). The Moderating Effect of Technology Awareness on the Relationship between UTAUT Constructs and Behavioral Intention to Use Technology: A Conceptual Paper. *Australian Journal of Business and Management Research*, 3(2), 14-23.
- Ahlemann, F. (2010).Structural equation modeling in information systems research using partial least squares.*Journal of Information Technology Theory and Application*, 11(2), 5- 40.
- Akbar, F. (2013). What affects students' acceptance and use of technology? A test of UTAUT in the context of a higher-education institution in Qatar.Senior Honors Thesis, Information Systems, Dietrich College, Carnegie Mellon University, USA.

- AKER, J.C. (2010): Dial 'A' for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries. Center for Global Development, Washington, DC.
- Akhavan, P., Jafari, M., &Fathian, M. (2006). Critical success factors of knowledge management systems: a multi-case analysis. *European business review*, 18(2), 97-113.
- Al Mursalin, M. J. (2012). Information system adoption and usage: Validating UTAUT model for Bangladeshi SMEs. *International Journal of Management, IT and Engineering*, 2(10), 15-24.
- Alavi, M. L., Dorothy E. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues. *M/S quarterly*,25(1), 107-136.
- Alavi, M., Leider, D. (1999). Knowledge management systems: Emerging views and practices from the field. In *Systems Sciences, 1999.HICSS-32. Proceedings of the 32nd Annual Hawaii International Conference on* (pp. 8-16).
- Alazzam, m. b., basari, a., sibghatullah, a. s., doheir, m., enaizan, o., &mamra, a. (2015). EHRS Acceptance in Jordan Hospitals By Utaut2 Model: Preliminary Result. *Journal of Theoretical and Applied Information Technology*, 78(3), 473-482.
- Alhirz, H., Sajeev, A. S. M. (2015). Do cultural dimensions differentiate ERP acceptance? A study in the context of Saudi Arabia.*Information Technology & People*, 28(1), 163- 194.
- Allahyari, A., Ramazani, M. (2012).Studying Impact of Organizational Factors in Information Technology Acceptance in Accounting Occupation by Use of TAM (Iranian Case Study). *ARNP Journal of Systems and Software*, 2(1), 12-17.
- Awuor, F. M., Rabah, K., & Kimeli, K (2013). E-Agriculture framework: Modeling stakeholders' competing and conflicting interests 2013 *International Journal of Agricultural Policy and Research*Vol.1 (6), pp. 172-17.
- B. Kargin and N. Basoglu, (20007) "Factors Affecting the Adoption of Mobile Services". *PICMET Proceedings*, Portland, USA, 5-9.

- Bangladesh Bureau of Statistics (BBS), (2009). Statistical Yearbook. Bangladesh Bureau of Statistics (BBS), Government of Bangladesh, Dhaka.
- Bangladesh Bureau of Statistics & UNESCO, (2008). Bangladesh: Literacy Assessment Survey-2008.
- Bilbao-Osorio, B., Dutta, S., & Lanvin, B. (2016). The global information technology report 2015. Cornell University, World Economic Forum, Geneva.
- C. C. Wong and P. L. Hiew, (2003) "Diffusion of Mobile Entertainment in Malaysia: Drivers and Barriers". *Proceedings of World Academy of Science*, vol. 5.
- C. R. Doss, (2003) "Understanding farm level technology adoption: Lessons learned from CIMMYT's microsurveys in Eastern Africa". *CIMMYT Economics Working Paper*, 03-07. Mexico, D.F.: CIMMYT.
- C. Sinha, (2005) "Effect of Mobile Telephony on Empowering Rural Communities in Developing Countries". *IRFD Conference on Digital Divide*, Tunisia.
- C.O. Seneler, N. Basoglu, and T.U. Daim, (2008) "A Taxonomy for Technology Adoption: A Human Computer Interaction Perspective". *PICMET 2008 Proceedings*, South Africa.
- D. Gefen and D. Straub, (2000) "The Relative Importance of Perceived Ease of Use in IS Adoption: A Study of E-Commerce Adoption". *Journal of the association of information*, vol. 1, no.
- D. Richardson, R. Ramirez, and M. Haq, (2000) "Grameen Telecom's Village Phone Programme: A Multi-Media Case Study". *CIDA*, Canada.
- Davies, M. (2014). Knowledge—Explicit, implicit and tacit: Philosophical aspects. *International encyclopedia of the social & behavioral sciences*, Oxford, England, Elsevier Ltd. 74-90.
- E. R. Hilgard, (1980) "The trilogy of mind: Cognition, affection, and conation". *Journal of the History of Behavioral Sciences*, vol. 16, pp. 107-117.
- E. Rogers, (1995) *The Diffusion of Innovations*. First & Fourth Editions, New York: Free Press.

- F. D. Davis, (2007) "Acceptance of Information Technology: Research Progress, Current Controversies, and Emerging Paradigms". *Workshop on HCI Research in MIS*, Walton College of Business, University of Arkansas.
- Featherman, M. S., & Wells, J. D. (2004). The intangibility of E-services: effects on artificiality, perceived risk, and adoption. In *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on* (pp. 177-187).
- Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International journal of human-computer studies*, 59(4), 451-474.
- G. Hans, (2004) "Towards a Sociological Theory of the Mobile Phone". *In: Sociology in Switzerland: Sociology of the Mobile Phone*. Online Publications, Zurich.
- G. Walsham, (1995) "Interpretive case studies in IS research: nature and method". *European Journal of Information Systems*, vol. 4, pp. 74-81.
- G.M. Beal and J. M., Bohlen, (1956) "The Diffusion Process". *Special Report, Agriculture Extension Service, Iowa State College*, no. 18, pp. 56-77.
- Gallupe, B. (2001). Knowledge management systems: surveying the landscape. *International Journal of Management Reviews*, 3(1), 61-77.
- Goodhue, D., Lewis, W., & Thompson, R. (2006, January). PLS, small sample size, and statistical power in MIS research. In *System Sciences, 2006.HICSS'06. Proceedings of the 39th Annual Hawaii International Conference on* (Vol. 8, pp. 202b-202b).
- H. Gatignon and T.S. Robertson, (1989) "Technology Diffusion: An Empirical Test of Competitive Effects", *The Journal of Marketing*, vol. 53, pp. 35-49.
- H.S. Kwon and L. A. Chidambaram, (2000) "Test of the Technology Acceptance Model, the Case of Cellular Telephone Adoption". *Proceedings of the 33rd Hawaii International Conference on System Sciences, USA*.

- Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). A primer on partial least squares structural equation modeling (PLS-SEM): Sage Publications, United Kingdom.
- Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing (AIM)*, 20, 277-289.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2007). *Multivariate data analysis 7th Edition*. New Jersey: Pearson Education, USA.
- Hossain, M. M., Ouedraogo, N., & Rezania, D. (2013). Student Acceptance of Knowledge Management Systems: Evidence from a Canadian Business School. *International Journal of Business and Management*, 8(12), 29-41.
- Hung, Y.-C., Huang, S.-M., Lin, Q.-P., & Tsai, M.-L. (2005). Critical factors in adopting a knowledge management system for the pharmaceutical industry. *Industrial Management & Data Systems*, 105(2), 164-183.
- Igarria, M., Zinatelli, N., Cragg, P., & Cavaye, A. L. (1997). Personal computing acceptance factors in small firms: a structural equation model. *MIS quarterly*, September, 279-305.
- J. B. Stiff and P. A. Mongeau, (2003) *Persuasive communication* (2nd ed.). USA: Guilford Press.
- J. Donner, (2005) "The social and economic implications of mobile telephony in Rwanda: An ownership/access typology". In P. Glotz, S. Bertschi & C. Locke (Eds.), *Thumb culture: The meaning of mobile phones for society*, pp. 37-52.
- J. Isham, (2000) "The Effect of Social Capital on Technology Adoption: Evidence from Rural Tanzania". *IRIS Center Working Paper*, no. 235.
- J. Lu, J.E. Yao, and C. S. Yu, (2005) "Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology". *Journal of Strategic Information Systems*, vol. 14, no. 3.

- J. V. Biljon and K. Renaud, (2008) “A Qualitative Study of the Applicability of Technology, Acceptance Models to Senior Mobile Phone Users, Advances in Conceptual Modeling – Challenges and Opportunities”. *Lecture Notes in Computer Science*, Germany: Springer, no. 5232, **pp.** 228-237.
- K. O. Fuglie and C. A. Kascak, (2001) “Adoption and diffusion of natural- resource-conserving agricultural technology”. *Review of Agricultural Economics*, vol. 23, no. 2, **pp.** 386-403.
- Kale, D., & Little, S. (2005). Knowledge generation in developing countries: A theoretical framework for exploring dynamic learning in high technology firms. *Electronic Journal of Knowledge Management*, 3(2), 87-96.
- Keong, M. L., Ramayah, T., Kurnia, S., & Chiun, L. M. (2012). Explaining intention to use an enterprise resource planning (ERP) system: an extension of the UTAUT model. *Business Strategy Series*, 13(4), 173-180.
- Khalifa, M., & Alswailem, O. (2015). Hospital Information Systems (HIS) Acceptance and Satisfaction: A Case Study of a Tertiary Care Hospital. *Procedia Computer Science*, 63, 198-204.
- Khraim, H. S., Al Shoubaki, Y. E., & Khraim, A. S. (2011). Factors affecting Jordanian consumers' adoption of mobile banking services. *International Journal of Business and Social Science*, 2(20), 118-139.
- Krstic, B., & Petrovic, B. (2012). The role of knowledge management in increasing enterprises innovativeness. *Economics and Organization*, 9(1), 93-110.
- L. Hultberg, (2008) “Women Empowerment in Bangladesh: A Study of the Village Pay Phone Program”. *Thesis: Media and Communication Studies, School of Education and Communication (HLK) Jönköping University*, Spring Term .
- L. Wei and M. Zhang, (2008) “The adoption and use of mobile phone in rural China: A case study of Hubei, China”, *Telematics and Informatics archive*, vol. 25, no. 3, **pp.** 169-186.

- Lescevic, M., Ginters, E., & Mazza, R. (2013). Unified theory of acceptance and use of technology (UTAUT) for market analysis of FP7 CHOREOS products. *Procedia Computer Science*, 26, 51-68.
- M. Fishbein, and I. Ajzen, (1975) *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. MA : Addison-Wesley.
- M. Qingfei, J. Shaobo, and Q. Gang, (2008) "Mobile Commerce User Acceptance Study in China: A Revised UTAUT Model". *Tsinghua Science and Technology*, vol. 13, no. 3.
- M. T. Dishaw and D. M. Strong, (1999) "Extending the technology acceptance model with task-technology fit constructs". *Information & Management*, vol. 36, no. 1, pp. 9-21.
- M.S. Islam, M. E. Uddin, and M.U. Rashid, (2007) "Use of Knowledge System in the Rural Community in Improving Livelihood Status of the Farmers under RDRS". *Journal of Agriculture & Rural Development*, vol. 5, no. 1&2, pp. 167-172.
- Marchewka, J. T., Liu, C., & Kostiwa, K. (2007). An application of the UTAUT model for understanding student perceptions using course management software. *Communications of the ITMA*, 7(2), 93-104.
- Marsan, B., Cassivi, L., & Elia, E. (2012). Factors Influencing the Behavioral Intention of using Enterprise 2.0 Tools as a Knowledge Management Platform Information Sharing - Volume 1: KMIS, (IC3K 2012), (pp 281-284).
- Measuring the Information Society: ICT Development Index (2009)*, ITU- International Telecommunication Union , Geneva: ITU.
- Mobile phone subscribers in Bangladesh* Government of Bangladesh. Bangladesh Telecommunication Regulatory Commission (BTRC). Dhaka, 2010.
- Money, W., & Turner, A. (2004). Application of the technology acceptance model to a knowledge management system. In *System Sciences, 2004. Proceedings of the 37th Annual Hawaii International Conference on* (pp. 9-11pp).

- Morrow, P. C., & Crum, M. R. (1998). The effects of perceived and objective safety risk on employee outcomes. *Journal of Vocational Behavior*, 53(2), 300-313.
- Mosweu, O., Bwalya, K., & Mutshewa, A. (2016). Examining factors affecting the adoption and usage of document workflow management system (DWMS) using the UTAUT model: Case of Botswana. *Records Management Journal*, 26(1), 38-67.
- N. Lu and P.M.C. Swatman, (2009) “The MobiCert project: Integrating Australian organic primary producers into the grocery supply chain”. *Journal of Manufacturing Technology Management*, vol. 20, no. 6, pp. 887-905.
- N. Venkatesh, M. G. Morris, G. B. Davis, and F.D. Davis, (2003) “User acceptance of information technology: Toward a unified view”. *MIS Quarterly*, vol. 27, no. 3, pp. 425-478.
- Nassuora, A. B. (2011). Knowledge sharing in institutions of higher learning. *International Journal of Economics and Management Sciences*, 1(3), 29-36.
- Nickols, F. (2000). The knowledge in knowledge management. *The Knowledge Management Yearbook*, 2000—2001, 12-21. *Independent Business Review*, Volume 10.
- Oye, N., Iahad, N., & Nor, Z. A. R. (2012). The impact of UTAUT model and ICT theoretical framework on university academic staff: Focus on Adamawa State University, Nigeria. *International Journal of Computers & Technology*, 2(2), 81-89.
- P. A. Geroski, (2000) “Models of Technology Diffusion”. *Research Policy*, no. 29, pp. 603-626.
- P. DiMaggio and J. Cohen, (2003) “Information Inequality and Network Externalities: A Comparative Study of the Diffusion of Television and the Internet”. *The Economic Sociology of Capitalism*, Working paper, no. 31.
- P. Kotler and G. Armstrong, (1994) *Principles of Marketing*. Englewood Cliffs, NJ: Prentice Hall.

- Poba-Nzaou, P., Raymond, L., &Fabi, B. (2008). Adoption and risk of ERP systems in manufacturing SMEs: a positivist case study. *Business process management journal*, 14(4), 530-550.
- Prado Tamez, L. E. (2014). The adoption of Knowledge Management Systems in Mexico: A Quantitative Study. (Master's Master's Thesis), Linnaeus University, sweden.
- Prasanna, R., & Huggins, T. J. (2016). Factors affecting the acceptance of information systems supporting emergency operations centres. *Computers in Human Behavior*, 57, 168-181.
- Quaddus, M., &Xu, J. (2005). Adoption and diffusion of knowledge management systems: field studies of factors and variables. *Knowledge-Based Systems*, 18(2), 107-115.
- Ramazani, A., Ramazani, M., &Davirani, S. (2012).Studying Impact of Individual Factors in Information Technology Acceptance in Accounting Occupation by Use of TAM Model (Iranian Case Study). *Global Journal of Management and Business Research*, 12(4),37- 45,
- S. Mallenius, M. Rossi, and V. K. Tuunainen, "Factors affecting the adoption and use of mobile devices and services by elderly people- results from a pilot study". *Proceeding of 6th Annual Global Mobility Roundtable, USA,2007*.
- S. Sangwanand L.F.Pau, (2005) "Diffusion of Mobile Phones in China".*ERIM Report Series*, ERS-2005-056-LIS.
- Sabherwal, R., Jeyaraj, A., &Chowa, C. (2006). Information system success: Individual and organizational determinants. *Management science*, 52(12), 1849-1864.
- Sargent, K., Hyland, P., &Sawang, S. (2012). Factors influencing the adoption of information technology in a construction business. *Construction Economics and Building*, 12(2), 72- 86.
- Saunders, M. N. (2011). *Research methods for business students*, 5/e: Pearson Education India.

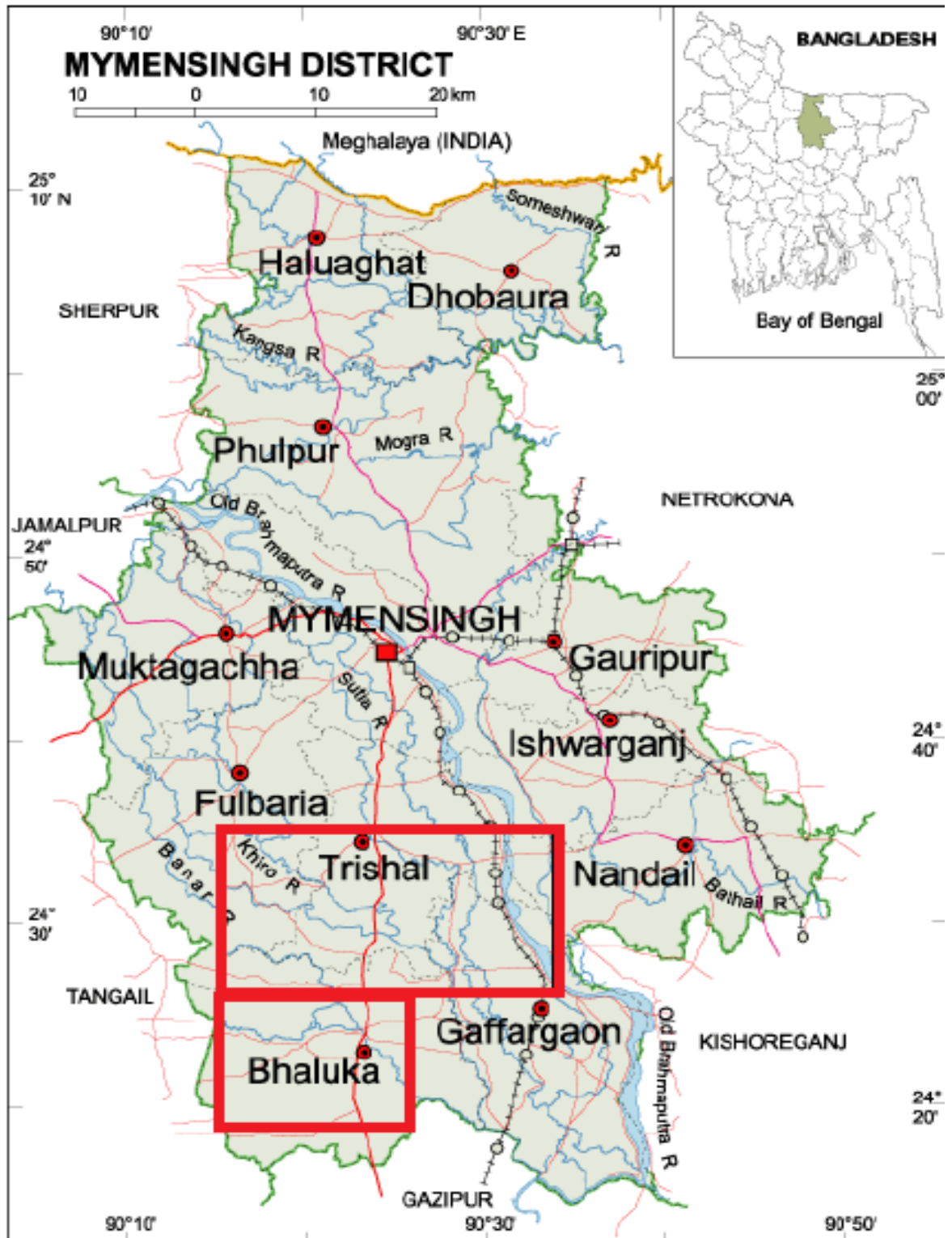
- Schwab, K., Sala, Martin. X., (2015). World Economic Forum's Global Competitiveness Report, Switzerland .
- Sekaran, U. (2006). Research methods for business: A skill building approach: John Wiley & Sons. Hermitage Publishing Services, United States of America.
- Sharifian, R., Askarian, F., Nematollahi, M., & Farhadi, P. (2014). Factors influencing nurses' acceptance of hospital information systems in Iran: Application of the unified theory of acceptance and use of technology. *Health Information Management Journal*, 43(3), 23-28.
- Siddique, M., Kalam, A., & Munshi, M. N. (2012). Perceptions of Information Professionals about Knowledge Management in the Information Institutions of Bangladesh: An Exploratory Study. *Library Philosophy and Practice*, e-journal, 1-10.
- Sillah, A., & Chang, W.W, (2014), Knowledge Management Adoption and the role of HRM: Evidence from The Gambia Public Organizations. *International Conference on Economics, Education and Humanities*, 10-11, Bali (Indonesia), (pp. 179-183).
- Surendran, P. (2012). Technology acceptance model: A survey of literature. *International Journal of Business and Social Research*, 2(4), 175-178.
- Employee Acceptance of Knowledge Management Systems in Bangladesh: 107 Integrating UTAUT and KMS Diffusion Model
- United Nations Department of Economic and Social Affairs (UNDESA), (2009) *“World Population Prospects: Selected Demographic Indicators: Population Division*, UN, New York.
- V. Venkatesh and F.D. Davis, (2000) “A theoretical extension of the technology acceptance model: Four longitudinal field studies”. *Management Science*, vol. 46, no. 2, pp. 186-204.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11(4), 342-365.

- Venkatesh, V., Morris, D., Michael G, & , D. a. F. D., Gordon B. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 27(3), 425-478.
- Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 36(1), 157-178.
- W. J. Orlikowski, (1993) "CASE Tools as Organizational Change: Investigating Incremental and Radical Changes in Systems Development". *MIS Quarterly*, vol. 17, no. 3.
- Wen Chong, C., Holden, T., Wilhelmij, P., & Schmidt, R. A. (2000). Where does knowledge management add value? *Journal of Intellectual Capital*, 1(4), 366-380.
- Wong, K. K.-K. (2013). Partial least squares structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*, 24(1), 1-32.
- Xu, J., & Quaddus, M. (2005a). Adoption and diffusion of knowledge management systems: an Australian survey. *Journal of Management Development*, 24(4), 335-361.
- Xu, J., Quaddus, M. (2005b). A reality-based guide to KMS diffusion. *Journal of Management Development*, 24(4), 374-389.
- Xu, J., Quaddus, M. (2012). Examining a model of knowledge management systems adoption and diffusion: A Partial Least Square approach. *Knowledge-Based Systems*, 27, 18-28.
- Xu, J., Quaddus, M. (2013). Exploring the Role of Size in Use Behaviour of Knowledge Management System: An Australian Study. *The International Technology Management Review*, 3(1), 60-70.
- Y. Li, Z., T. Fu, and H. Li, (2007) "Evaluating factors affecting the adoption of mobile commerce in agriculture : an empirical study". *New Zealand Journal of Agricultural Research*, vol. 50, no. 5, pp. 1213- 1218.

- Y. Lu, Z. Deng, and B. Wang, "An Empirical Study on Chinese Enterprises" *Adoption of Mobile Services*, 1-4244-1312.
- Y. Malhotra and D. F. Galletta, (1999) "Extending the technology acceptance model to account for social influence: theoretical bases and empirical validation". *Proceedings of 32nd HICSS*, pp.6-19.
- Zain, M., Rose, R. C., Abdullah, I, &Masrom, M. (2005).The relationship between information technology acceptance and organizational agility in Malaysia. *Information & Management*, 42(6), 829-839.
- Zhang, X. (2011). Cultural influences on explicit and implicit knowledge sharing behaviour in virtual teams. *International Journal of Computer Science & Information Technology*, 3(4),29-44. *Independent Business Review*, Volume 10.

APPENDICES

Appendix I. Map showing the experimental sites under study



AppendixII: A Measurement Constructs Development

**FARMERS ATTITUDE TOWARDS ADOPTION OF
AGRICULTURE TECHNOLOGY IN BANGLADESH**

INTERVIEW SCHEDULE

SI. No.:.....

Date:.....

Name of the respondent:Village.....

Thana / Upazilla Post Office:.....

District:

Direction: Please check () and rate yourself honestly based on what you actually observe, give the statements using the scale: 5-Over satisfied; 4-Satisfied; 3-Neutral; 2-Dissatisfied; 1-Very Dissatisfied.

No.	Variables name	1	2	3	4	5
1	Perceived Ease to Use					
	My interaction with the system is clear and understandable					
	Interacting with the system does not require a lot of my mental effort					
	I find the system to be easy to use					
	I find it easy to get the system					
2	Perceived Usefulness					
	Using the system improves my performance in my job					
	Using the system in my job increases my productivity					
	Using the system enhances my effectiveness in my job					
	I find the system to be useful					
3	Facilitating conditions					

	Government encourages the use of technology for agricultural information access					
	I believe government will provide training service for using technology					
	I have the knowledge to use technology					
	Having internet access will influence me to use technology					
4	Trust in technology					
	I trust the security of the internet					
	Legal/technical infrastructure is sufficient in protecting my information					
	I trust computers when I use them in farming purpose					
	I trust smart phones when I use them in farming purpose					
No.	Variables name	1	2	3	4	5
5	Behavioral intension					
	I predict I would use technology to access agricultural market information					
	I will recommended others to use technology to access agricultural market information					
	I intend to continue using technology to access agricultural market information in future					
	I intend to use updated version of technology in the future					
6	Adoption					
	I will be reliable to use technology than using the traditional channels like radio, newspapers, magazines, friends,etc.					
	Using technology will be more flexible than the traditional agricultural information access channels					
	Using technology will save time					

Demographic Information

<p><u>Gender</u></p> <p><input type="radio"/> Female</p> <p><input type="radio"/> Male</p>	<p><u>Age group :(Years)</u></p> <p><input type="radio"/> 20-30</p> <p><input type="radio"/> 30-40</p> <p><input type="radio"/> 40-50</p> <p><input type="radio"/> 50 above</p>	<p><u>Education</u></p> <p>No read orwrite</p> <p>Readonly</p> <p>Read & Writeonly</p> <p>I read up to Class.....</p>
<p><u>Past experience:</u></p> <p><input type="radio"/> First time visitors</p> <p><input type="radio"/> Repeat Visitors</p>	<p><u>Income:(BDT)/Month</u></p> <p><input type="radio"/> Less than 10 thousand</p> <p><input type="radio"/> 10-20thousand</p> <p><input type="radio"/> 20-30 thousand</p> <p><input type="radio"/> 30-50 thousand</p> <p><input type="radio"/> 50 thousand above</p>	

Thank you for your nice cooperation.