Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities in Addis Ababa

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This is to certify that the thesis prepared by Nardos Getachew, entitled: Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities in Addis Ababa for the degree of Master of Science *in* Supply Chain Management *complies with the regulations of the University and meets the accepted standards with respect to originality and quality.*

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ABSTRACT

Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities in Addis Ababa

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Addis Ababa University, 2023

Introduction: The electronic Health Commodity Management Information System (e-HCMIS), also known as DAGU, was developed locally to help in improving the health commodity supply chain in Ethiopia. However, there is paucity of information on the acceptability of the system for the end users.

Objective: To investigate pharmacy professionals' acceptance of the e-HCMIS and identify its determinants in public hospitals of Addis Ababa.

Methods: A facility-based cross-sectional descriptive study, following a sequential explanatory mixed method approach with both qualitative and quantitative methods of data collection, was done. The study included 10 public hospitals in Addis Ababa. The quantitative approach used structured questionnaire based on extended Technology Acceptance Model 3 (TAM-3). Key informant interviews were done to clarify and contextualize the quantitative findings. Structural equation modeling with maximum likelihood estimation were used to analyze quantitative data. Qualitative interviews were thematically evaluated.

Results: There were a total of 237 survey respondents, response rate of the study was 96.19%. TAM-3 explained 49.2% of the variance of behavioral intention to use e-HCMIS. The study found that Perceived Usefulness and Perceived ease of use were significant predictors of behavioral intention. Job relevance was a predominant factor for perceived usefulness; perceived enjoyment and computer anxiety were predominant factor for perceived ease of use. The qualitative study revealed perceived usefulness, management support, ownership and perceived ease of use were the major determinants of behavioral intention.

Conclusion and Recommendation: Given the importance of perceived usefulness and perceived ease of use, including a more user friendly design and scaling up the level of application of the system are recommended.

Key words: *e-HCMIS, DAGU, digitalization, acceptance, technology acceptance model*

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Abbreviation and Acronyms

BI:	Behavioral Intention
CANX:	Computer Anxiety
CFA:	Confirmatory Factor Analysis
CPLAY:	Computer Playfulness
CSE:	Computer Self Efficacy
e-HCMIS:	Electronic HCMIS
e-LMIS:	Electronic LMIS
EPSA:	Ethiopian Pharmaceutical Supply Agency
HCMIS:	Health Commodity Management Information System
ICT:	Information Communication Technology
IPLS:	Integrated Pharmaceutical Logistic System
JR:	Job Relevance
JSI:	John Snow Inc.
LMIS:	Logistic Management Information System
MOH:	Ministry of Health
MS:	Management Support
OUT:	Output Quality

PEOU:	Perceived Ease of Use
PENJ:	Perceived Enjoyment
PEC	Perception of External Control
PU:	Perceived Usefulness
RD:	Result Demonstrability
SEM:	Structural Model
TAM:	Technology Acceptance Model
TRA:	Theory of Reasoned Action
TS:	Technical Support
UTAUT:	Unified Theory of Acceptance and Use of Technology

1. Introduction

1.1. Background

Healthcare supply chain is very expensive due to its natural complexity and inability of stakeholders to implement exemplary practice like Information Communication Technology (ICT). In terms of effectiveness and the application of best practices, the healthcare supply chain falls substantially behind supply chains in other industries (Beaulieu and Bentahar, 2021). This complexity and burden of supply chain can be resolved by precise count at every level, and technologies can help and support to gain better visibility and tracking methods (Kokilam, Joshi and Kamath, 2016).

Supply chain costs 25-30% of operational budget of hospitals. Even in hospitals in developed nations like the USA, supply chain costs one third of this operational cost. However, it has been seen that digitalizing supply chain reduce cost and increase revenue by 50% and 20% respectively. In this regard, health care is no exception, Through automating the whole system they can decrease supply chain and inventory cost (Bates, 2002; Mathew *et al.*, 2013). In developing nations where resource is constraint and optimum usage of available resource is mandatory, ICT tools are very crucial to improve health care through availability, accessibility and affordability of the health commodities (Kokilam, Joshi and Kamath, 2016).

In 2009, implementing automated inventory and logistics management information system was started in health facilities. This automation used a software called Health Commodity Management Information System (HCMIS), also known as DAGU, DAGU is an Afar word describing information exchange between people. DAGU is an open access custom

solution developed locally by the USAID for Ethiopia for its health commodity supply chain (Messele, 2020). The implementation of electronic HCMIS (e-HCMIS) called DAGU allowed increased visibility of data at health facilities, improved inventory management, reduced inventory waste and ultimately improved supply chain performance (Mohammed, Mengesha and Hailu, 2020).

Whenever developing such systems, understanding needs and acceptance of end users would be helpful to find the way of future development. User acceptance is key for any continuous applications and improvement of innovation and technology (Malatji, van Eck and Zuva, 2020). Many theoretical models have been developed to explain end user's behavior but Technology Acceptance Model (TAM) developed by Davis is the most widely used one, it is broadly accepted and has to be proven applicable in identifying consumer's willingness to use information and communication technology. The model has been utilized to measure different types of technologies for usage as well as acceptance (Ma and Liu, 2011; Esmat and Mohamad, 2015; Alokgaddi, 2021).

In Ethiopia, researches have been conducted about the practice, implementation, utilization and performance of e-HCMIS. However, there is no study on the acceptance and behavior of pharmacists to use the system. Thus, this study aimed to investigate pharmacy professional's acceptance of e-HCMIS and identify its determinants at Addis Ababa city and federal hospitals based on extended TAM 3 framework.

1.2. Statement of the problem

In most developing countries, particularly sub-Saharan Africa including Ethiopia, the health system is dominated by paper based data collection and storage which tends to generate inaccurate and incomplete data (USAID Deliver, 2011). This has negative impact on the pharmaceutical supply chain, as part of overcoming this challenge e-HCMIS was developed and deployed in Ethiopia. It was deployed in almost all health facilities i.e. all hospitals are automated. But system was seen to be functional in only two third of the health facilities. Studies show that, Ethiopian pharmacists believe and are aware e-HCMIS is time saving, generate accurate data, has minimal data loss and improve efficiency and effectiveness (Bedru, Shukure and Derese, 2019).

Even if there is awareness regarding the use and benefit of e-HCMIS for pharmaceutical supply chain, pharmacists don't fully utilize the system. Generally, the utilization level is not appreciated and less than standard. e-HCMIS is not used properly and significantly for decision making (Bedru, Shukure and Derese, 2019).In parallel, literatures demonstrated that success level of integrated technology to the system highly depend on the level of user acceptance (Taherdoost, 2019; Malatji, van Eck and Zuva, 2020). Pharmacists' acceptance of e-HCMIS is an important determinant of successful implementation of the system. Unlike developed nations where system is successfully implemented and the factors that led to its successful implementation are identified. In Ethiopia, there was a lack of studies that assess the level and determinant of acceptance of e-HCMIS despite its application and benefit.

1.3. Significance of the study

The purpose of the study was to investigate pharmacy professionals' acceptance of the e-HCMIS and identify its determinants in public hospitals of Addis Ababa. The study will give an in-depth understanding of pharmacist perception about the system in use. This will help system developers, hospital administrators and higher level policy makers to develop effective interventions to boost the acceptance rate of the e-HCMIS. The findings of the study will also be useful as inputs for the formulation and application of appropriate policies in order to encourage the effective and efficient use of e-HCMIS.

2. Literature Review

2.1. Theoretical Literature Review

Technology Acceptance Model

The concept ‘use’ is only one indicator of the implemented technology success. User acceptance and adoption can adequately predict individual’s intent to use the technology (Wu, Wang and Lin, 2007). When trying to assess acceptance of the integrated technologies and explain what affects user acceptance, several models and theories have been proposed and used. Researchers have combined these theories and models to carry out their study (Taherdoost, 2018).

Among these TAM is the most widely used model. TAM is popular in predicting use and acceptance of information system by individual users (Al-mamary, Al-nashmi and Ghaffar, 2016). TAM was derived from Theory of Reasoned Action (TRA). TRA was first developed by Fischbein and Ajzen in 1975, for sociological and psychological researches (Venkatesh and Bala, 2008). TRA was the most widely used model and it also was the foundation to investigate individual IT usage (Davis and Venkatesh, 1996). According to the TRA model, any human behavior is explained through three cognitive components. Those are attitudes (unfavorableness or favorableness of person’s feeling for a behavior), social norms (social influence), and intentions (individual’s decision do or don’t do a behavior) (Taherdoost, 2018). TRA model is presented in figure one below.

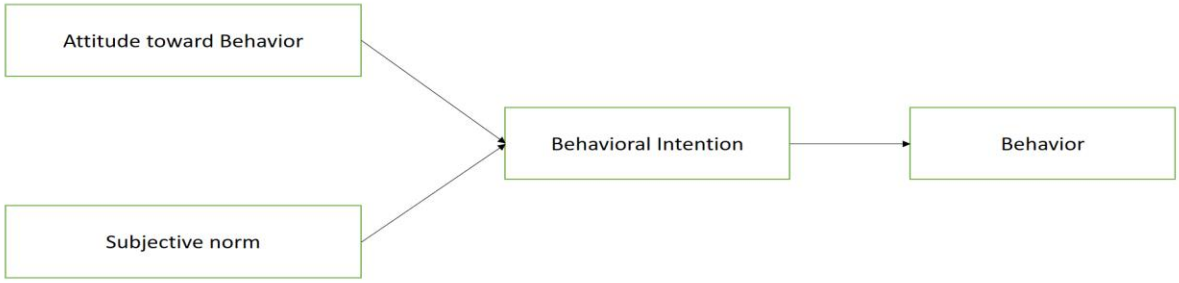


Figure 1. Theory of Reasoned Action (TRA) (Taherdoost, 2018) .

When Davies was a PhD student, he was trying to find a better measure for predicting, acceptance and explain use of technology. This was because TRA was uncertain in measuring theoretical and psychometrical status. Explaining user acceptance was a major issue in management information system, as a result TAM (original) was born focusing on three theoretical constructs (Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Attitude Towards Use). It argued these constructs to be fundamental determinants of system use (Davis, 1985). Attitude was deemed to be the major factor on deciding to use or not to use the system (Davis, 1989; Alokgaddi, Prashantha and Shivashankar, 2021).

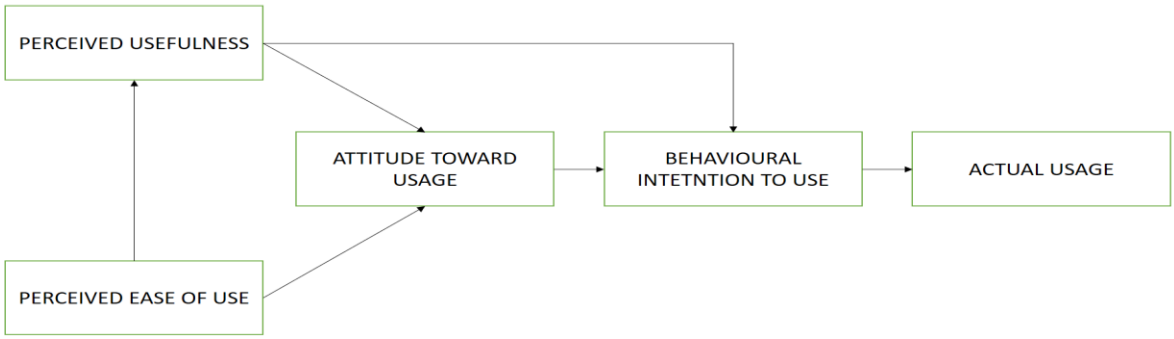


Figure 2: The original TAM , (Alokgaddi, Prashantha and Shivashankar, 2021)

Later, on 1989 Davis and his team found out that attitude does not have a major role in behavior to use a system. They modified the original TAM by omitting attitude towards use from the model based on empirical evidences (Davis, Bagozzi and Warshaw, 1989; Davis and Venkatesh, 1996). This model also takes additional external variables into consideration (Lee, Kozar and Larsen, 2003). The model is presented in figure three below.

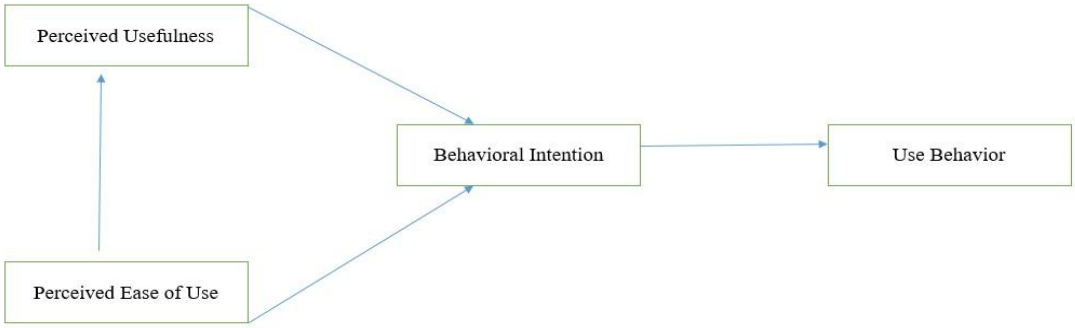


Figure 3. Modified TAM 1(Davis and Venkatesh, 1996)

Through time TAM 2 was developed aiming at improving mainly its explanatory power as well as its adaptability. This model was developed by Venkatesh and Davis in 2000 (Venkatesh and Davis, 2000). TAM 2 was proposed by adding two sets of additional constructs; social influence (image, subject norms and voluntariness), and cognitive (Result Demonstrability (RD), Job Relevance (JR) and Output Quality (OUT)). This was to improve the predictive power of PU (Venkatesh and Davis, 2000; Mlekus *et al.*, 2020). Therefore, for both voluntary and mandatory environments (Venkatesh and Davis, 2000; Taherdoost, 2018). TAM 2 model is presented in figure four below.

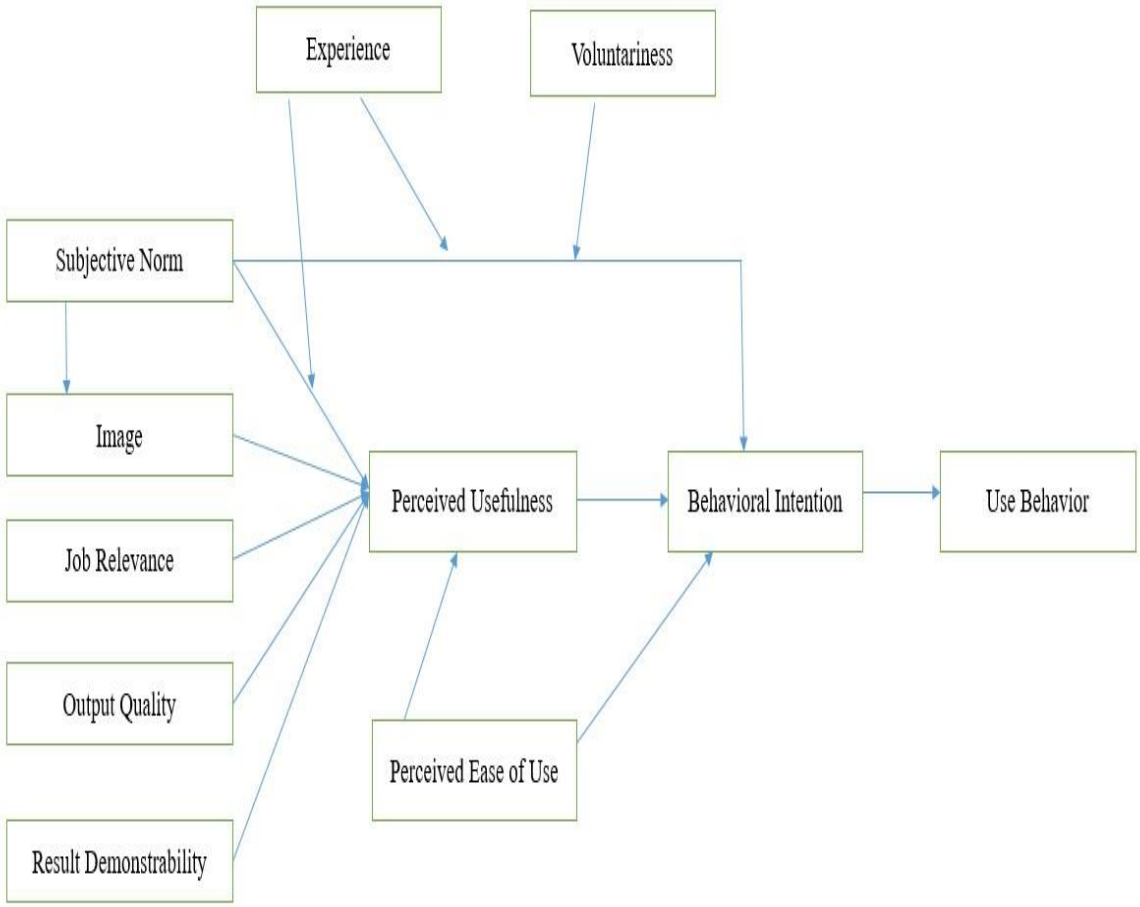
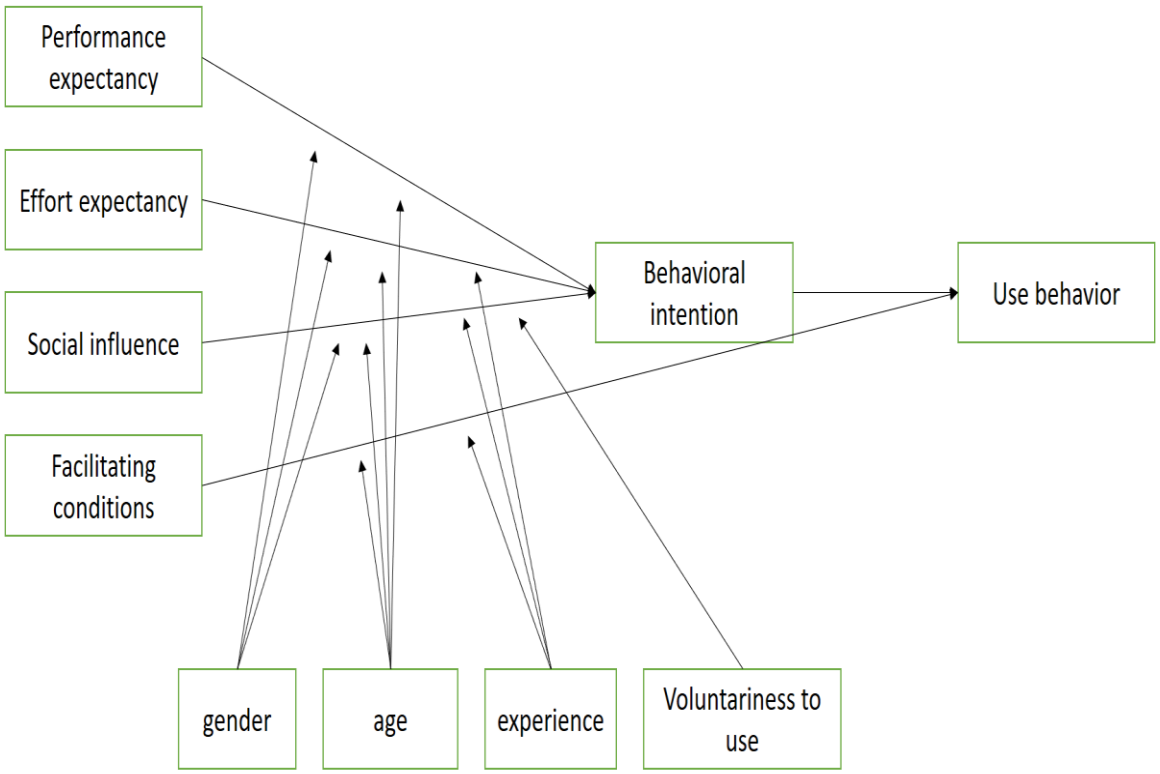


Figure 4. TAM 2 model (Venkatesh and Davis, 2000)

Venkatesh, Morris and Davis studied the previous models and formed Unified Theory of Acceptance and Use of Technology (UTAUT) by integrating eight theories. Those theories are TAM, innovation diffusion theory, TRA, the motivational model, the theory of planned behavior, a model combining the TAM and theory of planned behavior, the model of personal computer utilization and social cognitive theory (Venkatesh, Morris and Davis 2003). This model was heavily criticized but despite the criticism, it was able to represent

the majority of the eight separate models which formed its basis (Alwahaishi and Snášel, 2013; Lee *et al.*, 2017). UTAUT is presented in figure five below.



(Alwahaishi and Snášel, 2013)Figure 5. UTAUT Model (Venkatesh, Morris and Davis 2003)

Technology Acceptance Model has undergone through different phases and was supported by empirical studies. Lee and colleagues summarized the development of TAM in four different phases. The chronological process of these phases are presented in table one below.

Table 1: phases of TAM

Phase	Phase name	Activities during that phase
one	Model Introduction Period	- Focused on replication TAM - Compared TAM to TRA to confirm its superiority
Two	Model Verification Period	- Validated the instruments used in TAM
three	Model Extension Period	- Extend the initial TAM model - Introduced new variables - Investigate the boundary condition of TAM
Four	Model Elaboration period	- Focus on developing next generation of TAM - Resolve problems within the model

(Lee, Kozar and Larsen, 2003)

Venkatesh and colleagues did further studies to investigate determinants of PEOU. They classified the determinants as anchor and adjustment. The anchor group was further classified as control (Computer Self-Efficacy (CSE), facilitating condition), intrinsic motivation (Computer Playfulness (CPLAY)) and emotion (Computer Anxiety (CANX)). The adjustment group was perceived enjoyment and object usability. The result showed the proposed model was able to explain the variation in intention to use the model very well (Venkatesh, 2000).

Through time TAM 3 was born by combining TAM 2 and the model of the determinants of PEOU. This integrated model of technology acceptance suggests three theoretical

extensions beyond TAM 2 (Venkatesh and Bala, 2008). According to the model individual's belief about computers in general was the strongest determinant of system specific PEOU.

Source: (Venkatesh and Bala, 2008) TAM 3 is presented in figure six below.

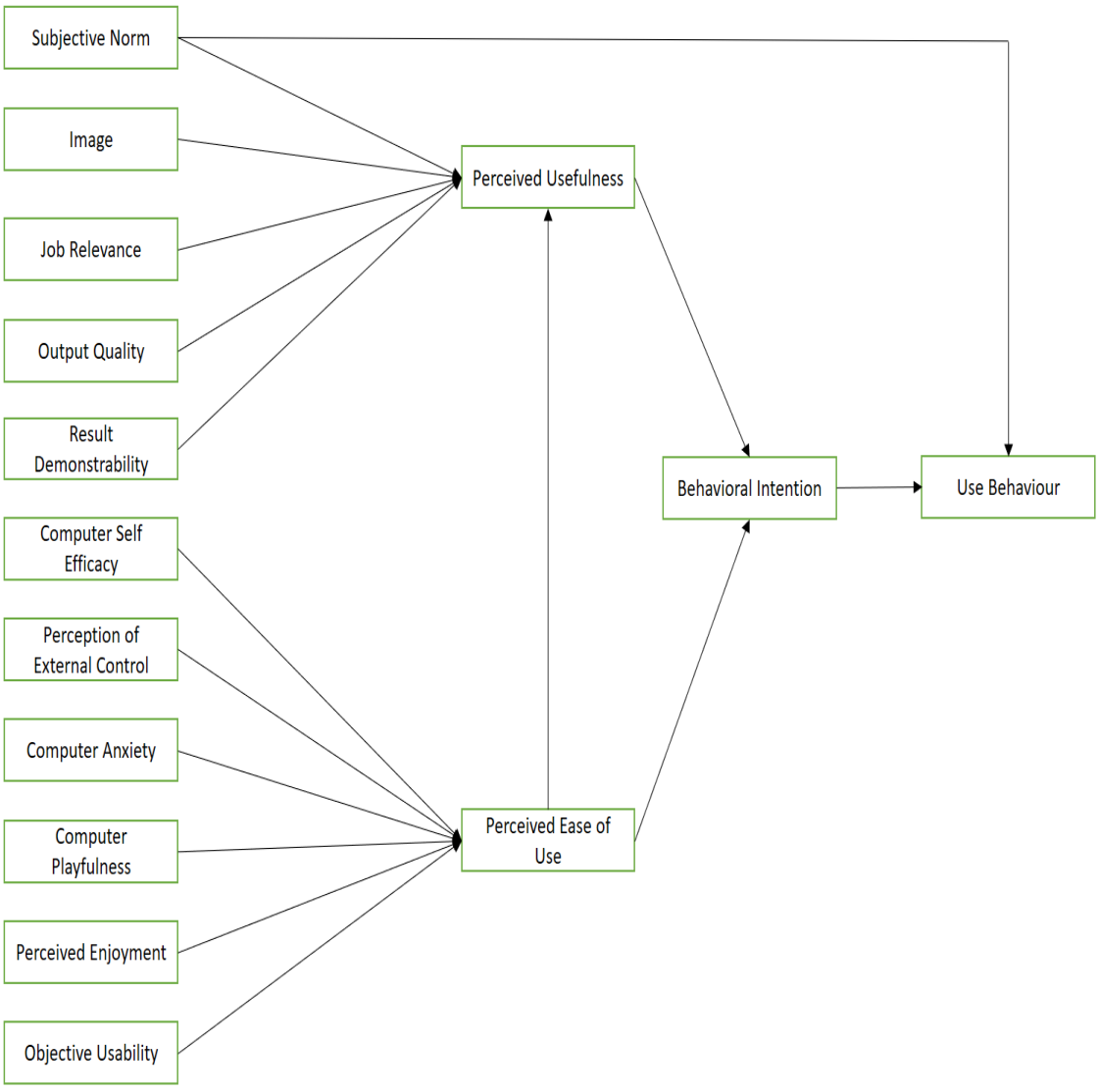


Figure 6. TAM 3 (Venkatesh and Bala, 2008)

Health Commodity Management Information System

Health care provision includes availability of safe, effective and affordable drugs and related supplies in the required quality and quantity. The Ethiopian supply chain was challenged by unavailability and irrational use, poor storage and stock keeping of drugs and related supplies (Dires T.10th Global Health Supply Chain Summit, Accra (Ghana), 2017; Alemu *et al.*, 2021).

In order to solve this problem Pharmaceutical Logistic Master Plan (PLMP) was designed. The goal of PLMP was improving availability of medicine to the public health facilities. As part of the plan, the Ethiopian Pharmaceutical Supply Agency (EPSA) was established, (IPLS SOP, 2017). Though institutions were expected to report their consumption and stock, however they don't often do it. As a result EPSA was not able to make timely and accurate forecasting (Boche, Mulugeta and Gudeta, 2022).

Ethiopia pharmaceutical supply agency and MOH created and oversee a system called IPLS. IPLS ensures uninterrupted drug supply thus enhancing the drug supply system (‘USAID | DELIVER PROJECT, Task Orders 4 and 7. 2016’). Since 2009 health facilities inventory and logistics management was automated using the home produced open access software called DAGU (Messele, 2020).

Logistic Management Information System (LMIS) is a component of IPLS, the major purpose of LMIS is collecting, organizing and reporting information. It helps in facilitating decision governing the logistic system. LMIS is a system of Physical and technology based records and reports that supply chain workers and managers used to collect, present and use logistics data gathered across all levels of the system, thus it enables facilitated decision

making by incorporating into the routine data management system (IPLS SOP, 2017; Tiye and Gudeta, 2018).

DAGU is locally developed electronic LMIS (e-LMIS). It is designed to support inventory control, and logistics management information at public health facilities of Ethiopia. It provides a systematic recordkeeping system for managing health commodities at health facility stores. The system is installed in more than 800 health facilities, including most hospitals and major health centers across Ethiopia. There are 90 e-LMIS "HCMIS" facilities and out of which 51 are at early stage of implementation support (practice phase) and 49 are mature sites (4 hospitals and 45 health Centers) (Dires T.10th Global Health Supply Chain Summit, Accra (Ghana), 2017; Messele, 2020).

Before DAGU, the system used to be paper based and had errors due to manual input. During DAGU one, though it was automated, health facilities were still using paper for reporting and requisition. DAGU has been updated once since it was first produced. On the latest version of DAGU called DAGU 2, electronic transmission of requisition was applicable with the other supply chain system (EPSA, e-APTS). DAGU two's objective is to support the electronic transmission of requisitions from health facilities, to electronically link health facilities to EPSA and facility e-LMIS. This increase data visibility and its expected benefits includes data visibility, Hospital administrator can view their stock and rate of expiry where ever they are. Approval can be done at distant, MOH//Regional Health Biro RHB /Zonal Health Biro/ZHD /Woreda Health Biro /WoHO can easily have access to information (no need to go facility).

2.2. Empirical Literature Review

Researches indicates three ICT application areas for the TAM done in health services: telemedicine, electronic health records, and mobile applications (Rahimi, 2018).

Richard J. Holden find that over twenty studies tested TAM in health care and dozens more mentioned the theory. Though the model is not created for the health care context and may either do not capture or contradict with contextual feature of computerized health care deliver. It was increasingly seen as a fitting theory for health care (Holden and Karsh, 2010).

Different studies assessed health professional's acceptance of technologies using TAM. Almost all studies extended and modified the model in order for it to fit the contextual character of health care. This was supported by a systematic review of TAM in health which found TAM was almost always extended by integrating it into TPB, UTAUT theoretical framework components and also by adding specific contextual variables (Rahimi, 2018).

Various studies used TAM to assess health professional's Behavioral Intention (BI) to use technologies like Personal Digital Assistance, telemedicine, health information management, health information system, adverse drug reporting system, and clinical information system in different settings (Liang, Xue and Byrd, 2003; Wu *et al.*, 2008; Melas *et al.*, 2011; Hu *et al.*, 2012; Abdekhoda *et al.*, 2014; Basak, Gumussoy and Calisir, 2015; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020).

Among the variables that were added into the original TAM, Perceived Enjoyment (PENJ), Subjective Norm (SN), CSE, personal innovativeness, user satisfaction, JR, trust, social

influence, technology anxiety and CANX are some of them (Liang, Xue and Byrd, 2003; Basak, Gumussoy and Calisir, 2015; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020).

From the studies that used TAM, their proposed model explained PU and PEOU are the most determinant factor for BI. The explanatory variance of the TAM ranges from 50-83%. Eighty three percent (83%) variance by a proposed model is the maximum achieved in health professional's BI to use the technology(Liang, Xue and Byrd, 2003; Melas *et al.*, 2011; Ketikidis *et al.*, 2012; Basak, Gumussoy and Calisir, 2015; (Kalayou, Endehabtu and Tilahun, 2020).

Perceived usefulness significantly and positively affect health professional's behavioral intention to use a presented technology (Liang, Xue and Byrd, 2003; Wu *et al.*, 2008; Hu *et al.*, 2012; Abdekhoda *et al.*, 2014; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020).

Studies suggest PU itself was seen to be significantly influenced by PEOU and SN (Wu *et al.*, 2008; Basak, Gumussoy and Calisir, 2015) and on the other side it mediated the effect JR, Compatibility and PEOU (Liang, Xue and Byrd, 2003), also it is affected by Management Support (MS) (Wu *et al.*, 2008).

Perceived ease of use was seen to have positive significant effect on health professional's behavioral intention to use health technology (Liang, Xue and Byrd, 2003; Wu *et al.*, 2008; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020). On the contrary a study conducted in Hong Kong among health professional's acceptance of telemedicine found that PEOU has no significant effect on BI to use technology (Hu *et al.*, 2012). From

within the model PEOU was seen to have an influence or have an effect on PU (Liang, Xue and Byrd, 2003; Wu *et al.*, 2008; Basak, Gumussoy and Calisir, 2015).

Though most studies found that both PU and PEOU has significant and comparable effect on health professional's behavioral intention to accept the presented technology, but it was seen that, the effect of PU to be stronger (Abdekhoda *et al.*, 2014).

Technological anxiety/CANX, resistance, perceived risk were found to be significant barriers influencing intention to use telemedicine services (Kamal, Shafiq and Kakria, 2020).

MS had a direct effect on PU, PEOU, and SN (Wu *et al.*, 2008).

It is seen that constructs like PU, trust and PEU are facilitating condition for behavioral intention to use the system (Kamal, Shafiq and Kakria, 2020) .

Technology Acceptance Model in Ethiopia

A study was conducted in Ethiopia using TAM to assess sustainable adoption of e-health systems in resource limited settings. This study used extended original TAM model. Staff IT experience and Technical infrastructure were among the added variables into the model.

The proposed model was able to explain 56.2% of variability in intention to adopt and use the technology. The major findings of the study include PU and PEOU has significant influence on attitude and intention to use the technology. PEOU also influences PU. One of the added variable (IT experience) was not significantly associated with intention to use the system. (Kalayou, Endehabtu and Tilahun, 2020).

2.3. Conceptual Frame Work

Technology acceptance model is the most widely applicable model of IT acceptance and use. It is having been shown to be highly predictive of IT acceptance and use (Venkatesh and Bala, 2008). It posits that individuals' BI behavioral intention to use an IT is determined by two beliefs: *perceived usefulness*, defined as the extent to which a person believes that using an IT will enhance his or her job performance and *perceived ease of use*, defined as the degree to which a person believes that using an IT will be free of effort (Davis, 1985, 1989) .

One of the most common criticisms of TAM has been the lack of actionable guidance to practitioners. Many leading researchers have noted this limitation in interviews reported. For example, Alan Dennis, a leading scholar in the field of information systems, commented, "imagine talking to a manager and saying that the integrated technology must be useful and easy to use (Venkatesh and Bala, 2008). imagine the reaction would be 'Naha!' The more important questions are what makes the integrated technology useful and easy to use" (Lee, Kozar and Larsen, 2003). Some work has been done to address this limitation by identifying determinants of key predictors in TAM, namely, perceived usefulness and perceived ease of use (Venkatesh and Bala, 2008).

For the above reason, we used Modified Technology Acceptance Model 3 (TAM3) (Venkatesh and Bala, 2008). It further theorizes that the effect of external variables (e.g., design characteristics) on behavioral intention will be mediated by perceived usefulness and perceived ease of use. Since The behavioral intention of users to use a system is the sole best predictor of actual system usage, according to psychological research and TAM

itself (Davis and Venkatesh, 1996). By adding two external factors technical support (Hammad,2020) and management support (Wu, et.al,2008) , to give more explanatory power by reviewing the existing literatures.

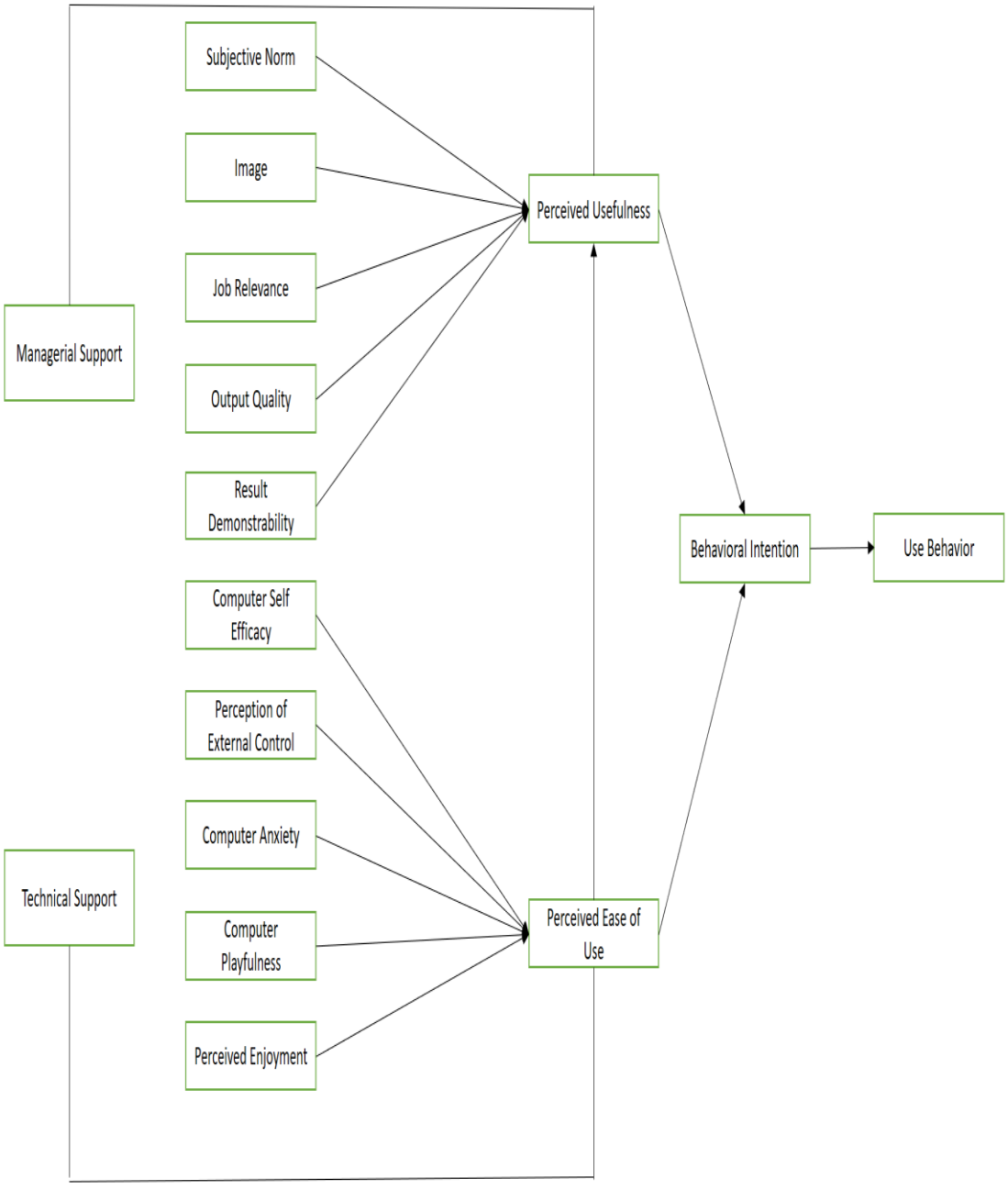


Figure 7. Research model, Modified TAM 3

3. Objectives

3.1. General Objective

The purpose of the study was to investigate pharmacy professionals' acceptance of the e-HCMIS and identify its determinants in public hospitals of Addis Ababa.

3.2. Specific Objectives

i. To assess the degree of acceptance of e-HCMIS by pharmacy professionals working in public hospitals of Addis Ababa

ii. To assess the factors affecting the acceptance of e-HCMIS by pharmacy professional's working in public hospitals found in Addis Ababa

3.3. Research questions

I. What is the level of acceptance of e-HCMIS in Addis Ababa hospitals?

II. How well do the TAM3 variables (perceived usefulness, perceived ease of use, subjective norm, image, job relevance, output quality, result demonstrability, computer self-efficacy, perceptions of external control, computer anxiety, computer playfulness, and perceived enjoyment) explain pharmacy professionals' behavioral intention of using e-HCMIS?

III. How well does management support affect the of perceived usefulness?

IV. What is the effect of technical support on perceived ease of use?

4. Research Methods

4.1. Description of the study area

❖ For quantitative

The study was carried out in Addis Ababa, Ethiopia. Addis Ababa is a capital city of Federal Democratic Republic of Ethiopia with a population of 2,738,248. The city has 10 administrative sub cities and 99 Kebeles. As of 2014, Addis Ababa had 52 hospitals 12 of them state run, and more than 40 privates. For the cross-sectional survey, the study included all Government hospitals which comprises hospitals under Addis Ababa city administration namely Tirunesh Beijing General Hospital, Zeweditu Hospital, Dagmawi Minilik Hospital, yekatite 12 hospital, Ras Desta Damitew Hospital, and Federal hospitals namely ALERT hospital, Amanual hospital, St-Peters-Specialized-Hospital, Tikur Anbesa Specialized Hospital (TASH) and St. Paul's Hospital Millennium Medical College (SPHMMC)(Central Statistical Agency, 2013).

❖ For qualitative

For the qualitative study key-informants working at Ethiopian Ministry of Health (EMOH), Ethiopian Pharmaceutical Supply Agency (EPSA), and public hospitals such as TASH, St. Peter Specialized Hospital, Yekatite 12 Hospital, SPHMMC and John Snow, Inc. (JSI**)** were included in the study.

4.2. Study approach

In order to achieve the researches goal, this study used both quantitative and qualitative approach. The quantitative approach used structured questioner based on Modified TAM-3 to collect data from pharmacy professionals and investigate pharmacy professionals'

acceptance of the e-HCMIS and identify the determinants that makes them accept. The qualitative approach employed a semi-structure questioner to capture information that cannot be gathered quantitatively and to supplement the quantitative data.

4.3. Study Design and period

A sequential explanatory mixed method was applied, the design enabled the cross-sectional survey and qualitative data to supplement each other. The data was collected between May to June 2021 G.C for the quantitative data and between September to October 2021 G.C for the qualitative data.

4.4. Source and study population

- **For quantitative data**

Our source population were all pharmacy professionals working at Government Hospitals in Addis Ababa, Ethiopia. Those who met our eligibility criterion were considered as study population.

- **For qualitative data**

Pharmacy and IT professionals working in government facilities and stake holders were used as source population, and those with more than six months of experience were considered as the study population.

4.5. Eligibility criteria

4.5.1. Inclusion criteria

- Pharmacy professionals working in hospitals located in Addis Ababa.
- Pharmacy professionals who are willing to participate.

4.5.2. Exclusion criteria

- Pharmacy professionals who are not willing to participate in the research.
- Pharmacy professionals who were on annual and sick leave.

4.6. Sample Size Determination and Sampling Technique

❖ **For quantitative data**

The sample size for the quantitative study was determined using finite population single proportion formula with the assumption of 50% level acceptance of e-HCMIS by pharmacy professionals working Addis Ababa city and Federal hospitals at 5% margin of error (Kalayou, Endehabtu and Tilahun, 2020).

.

$$N = \frac{(Z_{1-\alpha})^2 \times P(1-P)}{\delta^2}$$

$Z_{1-\alpha} = 1.96$

p= 0.5%

δ= 5%

$$n = \frac{(1.96)^2 (0.562)(0.438)}{(0.05)^2} =$$

n = 378

$Z_{1-\alpha}$ = Z score at 95% = 1.96 confidence interval.

δ = Margin of error

n= 378, Adding 10% non-respondents, because the questioner was self-administered type and there could be chance of getting non response.

$$n_{final} = \frac{n}{1 + \frac{n-1}{\text{pharmacists in AA hospitals}}}$$

Since the number of pharmacists working in Addis Ababa in public hospitals is 529, in finite population sample size correction formula was used giving the final sample size of 243.

The final sample size was proportionately divided among the ten hospitals in Addis Ababa.

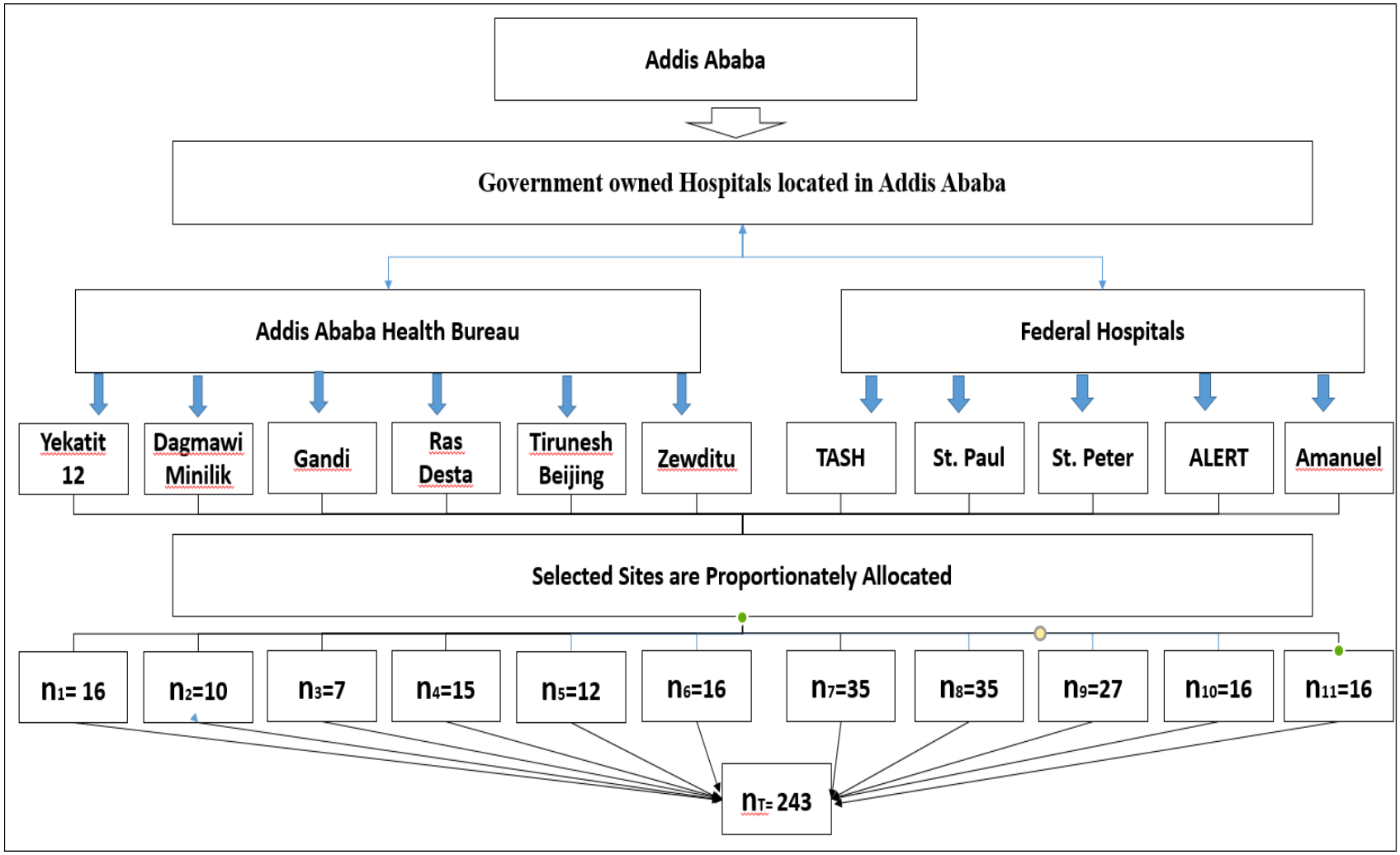


Figure 8: Sampling Technique for quantitative data

❖ For Qualitative part

The qualitative part of the study involved a purposive sampling strategy to identify key informants from public hospitals (TASH, SPSH, SPHMMC and yekatit 12 hospital) (administrative office and pharmacy departments) located in Addis Ababa FMOH (pharmacy and medical equipment directorate department), central EPSA, branch EPSA and JSI. A semi-structured, open-ended interview guide with flexible probing techniques was employed. The occurrence of information saturation dictated the final number of participants. Saturation was determined by the absence of new information from the interview from the next person. Once saturation was detected, three consecutive interviews were conducted to check if new codes and themes emerge

4.7. Variables

Dependent Variables

- Behavioral Intention
- Perceived usefulness
- Perceived ease of use

Independent Variables

- Subjective norm
- Image
- Job relevance
- Perception of external control
- Computer anxiety
- Computer playfulness

- Output quality
- Result demonstrability
- Computer self-efficacy
- Perceived enjoyment
- Technical Support (TS)
- Management Support (MS)

4.8. Operational definition

TAM variables

Responses to the TAM construct questions were measured by using Likert scale of 1-5, 1 = strongly disagree, to 5 = strongly agree.

Perceived Usefulness

Was originally defined by Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance". Individuals incline to use a system when they believe it will help them to perform their job better and enhance their performance (Davis, 1985, 1989). Many researchers have used PU original definition and all relate to using a system will help them improve performance, increase job effectiveness and productivity (Holden and Karsh, 2010).

Determinants of Perceived Usefulness

Venkatesh and Davis (2000) proposed an extension of TAM so called TAM2. By identifying and theorizing about the general determinants of PU that is, SN, Image (IMJ), JR, OUT, RD and PEOU. and two moderators that is, experience and voluntariness, (Venkatesh and Davis, 2000) in our study voluntariness is omitted because using e-HCMIS is national transformational plan so it is mandatory.

Table 2: Determinants of perceived usefulness.

Determinants	**Definitions**
Perceived Ease of Use	Extent to which a person believes using the technology simply and effortlessly both physically and mentally (Davis, 1989; Moore and Benbasat, 1991; Holden and Karsh, 2010).
Subjective Norm	The extent to which an individual feels that people relevant to him/her think he/she should or should not be using a technology (Venkatesh and Davis, 2000; Holden and Karsh, 2010)
Image	How much a person believes that using new technologies improve his/her status in the society (Moore and Benbasat, 1991).
Job Relevance	The extent to which a person believes the applied technology is useful to the job he/she is working (Venkatesh and Davis, 2000).

Output Quality	The extent to which a person believes the system gets the job done right (Venkatesh and Davis, 2000).
Result Demonstrability	To what range a person believed that the results of using system/(IT) is measurable, noticeable and transferable(Moore and Benbasat, 1991).

Perceived Ease of Use

This explains individuals' perception of the amount of work needed to use the system and using the technology will be effortless (Moore and Benbasat, 1991; Venkatesh and Davis, 2000). System quality can be measured by the idea how easy it is to manipulate (Venkatesh, 2000).

Determinants of Perceived Ease of Use

Perceived Ease of Use perception is developed by depending on several pillars related to individuals' general beliefs regarding computers and computer use. The anchors suggested by Venkatesh are CSE, CANX, CPLAY and perceptions of external control (or facilitating conditions) (Venkatesh, 2000).

Table 3: Determinants of perceived ease of use

Determinants	**Definitions**
Computer Self-Efficacy	An individual's confidence in his/her ability in completing tasks with a computer. (Compeau and Higgins, 1995a; 1995b).
Perception of External Control	How much a person believes there is a technical assistance from the organization to exploit the system (Venkatesh et al, 2003).
Computer Anxiety	The amount of fear/discomfort a person faces when there is possibility of using computers (Venkatesh, 2000).
Computer Playfulness	"...the degree of cognitive spontaneity in microcomputer interactions"(Webster, Martocchio and Webster, 2014).
Perceived Enjoyment	How much it is perceived applied technology usage is enjoyable in its own than the objective of the system (Venkatesh, 2000) .
Objective Usability	A "comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks" (Venkatesh, 2000) .

Management support

The level to which a person thinks that management is dedicated and helpful to the successful adoption and use of a system is referred to as management support (Venkatesh and Bala, 2008). In any organization for the success of implementation, acceptance, and use of technology the impact and responsibility of management support is not easy (Wu *et al.*, 2008).

Technical Support

Technical support is defined as knowledge people, who assist users of software products and computer hardware, which could include hotlines, services of online support, help desks, faxes, machine-readable support for knowledge bases, telephone system of voice responding, control remote software along with other services (Hammed,2020).

4.9. Data collection and management

4.9.1. Data collection instrument

- **For quantitative data**

A structured self-administered questionnaire was used. It included measure of demographic characteristics, variables of standard TAM-3 (PU, PEOU and BI), and determinants of PEOU and PU variables derived from TAM (Venkatesh and Bala, 2008) , and external variables added; MS and TS.

Those were PU (measured by 4 observed variables PU1, PU2, PU3, PU4), PEOU (measured by 4 observed variables PEOU1, PEOU2, PEOU3, PEOU4), BI (measured by 2 observed variables BI1, BI2), CSE (measured by 4 observed variables CSE1, CSE2,

CSE3, CSE4), PEC (measured by 4 observed variables PEC1, PEC2, PEC3, PEC4), PEJ (measured by 3 observed variables ENJ1, ENJ2, ENJ3), SN (measured by 4 observed variables SN1, SN2, SN3, SN4), IMG (measured by 3 observed variables IMG1, IMG2, IMG3), JR (measured by 3 observed variables JR1, JR2, JR3), OUT (measured by 3 observed variables OUT1, OUT2, OUT3), RD (measured by 4 observed variables RD1, RD2, RD3, RD4), , CPLAY (measured by 4 observed variables CPLAY1, CPLAY2, CPLAY3, CPLAY4), CANX (measured by 4 observed variables ANX1, ANX2, ANX3, ANX4), MS (measured by 5 observed variables MS1, MS2, MS3, MS4, MS5), TS (measured by 7 observed variables TS1, TS2, TS3, TS4, TS5, TS6, TS7). For object usability there is no measurement questions (Venkatesh and Bala, 2008).

All the measures were initially developed in English. Prior to the data collection, the questionnaire was pretested to assess the comprehensiveness of language, as well as the understanding of the items and completion instructions. Response options in the measures described below were coded on a 5-point Likert scale (1 = strongly agree, 5 = strongly disagree), unless otherwise stated.

- **For qualitative data**

The qualitative data was collected using a semi structured questionnaire for key informants. The instrument contains a sociodemographic characteristics section and the research questions.

4.9.2. Data collection procedure

- **For quantitative data**

Structured questionnaire was used to collect the data. The data was collected by data collectors who were trained on data collection procedures for the study before the study commenced.

- **For qualitative data**

The key informants were approached in order to acquire qualitative data, the interview guide was written in Amharic, it's the working language, hence the interview was conducted in Amharic. Open interview guide with flexible probing technique was used where participants were encouraged to express their ideas freely. All the interviews were conducted by the principal Investigator, audio recording started after obtaining informed consent. The interview followed an emerged approach where prior interview was used to improve the interview guide and include critical questions for the next interview. Each interview continued for a minimum of 30 minutes to hours as recommended by (DiCicco-Bloom and Crabtree, 2006).

4.10. Data quality control and analysis

4.10.1. Data quality control

- **For quantitative data**

Under the direction of the principal investigator, data was collected by trained data collectors (with a pharmacy background), and a pretest was completed outside of the major research sites before the main study data collection procedures were carried out. The data was validated for completeness and accuracy before being entered into SPSS version 26

for analysis. Also, before to data collection, the primary investigator had a more in-depth discussion regarding the instruments with the research supervisors. The collected data was reviewed for accuracy, summarized, and recorded on the computer for each facility on the same day.

- **For qualitative data**

Since qualitative data is not as reliable and valid as quantitative data, to improve its trustworthiness and enhance its validity and reliability, participants were clearly told about the nature of the study, audiotaped and then peer examination were used.

4.10.2. Data analysis

- **For quantitative data**

Quantitative data from respondents were entered and analyzed using SPSS version 26. Descriptive statistics were computed for the study variables and frequency distribution tables were used to describe the finding. The extent of the relationship between variables was described using SEM using maximum likelihood estimation, analyzed and developed using AMOS version 23 software. The SEM was used to test the research question since it is a dominant statistical method that measures and clarifies the degree of relationships between variables. The model construct is consisting of measured and latent variables (Saunders, Lewis and Thornhill, 2007).

Data Cleaning

Data cleaning was conducted by using SPSS version 26 and there were no missing data in any of the variables for which data was collected. Our data does not achieve multivariate normality, for this reason we used bootstrapping. Our study has 15 variables or constructs

and these variables have 58 measurements. Because factor loading was less than 0.5, nine variables were removed from analysis (Civelek, 2018).

- **Structural Equation Model**

Structural Equation modelling was used to analyze the relationship between the study variables. SEM is the most widely used form of analysis for testing research questions about the influence of sets of variables on other variables. It uses latent variables to account for measured error. SEM deals with measured and latent variables.

Structural Equation modelling have two parts the first is confirmatory factor analysis (CFA), also called Measurement Model Assessment) and structural Equation model analysis.

Confirmatory Factor Analysis

Confirmatory Factor Analysis which is also known by the name Measurement Model Assessment. All constructs we have in the model were included in the CFA and their measurement items in this part. The focus was on the measurements, and not the relationship between the constructs. In CFA analysis we see how well the constructs were measured. It tells us how the constructs are measured.

In Confirmatory Factor Analysis (CFA), we addressed three things.

- **Factor Loading**

This is the first step of CFA. In this process of the analysis, we performed factor loading and during the factor loading analysis out of the 58 measurements, nine of them were avoided as their factor loading result showed they have less than 0.5 factor loading. Factor

loading result should be > 0.7. But in case of new model >0.5 is the acceptable range (Civelek, 2018). The factor loading result is shown in Annex eight.

- **Model Fit**

The second step in CFA is checking model fit of the research model. Before we undergo further analysis, in SEM/CFA we should check goodness of fit of the model. Chi-square or goodness of fit tells how much the model is good or not. It tests the difference between observed model and the hypothesized model. But chi-square is highly affected by the sample size effect. If we have a large sample size even the small difference between the model and the data will be significant. If the sample size is small, it's hard to detect a difference between the model and the data even if the model is a poor fit. Hence the use of chi square was limited. Other alternative indexes are developed as alternative or to supplement chi square and those indexes were used to accept or reject model fit. (Tabri and Elliott, 2012).

As shown on annex 9, our CFA model have good model fit indices, Chi-square ratio 1.757 (<3), root mean square error of approximation(RMSEA) is 0.057(<0.8), standardized root mean square residuals (standardized RMR) is 0.0546 (<0.8), comparative fit index 0.855 (CFI > 0.9) which is acceptable (CFI >0.9), incremental fit index0.858 it is in the acceptable (IFI > 0.9).

- **Reliability and Validity of measurements**

The third step is testing reliability and validity of the measurements. Reliability is how consistent is our measurement whereas validity is whether we used the right measurement for our construct. In CFA and SEM we measure construct reliability and construct validity.

1. In construct reliability Cronbach's Alpha (α) >0.7 indicates good reliability. Cronbach's Alpha (α) >0.6 is acceptable; even if we report Cronbach's Alpha (α) which assumes there is no error, the whole idea of SEM is, there is measurement error.
2. In Construct validity, there are two validities called convergent validity and discriminant validity.

    2.1 In Convergent Validity the items that are indicators of the specific construct should converge or share a high proportion of variance in common, Which Is Average Variance Extracted (AVE) > 0.4 So, variables that have less than 0.4 AVE is removed, and those are CSE AND PEC, and also, we drop the 3 vicious measurements (SN3, CPLAY1, SN4) to achieve our AVE cut point (Fornell and Larcker, 1981).

    2.2. Discriminant Validity is the extent to which a construct is truly distinct from other constructs .it means the construct should be unique and captures some phenomena others measured do not, Which Is the Root Square of AVE Which Is <0.9. Construct reliability test result and CFA are shown on annex 10 and 11 respectively.

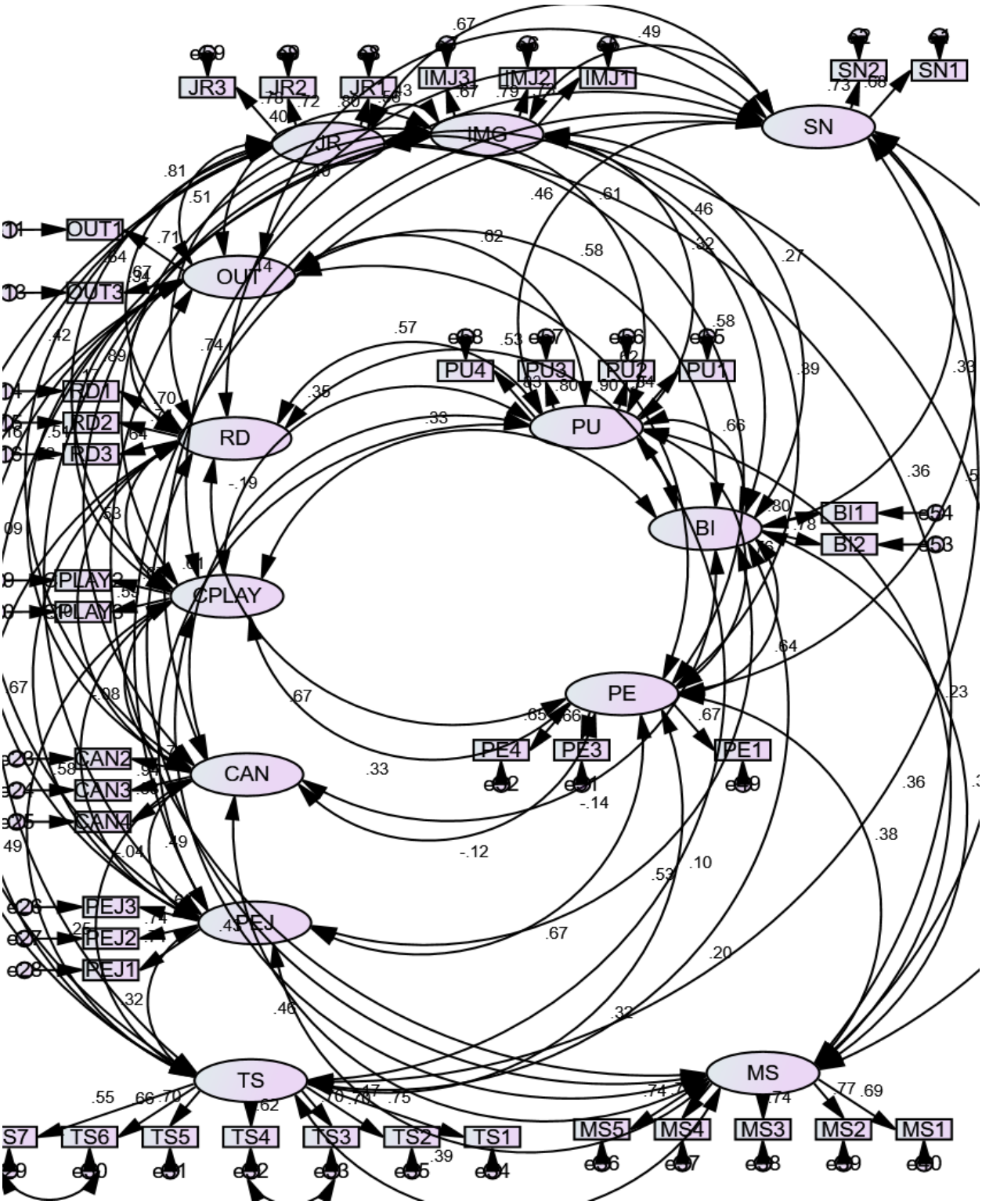


Figure 9: Confirmatory Factor Analysis (AMOS)

❖ **For qualitative data**

The audio-recorded interview was transcribed verbatim. The analysis used Open-Code Qualitative Data Analysis software. We first transcribed and analyzed the language of the interview (Amharic) then translated the identified themes to the English language (Bogusia and Alys, 2004). The interview was transcribed by the PI (NG). The data were analyzed by the PI and thesis advisor (EE).

The gathered data were analyzed using the 'framework analysis approach'. Framework analysis is the preferred method for research that has specific research questions, limited time, pre-designed samples, and identified prior topics (Srivastava *et al.,* 2009). In the analysis, data were selected, charted, and organized under key ideas and themes with five steps: familiarization; identifying a thematic framework; indexing; charting; and mapping and interpretation. After lasting the interview, we carefully listened to the audio and studied the transcriptions, details, and field notes to overview the collected data. Consequently, we familiarized ourselves so we were aware of the upcoming themes and the key messages and then made a note. Based on the note made during familiarization, the thematic framework was identified by coding the key issues and ideas. The Coding was flexible to add when a new concept of participants was identified during the analysis. The third step was indexing, in this stage, we developed sub-themes of coded data followed by themes that formed from particular sub-themes. Charting involved placing or ordering the themes and sub-themes consistently to allow convenient research reporting. Finally, an explanation and recommendations were made. Throughout the analysis's steps, the importance of the idea, possible connection of concepts, and complying with the research objective was being checked (Braun and Clarke, 2006).

4.11. Researchers reflexivity

Stating researcher's position and reflexivity is crucial in understanding the epistemological and personal conviction of the individual researcher, which in turn influences the research finding (Hsiung, 2008). In doing so, the following circumstances are believed to have had an impact on the research, though utmost care has been taken to avoid any bias that may have resulted from this.

The researcher being a pharmacist, has been seen both as an opportunity and impediment in the research. The researcher was working previously as a pharmacist at different units of SPSH pharmacies. This may have imparted effect on the research as the researcher might unknowingly overlooked some factors in the overall process of the research. However, being an employee provided an already established network of informants, health care providers where communication was smooth as a result. On the contrary, additional effort was required from the researcher to understand pharmacists view as well as experience. The researcher is currently an equipment store manager at SPSH doing her Master's degree. Nonetheless, pharmacists were, in some cases, willing to share their concern and provide detailed explanation on their situation with the expectation that the pharmacist would give them a solution. Knowing that the researcher was a pharmacist and active professional helped the respondents to discuss issues that they would normally restrain from.

Most participants had questions regarding the research and other factors in which they showed interest to discuss on additional factors like the stresses they are having while working as a pharmacist and their quarrel with patients.

4.12. Ethical consideration

Ethical clearance was obtained from the Ethical Review Committee of the School of Pharmacy, Addis Ababa University, Ethical approval was also obtained from the Federal Hospitals IRB as well as Addis Ababa Health Bureau Ethical Committee.

Participants of the key informant interviews were provided with information regarding the drive of the study, what is expected from them, and how they can benefit from the study result. Each participant was also aware that involvement in the study was voluntary and she/he could leave at any time, and the leaving of consent would not disturb his/her relation with the institution or any other person. In addition, participants were guaranteed about the secrecy of the information obtained and informed that the information only is accessible to the research team.

5. Results

5.1. Quantitative Study

The response rate of the study was 96.19%. All participants were selected from the five specialized hospitals and five Addis Ababa Health bureau tertiary hospitals located in Addis Ababa, Ethiopia. The most frequently mentioned reasons for not participating in the study were being busy at their work and not wanting to be part of the study.

5.1.1. Sociodemographic characteristics

There were a total of 237 survey respondents, and majority were males (145, 61.2%). The mean age of the study participants was 30.74± 4.81 (SD) years. The majority of the participants had Bachelor degree (191, 80.60%), work as pharmacy dispensary (118, 49.8%). Most of the participant professional's work at Federal Hospital that has university affiliation (99, 41.8%). Most of the study participants has no both DAGU one and two training 164 (69.2), 199 (84.0) respectively. The sociodemographic characteristics of the respondents is presented on table 3.

Table 4: Socio demographic characteristic of respondents.

Variable		n (%)
Gender	Male	145 (61.2)
	Female	92 (38.8)
Age	Median age (30 years)	
Academic Status	Druggist	6 (2.5)
	Bachelor	191 (80.60)
	Masters	40 (16.90)
Current Position	Pharmacy Head	7 (3.0)
	Case Team Leader	28 (11.8)
	Store head	22 (9.3)
	Pharmacist at Dispensary	118 (49.8)
	Pharmacist at ward	32 (13.5)
	Pharmacist at Compounding	6 (2.5)
	Drug Information Center(DIC)	8 (3.4)
		13 (5.5)
	Drug Supply Management Assistants (DSMA)	3 (1.3)
	Other	
DAGU-One Training	Yes	73 (30.8)
	No	164 (69.2)
DAGU-Two Training	Yes	38 (16.0)
	No	199 (84.0)
Work Experience	Median work exp. (2 years)	
Level of Working Organization	Federal Hospital	51 (21.5)
	Federal Hospital, University Affiliated	99 (41.8)

	Addis Ababa Health Bureau	56 (23.6)
	Addis Ababa Health Bureau, University Affiliated	31 (13.1)

5.1.2. Structural Equation Modeling

By using Structural Equation Modeling we tested the research question and the relationship between the constructs. We also undergo SEM analysis with and without the added External Variables. Since we already conducted CFA, dropped some latent variables and measurement items and already confirmed we have good model fit, we did not start constructing the model from scratch for SEM analysis. We added error terms in the dependent variables and we construct Path Diagram by drawing the relationship between dependent and independent variables. It shows the relationship between the variables and we add the error terms in to dependent variables. It consists of the following steps.

1st. Model Fit Assessment of SEM

In case of model fit assessment of SEM, we don't start from scratch. During the CFA, we dropped some measurements and constructs and took the model with good reliability, validity and that fits good. We usually need to assess model fit again, though it is similar as our model was good fit in the CFA, we still checked it again and the models containing external variables have a good model fit. i.e. Both CFA and SEM showed we have a good model fit.

2nd. Estimating the path coefficient

We test our research questions and explain the relationship between constructs. We were testing the path co-efficient and p-value.

3rd.Estimating Square Multiple Correlations (estimating R2)

Squared multiple correlation (r^2) is called the coefficient of determination which is defined as the proportion of the total variation explained by the model.

5.1.3. Structural equation modeling (SEM) without external variable

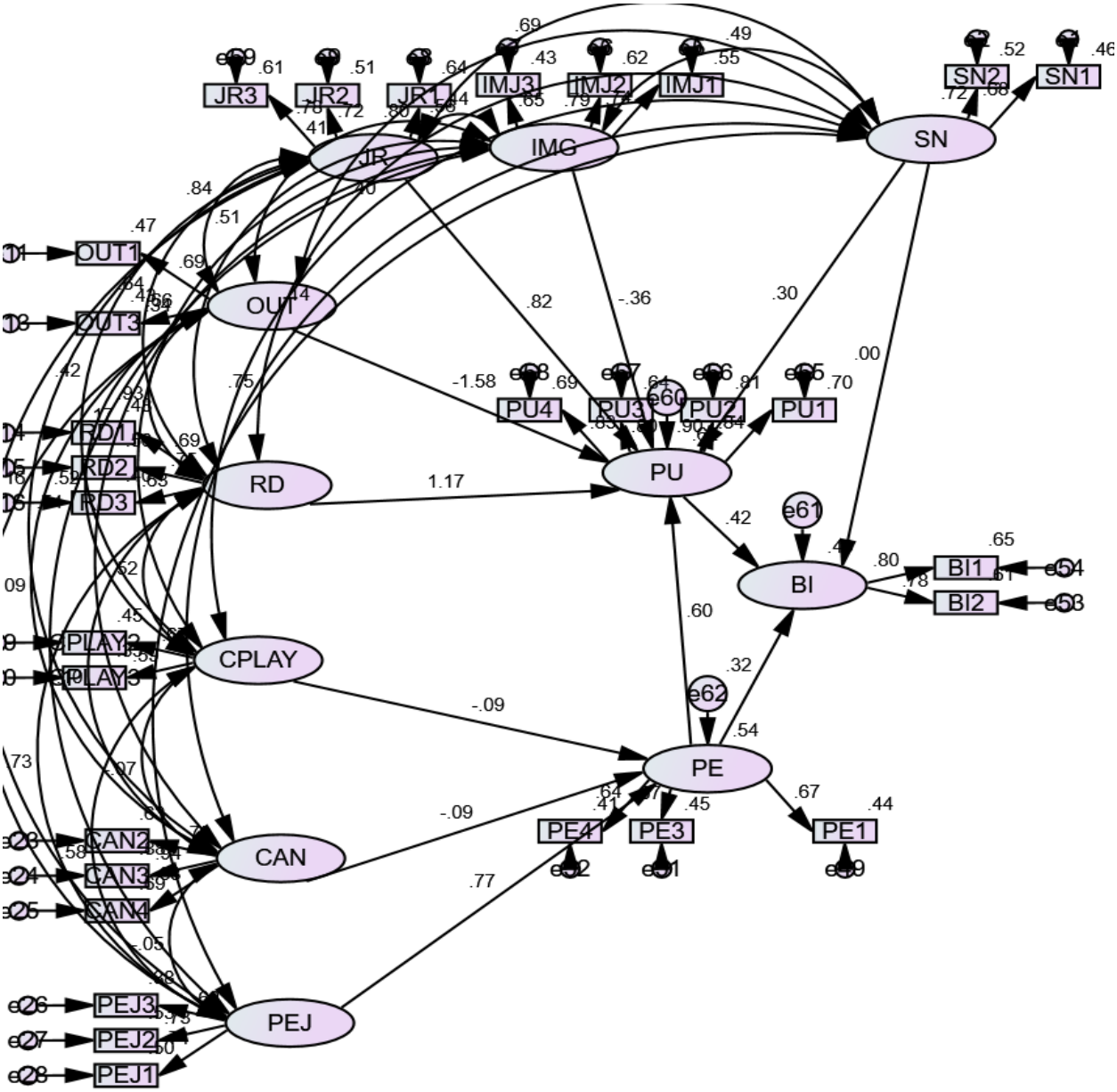


Figure 10: SEM result without External Variables (AMOS)

❖ **Model Fit Summary of SEM without external variables**

Table 5: Model Fit Summary of SEM without external variables

Model	Model Fit	Result	Recommended Value
1	NPAR	92	
	CMIN	636.029	
	DF	373	<3
	P	0	
	CMIN/DF	1.705	
2	IFI	0.922	
3	TLI	0.907	> 0.9
4	CFI	0.92	
5	RMSEA	0.057	< 0.08
6	Standardized RMR	0.522	< 0.08

❖ ***We have good model fit of SEM without external variables.***

Estimating path coefficients

It tests our model and the relationship between constructs of the model. This part of the result answers the research questions.

Table 6: path coefficient result of SEM without external variables

		Construct	*Estimate*	*S.E.*	*C.R.*	*P*
PE	<---	*CPLAY*	*-0.1*	*0.141*	*-0.71*	*0.478*
PE	<---	*CAN*	*-0.066*	*0.052*	*-1.271*	*0.204*
PE	<---	*PEJ*	*0.766*	*0.114*	*6.745*	***
PU	<---	*PE*	*0.659*	*0.137*	*4.807*	***
PU	<---	*SN*	*0.312*	*0.659*	*0.473*	*0.637*
PU	<---	*IMG*	*-0.346*	*0.52*	*-0.665*	*0.506*
PU	<---	*JR*	*0.84*	*1.063*	*0.79*	*0.429*
PU	<---	*OUT*	*-1.674*	*2.868*	*-0.584*	*0.559*
PU	<---	*RD*	*1.307*	*1.992*	*0.656*	*0.512*
BI	<---	*PE*	*0.365*	*0.17*	*2.143*	*0.032*
BI	<---	*PU*	*0.428*	*0.126*	*3.388*	***
BI	<---	*SN*	*0*	*0.1*	*-0.001*	*0.999*

*** Significant at 0.01 level

1. PEOU is Positively and significantly affected by PEJ (p=0.01).
2. PU is associated positively and significantly affected by PEOU (p=0.01).
3. BI Positively and Significantly affected by PU (p=0.01).
4. BI Positively and Significantly affected by PEOU (p=0.05).

Squared Multiple Correlations (explanatory power of the model) (r^2)

This results how the Technology Acceptance Model 3 explains behavioral intention to use e-HCMIS.

Table 7: squared multiple correlations r^2

Construct	Estimate
PE	0.536
PU	0.622
BI	0.488

1) 53.6% of the Variance of the Perceived Ease of Use Explained by the Above Factors.
2) 62.2 % of the Variance of the Perceived Usefulness Explained by the Above Factors.
3) 48.8% of the Variance of Behavioral Intention is Explained by This Model.

5.1.4. Structural Equation Modeling with External Variables Technical Support and Management Support

Model Fit Summary SEM model with external variables

Table 8: Model Fit Summary SEM model with external variables

MODEL	MODEL FIT	RESULT	RECOMMENDED VALUE
1	NPAR	135	
	CMIN	1298.155	
	DF	768	
	P	0	<3
	CMIN/DF	1.69	
2	IFI	0.895	
3	TLI	0.88	>0.9
4	CFI	0.893	
5	RMSEA	0.054	<0.08
6	Standardized RMR	0 .0569	<0.08

We have good model fit of SEM with external variables.

❖ **Estimating Path Coefficient**

Table 9: Estimated Path Coefficient SEM with external variables

Construct			Estimate	S.E.	C.R.	P
PE	<---	CPLAY	-0.164	0.155	-1.056	0.291
PE	<---	CAN	-0.118	0.055	-2.134	0.033
PE	<---	PEJ	0.723	0.109	6.663	***
PE	<---	TS	0.172	0.092	1.875	0.061
PU	<---	PE	0.65	0.115	5.66	***
PU	<---	SN	0.003	0.102	0.03	0.976
PU	<---	IMG	-0.049	0.073	-0.666	0.506
PU	<---	JR	0.248	0.098	2.519	0.012
PU	<---	RD	0.164	0.106	1.547	0.122
PU	<---	MS	-0.133	0.073	-1.816	0.069
BI	<---	PE	0.386	0.167	2.314	0.021
BI	<---	PU	0.41	0.123	3.325	***
BI	<---	SN	0.008	0.1	0.078	0.938

*** Significant

1. PE have negative significant relationship with CANX (P=0.05).
2. PEOU have positive significantly affected by PEJ (p=0.01).
3. PU Is positively and significantly affected by PEOU (P=0.01).
4. PU have positively and significantly affected by JR (P=0.05).
5. BI is positively and significantly affected by PEOU (P=0.01).
6. BI is positively and Significantly affected by PEOU (P=0.05).

Squared Multiple Correlations

Table 10: Squared Multiple correlation of SEM model with external variables.

Construct	Estimate
PE	0.542
PU	0.63
BI	0.492

1. 54.2 % of the variance of the PEOU was explained by The Above Factors.
2. 63 % of the variance of the PU was explained by The Above Factors.
3. 49.2% of the variance of BI is explained by this model.

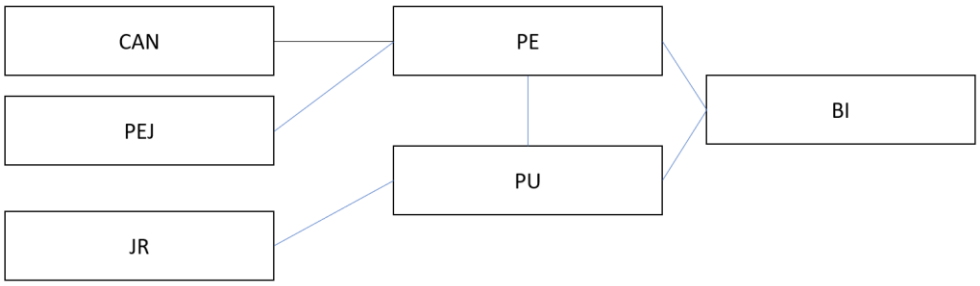


Figure 11: The final model according to quantitative result

Final quantitative result shows BI to use of pharmacists is determined by PU and PEOU.

5.2. Qualitative result

5.2.1. Characteristics of Participants

Fifteen participants participated in the interviews. Ten participants were male and two of the participants have master's degree-level education. In terms of professional background, thirteen were pharmacists and two of them were IT professionals. Moreover, all of the study participants held senior-level positions at the time of the study. The average period of participants who stayed in their profession at the time of the interview was five years.

The TAM3 was used as the guiding theoretical framework to provide insight into two key determinants that influence user acceptance of technology called perceived usefulness and perceived ease of use. The interview was done with pharmacy professionals, pharmacy heads, IT professionals and responsible stakeholders (MOH, EPSA and JSI).

Table 11. sociodemographic characteristics of qualitative study respondents

Characteristics		Number
Sex	Female	5
	Male	10
Age (in Years)	25-35	9
	Above 35	5
Highest academic degree completed	First Degree	13
	Second Degree and above	2
Profession	Pharmacist	13
	IT Profession	2
Place of work (Organization)	EPSA Centrale	1
	EPSA Branch	3
	TASH	2
	MoH	2
	Yekkatite 12 hospital	1
	SPSH	3
	SPHMMC	1
	JSI	1

	I-CARE	1
Role/position in the organization	Junior	0
	Senior	15
Length of service in current role/position in years	1-5	11
	>6	4

5.2.2. Qualitative Study Findings

The Analysis identified four major themes in the areas of behavioral intention to use e-HCMIS. The identified themes include perceived usefulness, perceived ease of use, management support and ownership. The main findings under each major themes and corresponding subthemes are presented below.

Perceived Usefulness

The extent to which a person thinks using a particular system would improve his or her performance, enhance effectiveness, increase productivity and help their job done at work. Participants indicate that using e-HCMIS improves their performance, effectiveness, and productivity.

- **The system is relevant for their job (job relevance)**

Respondents indicate that using the system help them to perform all pharmaceutical supply chain works like inventories, quantification, report and requesting track and trace of medicines. These reasons make them easily accept and use the system.

- ✓ **Multi-purpose**

The respondents believe that the importance or relevance of the system for their job encourages them to use it. They said even though the system is not fully automated it still performs all pharmaceutical supply chain work. Had it been fully automated, it would have been even more relevant for their job.

"…… *We use e-HCMIS, without that system we cannot do anything. We work all our job by the system, we can see stock status, bin card, expiry date, consumption, cost etc. We can generate different reports like consumption, inventory, wastage rate. It can help us practice first expire first out principle." (female, a pharmacist working in the hospital 5)*

"…… *Now that it is in operation, it would be better for store than dispensary units. The reason is when you are calculating balance, there are times where there is discrepancy between what is written on bin card and what you actually have, and during such times the system shows you to which units the medication was distributed, depending on that and referring from the models you can see and understand what you missed." (female, a pharmacist working in the hospital 5)*

- ✓ **Interlinking supply chain stakeholders**

Since the system interlinks different stakeholders along the supply chain path, individuals are not required to be present in person, this makes the system fast, time saving and help professionals to trace and track supply and demand easily.

"…… *We use the DAGU system, and when we receive reports of institutions that use the DAGU system. Their reports tell us about their consumption and demand, and we supply accordingly. The system contains its data calculation beginning data and loss adjustment. The professionals can send their reports from their institutions and update medication lists using the system. They only need a Wi-Fi connection." (male, a pharmacist working in the EPSA 2)*

- ➢ **Output Quality**

The respondents indicate that using the system increases the quality of their work output (Output Quality). Using the system appropriately increases data visibility, data quality, and data eligibility.

- ✓ **Data visibility**

*"****……*** *The maximum amount of time it takes for the drug to be registered at store into the system and then distributed to the patient at the dispensary unit is a maximum of one full day." (female, a pharmacist working in the hospital 5)*

"…… *It is easy to see what kind of decisions a national drug needs and observe where is the scarcity. Because it is system-based, it allows the system to run within the band channel and display data visibility." (male, a pharmacist working in the MOH 7)*

- **Workload/double Burden**

The respondents indicate that using e-HCMIS is very relevant and helpful for their day-to-day activities but almost all have the same concern, it has workload and repetition of work. All tasks performed in the system are also required to be performed on the paper based system. This creates work load and double burden which makes using the system meaning less. Participants indicate that they work on both paper based and electronic system making work huge load and time consuming. If they can only work using the electronic system, then it increases their productivity and performance.

"……When the system came, I was annoyed at first, because you do the same thing twice, and most of the people were not happy, but if we only used the system, it would be much easier for us and we would be happy……When we ask why, one of the reasons they give us is to replace it if the system is interrupted for some reason. Second, the Ministry of Finance should recognize that the Model 19, 20 and Cash Ticket, which will be fully digitally accredited by the system, should be completed as soon as possible." (female, a pharmacist working in the hospital 5)

***"……** Because the system is not fully automated and the paper based is not fully stopped, it has work burden**.** Experts point out that the workload increases as it is not fully automated. Since it is not fully automated, professionals are pushed to work on the paper as well. Professional are complaining to stop paper based work and reduce the work burden, it has now reached the final stage of implementation at the Federal and University Hospitals to make it fully automatic." (male, a pharmacist working in the MOH 8)*

Perceived Ease of Use

The extent to which a person is believed that using the e-HCMIS is free of effort (physical and mental).

- **Integrating with The Existing System**

Participants emphasized the significance of a new health technology's ability to smoothly connect with current technological systems in order to support its user-friendliness. This was crucial for providers who saw the potential burden of integrating new technology as an additional burden on top of their already demanding workload. The ability of technology to interact with already-existing health commodity management information systems to improve workflow and productivity without imposing additional work had a significant impact on people's attitudes toward and intentions for adopting it. Participants explain as the following.

The respondents indicate that if the system integrates with the existing system, it would be easy to use the system. But in our context, there are always some initiatives that are stopped only to start new initiative, this is discouraging.

"……*No technology is perfect, it needs improvement, but when we improve, I suggest not to completely overthrow the existing system. Instead of throwing it all out we need to hold on to the existing system as a backup, but in our case we tend to over throw what we have but when and if some mistake occurs the former system can be used to track back things." (female, a pharmacist working in the hospital 10)*

"…… Before creating a new system, we need to think and consider what can I do to update and improve what I already have, I don't think we have to start from scratch, we have to think of what is the gap and how can we improve the already existing system." (male, a pharmacist working in the hospital 12)

- **Technical Support**

When it comes to getting technical support, there are two groups of respondents. Participants from institutions where they easily get support who indicate that having technical support nearby and by their side makes it easy to use the e-HCMIS, it includes availability of a nearby technical team, availability of telephone. The other are participants from institutions where getting support is difficult. They indicated that non responsiveness of technical people, the unavailability of personnel nearby and not answering telephone make it very difficult to use the system. When supporting professionals are not readily available the end users of the system are discouraged from using the system.

"…… Off the things that helped me use the system, the major thing is that when system interrupts or fails in between work, we will call the supporting office using the phone number placed at the pharmacy unit and warehouse, they will come immediately and fix the issue, there is some gap but they come as soon as possible and fix our problems." (female, a pharmacist working in the hospital 5)

"……When we launched the system with our organization, we have prepared supporting office at the operating institution. This group gives pre and post training and assistance when problems occur and tries to solve problems as they happen. We are trying to increase acceptance of the system by pharmacists, we have posted the supporting bureaus number

at each warehouses and pharmacy units." (male, a IT professional working in the I-CARE 15)

"……*After the implementation of this system we are facing challenges to use the system, for example, when the system interrupts the people in charge of fixing they don't come on time and fix it. If they had fixed it as it happens, it would have been easier for us to use." (female, a pharmacist working in the hospital 1)*

Respondents also emphasized on the importance of participation of pharmacists on the development and updating of e-HCMIS as pharmacists are the end users of the system. They are the ones to be benefitted, challenged and see the imperfect side of the system.

"…… *Pharmacists are integral part of the program and system development, and even after launching the system, we are receiving feedback and improving the system and making it user friendly.* ***……*** *After we launched this system as partner company, we developed a support group office at the institute, and this group fix problem and interrupting with the system as it happens and by doing pre and post training we are trying to increase and improve the systems acceptance by the pharmacists."* (*male, a pharmacist working in the I-CARE 15)*

"……*We are receiving constant feedback from professionals and we are improving the system, and the person who is working is getting the job done." (male, IT professional working in the JSI)*

Management Support

The respondents indicate that 40-60% of the hospital budget is spent for the purchase of medicines and medical equipment, managing this starts from managing the warehouse properly. To do this, participants agreed that attention should be given to this process by the management. It includes Committed Management, Internal and external follow up and monitoring, designing appropriate strategy to learn, Ensure Sufficient allocation of resource and give appropriate incentive for pharmacy professionals.

- **Committed Management**

The respondents indicate that to get the maximum benefit of e-HCMIS need of Committed Management from all levels and all levels of managements need commitment and coordination and they should fulfill their responsibility.

"…… *It is better for the hospital to be fully accredited and fully converted to electronics by contacting the relevant body, recognizing that unnecessary workload and repetition are unnecessary." (female, a pharmacist working in the hospital)*

"…… *To get effective result from the system, it needs coordination more from the pharmacy professionals and it needs responsibility and accountability." (male, a pharmacist working in the EPSA)*

- **Failure of The Follow Up and Regulation**

Respondents indicate, this type of initiatives and system need follow up and monitoring, it is not and it should not be a one-time thing, it needs follow up, monitoring and support.

Respondents agrees failure of follow up and only using it for reporting is not the actual benefit of the system.

"……*The management team should motivate and follow the work they did, supervise and when they face the problem the management should be responsible to face and tackle the problems and support the assigned professional by every aspect they need." (male, a pharmacist working in the EPSA)*

- **Training**

Respondents give emphasis when implementing systems or technology, professionals need to know why, how and when they are to use the system being implemented. Among the system user's institutions who were given the necessary training were happy to use the system and were effective whereas professionals who did not get the necessary training were not happy and unsatisfied about the system.

"……*Before they implement the system, the hospital management and stakeholders gave us preliminary training which was very informative and useful, training was given differently for store managers and dispensary units, and this helped me a lot to use and accept the system." (female, a pharmacist working in the hospital)*

"…… *To accept the technology, the pharmacy professional should have awareness about the ultimate goal of the system by using trainings, this give the pharmacist the willingness to use the system." (male, a pharmacist working in the EPSA)*

- **Sufficient Allocation of Resource**

Respondents indicate the importance of ensuring sufficient allocation of the resources including infrastructure and trained human power.

- ✓ **Infrastructure**

Some respondents indicated that there is no problem of infrastructure in Addis Ababa hospitals and some argue that they are not happy by the infrastructure both groups agreed the importance of well function infrastructure.

"…… *It is best to manage electricity first because if the light goes out while you are working, you will start all over again and this will prevent us from working properly." (female, a pharmacist working in the hospital)*

"……*There is Wi-Fi, electricity we have everything needed like a computer and electronics, so there is nothing that prevent us from working on it."* (*male, a pharmacist working in the hospital)*

The respondents indicate that they use the system and request medication from the fulfilled correspondence EPSA branch and they don't get the requested medicines according to their report, this make them think what is the benefit of the system if they can't get what the system generate for them.

"…… *Health centers and hospitals use the system, but EPSA cannot fully provide/fulfil their request per their report, this sometimes discourages them, and when the items arrive at the EPSA, they request to be accommodated according to their previous report." (male, a pharmacist working in the EPSA)*

Ownership

In our interview, importance of ownership is given important place by participants and activities leading to build the ownership among the interested parties was mentioned in most of the interviews. Participants indicate that major initiatives like e-HCMIS is donor dependent System, have no specific responsible body, it has no its budget.

"……*When we implement such initiatives, we need to give technical assistance to the pharmacy professionals (end users) either on site or remotely. This would help us to increase the system acceptance. When system fails, we need to know how to trouble shoot and fix it otherwise we might continue feeding data to the system and come up with non-credible outcome. Institutions should not depend on donors and external partners; we need to understand with little investment more money can be saved." (male, a pharmacist working in the hospital 11)*

"……*Sometimes when the system breaks down, there are technical people assigned by the donor who come and fix it, and when it interrupts work we are forced to wait for these people and unless these people come and fix it, we cannot do it by ourselves." (female, a pharmacist working in the hospital 10)*

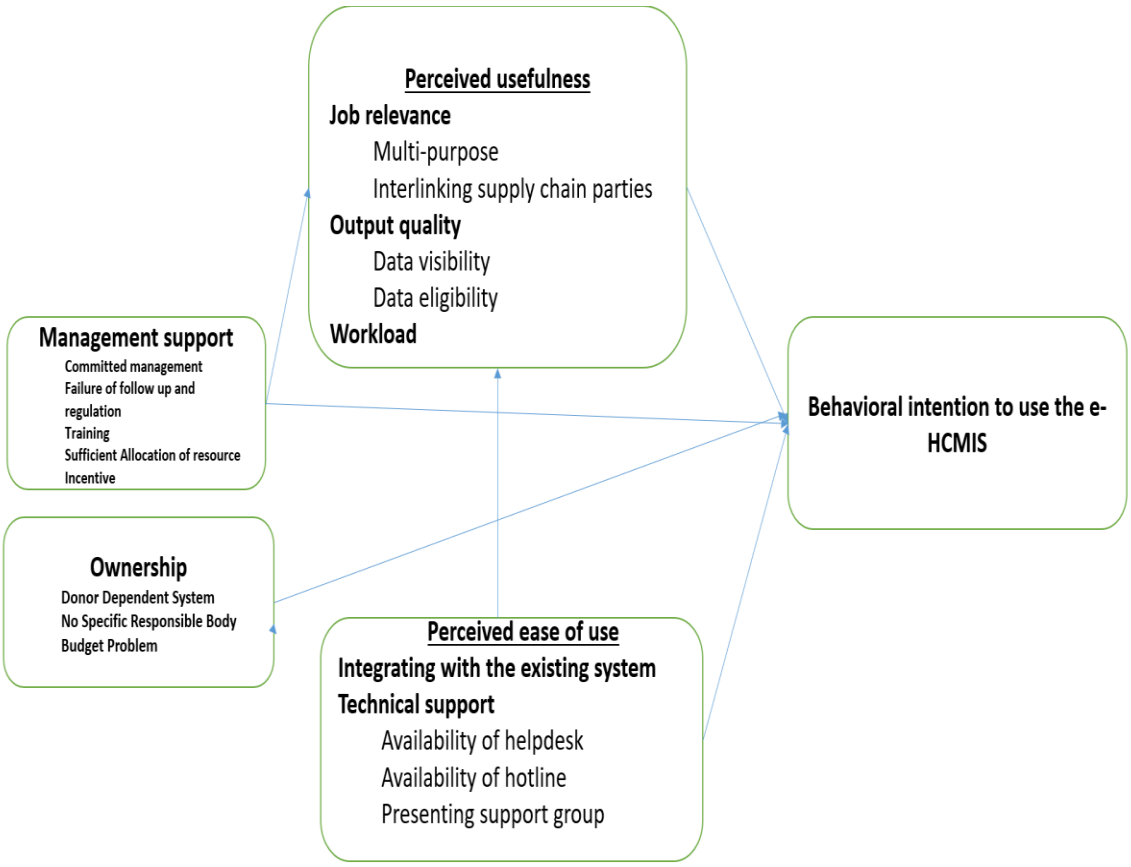


Figure 12: the final model according to the qualitative finding

6. Discussion

This study was set out to Assess Pharmacy Professionals' Acceptance of e-HCMIS by using Modified TAM3, in terms of model fit, the model was successfully extended by including two external factors management support and technical support.

In this section, findings from quantitative and qualitative key informant interview phases were integrated to more fully answer the research questions. The qualitative part helped to further explain and elucidate findings from quantitative phase of the study.

The study result showed that 49.2% of variation in Behavioral Intention to use the system was explained by the proposed model. Perceived Usefulness and Perceived ease of use were significant predictor of behavioral intention towards using the technology (e-HCMIS) this result aligned to (Liang, Xue and Byrd, 2003; Melas *et al.*, 2011; Ketikidis *et al.*, 2012; Basak, Gumussoy and Calisir, 2015) but our study have lower variance from this studies, this discrepancy could be due to the different types on technologies studies and different factors considered within the model .

Our study showed that PU directly and significantly affect pharmacy professionals BI to use the system. This finding is similar to several other studies (Liang, Xue and Byrd, 2003; Wu, Wang and Lin, 2007; Wu *et al.*, 2008; Abdekhoda *et al.*, 2014; Basak, Gumussoy and Calisir, 2015; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020) this may be because PU; which incorporated improved performance, enhanced effectiveness, increased productivity and time efficiency on the system use leads to increased BI to use the system.

Though TAM was used in different health professionals (pharmacists, nurses, physicians, etc.) as well as on different types of technologies like PDA, robotics and health informatics, all studies showed Behavioral intention to use the technology is highly and significantly affected by PU (Liang, Xue and Byrd, 2003; Wu, Wang and Lin, 2007; Wu *et al.*, 2008; Abdekhoda *et al.*, 2014; Basak, Gumussoy and Calisir, 2015; Helia *et al.*, 2018; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020) this may be because of the usage and acceptance of technology by health professionals depend on their perceived usefulness of the technology.

In contrast the study done in Skopje on acceptance of health information technology (HIT) by using TAM2 found interesting and opposite result that PU is not significant factor to intention to use HIT. The reason they gave is health professionals focuses its easiness rather than usefulness which is very unlikely when compared to the other studies (Ketikidis *et al.*, 2012).

The result of this study revealed that JR strongly and positively influence PU, this finding is supported by the study by (Hogan *et a.*, 2020). The probable reason for this could be perceiving the system is useful to complete their job and understanding its advantages ultimately pushes them to utilize the system.

Another study by (Liang, Xue and Byrd, 2003) states that JR is related to cognitive thinking and pharmacists understanding of job responsibilities, features and functionalities of the e-HCMIS and employing the right functionality to meet their objective increased PU. This result of the study goes along with our key informant finding which found the fact that the

e-HCMIS help them to do all their job and interlinks different stakeholders increased their PU.

Perceived Ease Of Use was found to have positive relation with PU and BI, this finding goes along with studies by (Liang, Xue and Byrd, 2003; Wu *et al.*, 2008; Abdekhoda *et al.*, 2014; Basak, Gumussoy and Calisir, 2015; Kalayou, Endehabtu and Tilahun, 2020). The probable reason for this similarity could be health professionals work environment is full of hustle and has demanding work load, as a result they don't want to engage in other work and prefer to be kept busy on their own work, but not other technologies that require their time. Another study found that perceived ease of use is not important factor for intention to use for health professionals (Hu *et al.*, 2012).

Perceived ease of use was found to be almost equally important as PU, and this could be due to easy task to use and that relives work load pushes the pharmacy professionals to use the system more. The lesser effort it requires and the easier it is to manipulate, the more people intent to use the e-HCMIS. This finding is similar with studies done on health professionals (Liang, Xue and Byrd, 2003; Wu, Wang and Lin, 2007; Wu *et al.*, 2008; Abdekhoda *et al.*, 2014; Basak, Gumussoy and Calisir, 2015; Helia *et al.*, 2018; Kalayou, Endehabtu and Tilahun, 2020; Kamal, Shafiq and Kakria, 2020; Kissi *et al.*, 2020). This finding is also supported by our qualitative study, when professionals believe the system is easy to use, their behavioral intention to use the system increases.

Our key informant interview revealed that integrating e-HCMIS with an existing system and availability of TS increases pharmacist's confidence to use the e-HCMIS and this

affects PEOU. This finding is similar with a study done in Canada (Nguyen *et al.*, 2020) and USA (Liang, Xue and Byrd, 2003).

Our study found that Computer Anxiety has negative and significant relation with PEOU. It has negative impact on perceived ease of use and have challenge for behavioral intention to use the e-HCMIS through PEOU. This could be because computers are essential part of exploiting the system and pharmacy professionals who are not friendly with computers are less likely to have the intention to use the system. In contrast, a study done in Skopje on acceptance of HIT by using TAM-2 found Computer Anxiety is not significant factor to intention to use HIT. The reason they gave were computer use task is not stressful (Ketikidis *et al.*, 2012), and this difference may because of exposure to technology and computers in the set of population were different.

Perceived enjoyment has a direct significant relationship with perceived ease of use. This is relatable to professionals who enjoy using the system without performing the actual use of the system are more likely to perceive using the system is easy.

In our quantitative result management support is not significant variable in contrary in our qualitative result it is important factor to intention to use e-HCMIS. Management support have direct positive impact on perceived usefulness, perceived ease of use and behavioral intention, it explained by committed management, follow up and regulation, training, sufficient allocation of resource and incentives. It is supported by the study done in Taiwan on adverse reporting system on physicians, nurses, medical technicians, pharmacists and administration staffs, management support had a direct effect on perceived usefulness, perceived ease of use, and subjective norm and through this it has effect on behavioral

intention to use the system. It is important factor (Wu *et al.*, 2008). This suggests that strong management support represents a key to build a more successful implementation and consistent use of e-HCMIS.

Our qualitative study revealed that ownership has positive relation with BI into using system. The fact that system is donor dependent, donors have to be referred for everything (updating, correcting malfunctions, training budget, etc.) might have been a reason not to fully use the HCMIS. Had there has been a governmental responsible body who own the system, the system would have been manipulated well.

7. Strength and Limitation of the study

7.1. Strength of the study

The study used SEM which accounted for measurement error and this would enhance the accuracy of the finding. The study used both qualitative and quantitative methods, and this would make the study a good bench mark for upcoming related researches.

7.2. Limitation of the study

While the study tried to include different factors and facilities, the fact that the facilities are in different phase of implementation of the system was potential factor that affected the finding.

Additionally, some of the interview guide might have been subject to recall bias.

8. Conclusion and Recommendation

8.1. Conclusion

The study result showed that 49.2% of variation in Behavioral Intention to use the system is explained by the proposed model, and Perceived Usefulness, perceived ease of use, management support and ownership were significant predictor of behavioral intention towards using the e-HCMIS. Job Relevance, output quality and work load are significant determinants of perceived usefulness. Perceived Enjoyment, Computer Anxiety, Technical Support and Integrating with the existing system are determinants of Perceived Ease of Use.

8.2. Recommendation

Based on the findings of the study, the following recommendations were made:

For the System Developers, Hospital Administration and Policy Makers

- Promote how useful and easy the e-HCMIS is to manipulate and relives workload.
- Promote and give the necessarily information about the ultimate goal and importance of using the e-HCMIS.
- Find a way to make the e-HCMIS easy to be understood and operate.
- Learn to give responsibilities with dedicated support and transparency.
- Establish continuous professional development in the area of technology and system

For pharmacy professionals

- Setup a mechanism to make themselves familiar with the e-HCMIS and try to know the ultimate goal of using the system.

- Create a supportive environment to operate and explore the e-HCMIS with confidence.

For Researchers

- Future research could further examine the acceptance and use of a technology model by adding additional factors as well as other models. This study could also contribute to a deeper understanding of what factors lead a professional lead to accept and use the e-HCMIS.

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Appendices

Annex 1: Informed Consent Letter

Informed Consent Form
Study Title: Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities in Addis Ababa
Introduction and study objective
Hello, my name is, Nardos Getachew and I am contacting you to gather information for a study undergoing for partial fulfillment of my master's degree. I am collecting this data from pharmacy professionals to investigate their acceptance of e-HCMIS and to identify its determinants at Addis Ababa public hospitals. The data generated will be analyzed and will give an in-depth understanding of pharmacist perception about the system in use, which may help them to develop effective interventions to boost the acceptance rate of the e-HCMIS and apply appropriate policies in order to encourage the frequent and efficient use of e-HCMIS. Your responses will be strictly anonymous, meaning that your name or any personalized information will not be used or appear in any documents, communications, or analysis related to these data. Participation is strictly voluntary, and you do not have to answer all questions you do not wish to. You can opt to withdraw consent at any time. There is no guarantee of immediate benefit from your participation, yet, the results will help the researcher to understand pharmacy professionals their intention to use e-HCMIS. To participate, you are requested to: 1) collaborate with our data collector to respond to questions linked to **Validating modified Technology Acceptance Model 3**. 2) authorize the use of these data while maintaining anonymity
Confidentiality
Our study data collector will maintain complete confidentiality during the data collection time. The other viewers of the report will NOT be told your name or any other personally identifiable information.
Risks
Although our team will never, under any circumstances, disclose your name or personal details about you being contacted to anyone. If users of the data guess (based on your location) or if you choose to

disclose your identity to anyone, there may be a risk that your identity is revealed and linked to the results of the assessment.	
Benefits	
The benefit of your participation in this research is that the data arising from this assessment will be used in different ways to Ethiopia to strengthen the ultimate use of technologies to improve pharmaceutical supply chain.	
Who to contact	
If you decide to participate in this research and you have additional doubts or questions, you can communicate with Nardos Getachew 091099092.	
Verbal consent and agreement	
If you would like to participate, please confirm that you understood everything I have told you about this exercise. Do you have any questions? (Let the participant ask any questions they have).	
Do you agree to allow us to start the anonymous partner tracing process? (staff to fill out part below and sign and give the participant a copy.)	
Agrees to participate	
Does NOT agree to participate	
I understand the study aims and objectives and have decided to allow the partner tracing process to go forward.	
Name:	
Signature:	Day/Month/Year
Person Obt**a**ining Consent:	
Name:	
Signature:	Day/Month/Year

Annex 2: Questionnaire

SECTION ONE: Participants' socio-demographic and practice setting information

1. Gender: ☐ Male ☐ Female
2. Age (Years): _____ Years
3. Highest Academic Degree

   ☐ Bachelor ☐ Masters ☐ PharmD ☐ PhD

   ☐ Others, Please Specify_____

4. Current Position

   ☐ Pharmacy Head ☐ Case team leader ☐ Store Head

   ☐ Pharmacist at dispensary

   ☐ Pharmacist at ward

   ☐ Pharmacist at compounding

   ☐ Others, Please Specify_____

5. Have you taken any training on DAGU-1 or any other Electronic HCMIS

   ☐ Yes

   ☐ No

6. Have you taken any training on DAGU-2

   ☐ Yes

   ☐ No

7. Work Experience: _____ Years _____Months
8. Level of your working Organization

   ☐ Federal hospital

   ☐ Federal Hospital University affiliated

   ☐ Addis Ababa health bureau

   ☐ Addis Ababa health bureau university affiliated

SECTION TWO: Perceptions about the use of electronic HCMIS systems

The following questions asks about your perception of using Electronic HCMIS (Health Commodity Management Information System) (DAGU-1, DAGU-2 and electronic APTS (Auditable Pharmaceutical Transaction). Please answer each of the following questions by circling the number, which best describes your opinion. [1 = **strongly agree;** 2 = **Agree**; 3 = **Neither Agree / Disagree**; 4 = **Disagree**; 5 = **Strongly Disagree**]

1 **Using the Electronic HCMIS would improve my performance in my job**

Strongly Agree 1 2 3 4 5 Strongly disagree

2 **Using the Electronic HCMIS would enhance my effectiveness in my job**

Strongly Agree 1 2 3 4 5 Strongly disagree

3 **Using the Electronic HCMIS in my job would increase my productivity**

Strongly Agree 1 2 3 4 5 Strongly disagree

4 **I would find the Electronic HCMIS to be useful in my job**

Strongly Agree 1 2 3 4 5 Strongly disagree

5 **My interaction with the Electronic HCMIS is understandable**

Strongly Agree 1 2 3 4 5 Strongly disagree

6 **Interacting with the Electronic HCMIS does not require a lot of my mental effort**

Strongly Agree 1 2 3 4 5 Strongly disagree

7 **I find the Electronic HCMIS to be easy to use**

Strongly Agree 1 2 3 4 5 Strongly disagree

8 **I find it easy to get the Electronic HCMIS to do what I want it to do**

Strongly Agree 1 2 3 4 5 Strongly disagree

9 Assuming I had access to the **Electronic HCMIS**, I intend to use it

Strongly Agree 1 2 3 4 5 Strongly disagree

10 Given that I had access to the **Electronic HCMIS**, I predict that I would use it

Strongly Agree 1 2 3 4 5 Strongly disagree

I could complete the job using an Electronic HCMIS …

11 …**if there was no one around to tell me what to do as I go**

Strongly Agree 1 2 3 4 5 Strongly disagree

12 …. **if I had just the built- in help facility for assistance**

Strongly Agree 1 2 3 4 5 Strongly disagree

13 …. **if someone showed me how to do it first**

Strongly Agree 1 2 3 4 5 Strongly disagree

14 **……if I had used similar package before this one to do the same job**

	Strongly Agree	1	2	3	4	5	Strongly disagree

15 **I have control over using the Electronic HCMIS**

	Strongly Agree	1	2	3	4	5	Strongly disagree

16 **I have the resources necessary to use the Electronic HCMIS**

	Strongly Agree	1	2	3	4	5	Strongly disagree

17 **Given the resources, opportunities and knowledge it takes to use the Electronic HCMIS, it would be easy for me to use the Electronic HCMIS**

	Strongly Agree	1	2	3	4	5	Strongly disagree

18 **The Electronic HCMIS is not compatible with Electronic HCMIS I use**

	Strongly Agree	1	2	3	4	5	Strongly disagree

19 **I find using the Electronic HCMIS to be enjoyable**

	Strongly Agree	1	2	3	4	5	Strongly disagree

20 **The actual process of using the Electronic HCMIS is pleasant**

	Strongly Agree	1	2	3	4	5	Strongly disagree

21 **I have fun using the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

22 **People who influence my behavior think that I should use the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

23 **People who are important to me think that I should use the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

24 **The senior management of this system has been helpful in the use of the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

25 **In general, the organization has supported the use of the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

26 **People in my organization who use the Electronic HCMIS have more prestige than who do not**

Strongly Agree 1 2 3 4 5 Strongly disagree

27 **People in my organization who use the Electronic HCMIS have a high profile**

Strongly Agree 1 2 3 4 5 Strongly disagree

28 **Having the Electronic HCMIS is a status symbol in my organization**

Strongly Agree 1 2 3 4 5 Strongly disagree

29 **In my job, usage of the Electronic HCMIS is important**

Strongly Agree 1 2 3 4 5 Strongly disagree

30 **In my job, usage of the Electronic HCMIS is relevant**

Strongly Agree 1 2 3 4 5 Strongly disagree

31 **The use of the Electronic HCMIS is pertinent to my various job- related tasks**

Strongly Agree 1 2 3 4 5 Strongly disagree

32 **The quality of the output I get from the Electronic HCMIS is high**

Strongly Agree 1 2 3 4 5 Strongly disagree

33 **I have no problem with the quality of the Electronic HCMIS output**

Strongly Agree 1 2 3 4 5 Strongly disagree

34 **I rate the results from the Electronic HCMIS to be excellent**

Strongly Agree 1 2 3 4 5 Strongly disagree

35 **I have no difficulty telling others about the results of using the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

36 **I believe I could communicate to others the consequence of using the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

37 **The result of using the Electronic HCMIS are apparent to me**

Strongly Agree 1 2 3 4 5 Strongly disagree

38 **I would have difficulty explaining why using the Electronic HCMIS may or may not be beneficial**

Strongly Agree 1 2 3 4 5 Strongly disagree

39 **Management is aware of the benefits that can be achieved with the use of the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

40 **Management always supports and encourages the use of the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

41 **Management provides most of the necessary help and resources to enable people to use the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

42 **Management is really keen to see that people are happy with using the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

43 **Management provides good access to hardware resources for people to use the Electronic HCMIS**

Strongly Agree 1 2 3 4 5 Strongly disagree

44 **A help desk always available**

Strongly Agree 1 2 3 4 5 Strongly disagree

45 **A hotline always available**

Strongly Agree 1 2 3 4 5 Strongly disagree

46 **Enquiries through the website can be done**

Strongly Agree 1 2 3 4 5 Strongly disagree

47 **Enquiries by e-mail can be done**

Strongly Agree 1 2 3 4 5 Strongly disagree

48 **A person or group are available for assisting me with solving the problem**

Strongly Agree 1 2 3 4 5 Strongly disagree

49 **A clear educational instruction in software is available to help me**

Strongly Agree 1 2 3 4 5 Strongly disagree

50 **A clear educational instruction in hardcopy is available to help me**

Strongly Agree 1 2 3 4 5 Strongly disagree

SECTION THREE: Perceptions about the use of computers

The following questions ask you how you would characterize yourself when you use computers

1 **Spontaneous**

Strongly Agree 1 2 3 4 5 Strongly disagree

2 **Creative**

	Strongly Agree	1	2	3	4	5	Strongly disagree
3	**Playful**						
	Strongly Agree	1	2	3	4	5	Strongly disagree
4	**Unoriginal**						
	Strongly Agree	1	2	3	4	5	Strongly disagree
5	**Computers do not scare me at all**						
	Strongly Agree	1	2	3	4	5	Strongly disagree
6	**Working with a computer makes me nervous**						
	Strongly Agree	1	2	3	4	5	Strongly disagree
7	**Computers make me feel uncomfortable**						
	Strongly Agree	1	2	3	4	5	Strongly disagree
8	**Computers make me feel uneasy**						
	Strongly Agree	1	2	3	4	5	Strongly disagree

Annex 3: The Amharic and English version of informed consent and the qualitative interview guide

PHARMACY PROFESSIONALS' ACCEPTANCE of ELECTRONIC HEALTH COMMODITY MANAGEMENT INFORMATION SYSTEMS: AN EVALUATION OF HEALTH FACILITIES IN ADDIS ABABA

Nardos Getachew
Department of Pharmaceutics and Social Pharmacy
School of Pharmacy
Addis Ababa University

About this research

We are requesting you to participate in this study. Scholars do research to find an answer for a certain problem that might be help to improve the way of life of the community. We are providing you this consent form, read it carefully, and decide whether you are volunteer to involve in the study. Please ask any obscurity prior to agree in the study.

I am Nardos Getachew MSc student at Addis Ababa university college of health sciences campus. I am doing research on Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities In Addis Ababa Ethiopia.

It is funded by Addis Ababa University.

Please review the rest of this document for more details about this study and the things you should know before making a decision about whether to participate in this study.

Taking part in this study is voluntary

Your participation in the study is completely voluntary and you can refuse to answer any question at any time, for any reason, if you so decide. Any decision you make will not bring you any penalty or loss of benefits, and will not affect your relationship with your organization.

Why is this study being done?

is to investigate pharmacy professional's acceptance of e-HCMIS and identify its determinants and what is your opinion on the acceptance and determinant factor about technology acceptance for pharmacy professionals. the interview will take 30'to 45'.

For the time being I am interested in out of pocket payment to healthcare services and I would like to talk with you about your practice, attitudes and feelings of out of pocket payment to healthcare and medicine.

You were selected as a possible participant because your department/working position is the area that we want the information for this study.

How many people will take part?

If you agree to participate, you will be one of key informants from Federal Ministry of Health (FMOH), Addis Ababa Health Bureau, Public hospitals located in Addis Ababa, and Minimum of 4 key informants will be selected from each institution which gives a total of 12 participants taking part in this research interview.

What will happen during the study?

If you agree to be in the study, I will take notes of your comments but it might be difficult to capture all of your comments. Hence, in order not to miss any of your comments, I need your permission to use tape recorder.

How long will I be in the study?

The interview will take once and proposed duration is about 30 to 60 minutes.

What are the risks of taking part in the study?

While participating in the study, the risks, and/or discomforts include:

- ✓ A risk of completing the interview is being uncomfortable answering the questions.

- ✓ No guarantee on decision made by policymakers based on the present study's conclusion,
    - But we will try to complete a conclusion very precise to the truth we find.
- ✓ However, please do not hesitate to ask any uncomfortable or that you do not want to answer a particular question.

What are the potential benefits of taking part in the study?

We don't expect you to receive any benefit directly after taking part in this study, but we hope to learn things which will help policymakers in the future.

How will my information be protected?

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Thus, we ensure you the information in the report does not identify you as the respondent. The information you provide me will be kept confidential where it will be shared to the research team when needed only.

Will my information be used for research in the future?

Information collected from you for this study will never be used for future research studies or shared with other researchers for future research.

Will I be paid for participation?

You will not be paid for participating in this study.

Will it cost me anything to participate?

There is no cost to you for taking part in this study. You will not be responsible for these study-specific costs:

Can I withdraw from the study?

If you decide to participate in this study, you can change your mind and decide to leave the study at any time in the future.

Participant's consent

In consideration of all of the above, I give my consent to participate in this research study. I will be given a copy of this informed consent document to keep for my records. I agree to take part in this study.

Participant's Name:_____

Participant's Signature:_____ **Date**: _____

Name of Person Obtaining Consent:_____

Signature of Person Obtaining Consent:_____ **Date**: _____

English version of the qualitative interview guide

I. Background Information on Informant

Sex
Age (in Years)
Highest academic degree you have completed
Profession
Place of work (Organization)
Role/position in the organization
Length of service in current role/position

II. Interview guide

1. Do you currently use (manage/promote the use of – e-HCMIS in case of respondents from MOH or RHB) any electronic application, which helps your current work?
    1.1. What is your opinion on the extent of use of the electronic application you are using in your health facility?
2. Are you currently using electronic HCMIS?
    2.1. …if not, I would like to hear your opinion why you are not using electronic HCMIS?

3. In your opinion what is the level of health facility usage of e-HCMIS?
    3.1. What made you reach at this conclusion?
4. What are facilitating factors to use e-HCMIS?
5. In your opinion which factor facilitates more the use of e-HCMIS?
6. In your opinion what is pharmacy professionals' view about e-HCMIS?
    5.1 What made you reach at this conclusion?
7. From your point of view, are there any relevant aspects or questions that you feel should be addressed, but weren´t mentioned thus far?

Thank you very much for your time and cooperation!!!

Annex 4: Amharic version of the data collection form

አዲስ አበባ ዩኒቨርሲቲ

ፋርማሲ ት/ ቤት

የፋርማሲ ባለሙያዎች የኤሌክትሮኒክስ መድሃኒቶች እና የሕክምና ቁሳቁሶች, አስተዳደር የመረጃ ሥርዓቶችን መቀበል፡ በአዲስ አበባ የጤና ተቋማት ግምገማ

ናርዶስ ጌታቸው

ኃላፊዎች/ / ባለሙያዎች ቃለ-መጠይቅ ማድረጊያ መመሪያ

ስለ ጥናቱ መገቢያ

በቅድሚያ ከዕርሶ ጋር ለመነጋገር ስለሰጡኝ ጊዜ እና መልካም ፈቃድ በጣም አመሰግናለሁ። እኔ ናርዶስ ጌታቸውእባላለሁ። በአዲስ አበባ ዩኒቨርሲቲ ፋርማሲ ት/ቤት የሁለተኛ ድግሪ ተማሪ ስሆን፤ የመመረቂያ ጽሁፌን የፋርማሲ ባለሙያዎች የኤሌክትሮኒክስ መድሃኒቶች እና የሕክምና ቁሳቁሶች,አስተዳደር የመረጃ ሥርዓቶችን መቀበል፡ በአዲስ አበባ የጤና ተቋማት ግምገማ ርዕስ በመስራት ላይ እገኛለሁ። በዚህ ጥናት ይሣተፉ ዘንድ በአክብሮት እየጠየቅንዎ ነዉ። አጥኚ ሰዎች ጥናት የሚሰሩት በማሕበረሰቡ ዉስጥ ለሚፈጠሩ ተግዳሮቶች መልስ ለማግኘት እንዲረዳቸዉ ነዉ። ይህን የስምምነት ቅጽ በጥንቃቄ እነዲያነቡት እንሰጥዎታለን። ይህን ካነበቡ በኋላ በዚህ ጥናት ለመሳተፍ ፈቃደኛ ስለመሆን አለመሆንዎ ያሳዉቁናል። ያልገባዎ ወይም ግልፅ ያለሆነ ነገር ካለ እባክዎ በየትኛዉም ሰዓት ይጠይቁን።

በዚህ ጥናት ላይ የሚሳተፉት በዕርሶ በጎ ፈቃድ ብቻ ነዉ

ዕርስዎ በዚህ ጥናት የሚሳተፉት ሙሉ በሙሉ በዕርስዎ ፈቃደኝነት ላይ ተመሰረተን ሲሆን ማንኛዉንም ጥያቄ በየትኛዉም ሰዓት፤ በምንም ምክንያት አለመመለስ ይችላሉ። ነገር ግን ለመሳተፍ የሚወስኑት ዉሳኔ በምንም ዓይነት መልኩ በዕርሶ ላይ ቅጣት፤ የሚያጡት ጥቅም ወይም ከመሥሪያ ቤትዎ ያሎትን ግንኙት ተፅዕኖ አያደርስርም።

ቀጥሎ ሙሉ ዝርዝር መረጃ አቅርበናል ማለትም ወሳኔ ከመወሰንዎ በፊት ማወቅ ያለብዎትን ነገሮች ያትታል። እባክዎትን በትኩረት ይመልከቱት

የጥናቱ ዓላማ ምንድነዉ

ትክክለኛ እና ወቅታዊ የጤና ሪፖርት አቀራረብ ስርዓት ለሁሉም የጤና ተቋማት ትክክለኛ እቅድ ማውጣትና ክትትልና ግምገማ ወቅታዊ መረጃ ማመንጨት ስለሚችል ለጤና ስርዓቱ መጠናከር ወሳኝ ነው። ያልተሟሉ እና ትክክለኛ ዘገባዎችን የማመንጨት አዝማሚያ ያለው በወረቀት ላይ የተመሰረተ መረጃ በማሰባሰብ እና በማከማቸት ያልተሟሉ እና ትክክለኛ ዘገባዎችን የማመንጨት አዝማሚያ ስላለው በፋርማሲዩቲካል አቅርቦት ሰንሰለት ላይ አሉታዊ ተጽእኖ ያሳድራል.ይህን ችግር ለማሸነፍ ኢንፎርሜሽን ቴክኖሎጂ መፍትሀ ነው። e-HCMIS መፍትሀ ፣የማንኛውም የኤሌክትሮኒክስ ጣልቃገብነት የስኬት ደረጃ በእጅጉ የሚወሰነው የኢ-ኤች.ሲ.ኤም.አይ.ኤስን ቴክኖሎጂ ተቀባይነት ደረጃ በተጠቃሚው ተቀባይነት ደረጃ ላይ የተመሰረተ መሆኑን የጽሁፍ ጥናቶች ያሳያሉ። ስለ ኢ-ኤች.ሲ.ኤም.አይ.ኤስ ተቀባይነት ደረጃ ስላሎት ልምድ እና ሀሳብ ከእርስዎ ጋር መነጋገር እፈልጋለሁ ። እርስዎ በተቻለ መጠን ተሳታፊ ሆነው ተመርጠዋል ምክንያቱም የእርስዎ ክፍል የስራ ቦታ የጥናቱ መረጃ በምንፈልገው አካባቢ ነው።

ምን ያህል ሰዎች በዚህ ጥናት ይሳተፋሉ?

ለመሳተፍ ከተስማሙ ከፌዴራል ጤና ጥበቃ ሚኒስቴር፣ ከአዲስ አበባ ጤና ቢሮ፣ ከአዲስ አበባ የህዝብ ሆስፒታሎች እና ባለድርሻ አካላት ቢያንስ 3 ቁልፍ መረጃ ሰጪዎች ከየተቋሙ የሚመረጡት በድምሩ 12 ተሳታፊዎች ይሆናሉ።

በቃለ-መጠይቁ ወቅት ምን ምን ይከወናል?

በዚህ ጥናት ለመሳተፍ ፈቃደኛ ከሆኑ በቃለ-መጠይቁ ወቅት በፍጥነት የምንነጋገረውን ሁሉ በማስታወሻ መዝግቦ ለማስቀረት ስለሚያስችግር መቅረፀ-ድምፅ (ቴፕ-ሪከርደር) ብመጠቀም እንዲፈቀድልኝ በትህትና እጠይቃለሁ።

በዚህ ጥናት ለምን ያህል ጊዜ እቆያለሁ?

ቃለ-መጠይቁ አንድ ጊዜ ብቻ የሚከወን ሲሆን ከጊዜዎት ደግሞ 30- 60 ደቂቃ አካባቢ የሚወስድ ይሆናል።

በዚህ ጥናት መሳተፍ ምን ዓይነት ስጋት ያመጣል?

በዚህ ጥናት በሚሳተፉበት ወቅት ሊያጋጥዎ የሚችል ስጋት/ምቾት ማጣት የሚከተሉት ናቸዉ

- ለጥያቄዎቻችን መልስ ለመስጠት ምቾት ማጣት ወይም ጥያቄዎቹ ላያስደስቶት ይችላል።.
- በዚህ ጥናት ማጠቃለያ ግኝት ላይ ተመስርቶ ፖሊሲ አዉጪዉን አካል ዉሳኔ ማወቅ አይቻልም
- ነገር ግን ዉሳኔዎቻቸዉ ተገቢ እንዲሆኑ የዚህ ጥናት ዉጤት መሬት ላለ እዉነት የተጠጋ እንዲሆን እንጥራለን።
- ከጥያቄዎቻችን መሃል ያለተስማማዎት ያለ እንደሆነ ወይም ለጥያቄዉ መልስ መስጠት ካልፈለጉ እባክዎትን ለማሳወቅ ወደ ኋላ እንዳይሉ።

በዚህ ጥናት መሳተፌ ምን ዓይነት ጥቅም ላገኝ እችላለሁ?

በዚህ ጥናት በመሳተፍዎ በቀጥታ የሚያገኙት ጥቅም የለም። ነገር ግን ይህ ጥናት ለፖሊሲ አዉጪ አካላት ግብዓት ሊሆን ይችላል።

የመረጃ ሚስጥራዊነት እንዴት ይጠበቃል?

አሁን የምንነጋገርባቸዉ ነጥቦች ሁሉ ሙሉ በሙሉ በምስጢር ለሚጠበቅ አስቸጋሪ ቢሆንም ከምርምር ቡድኑ ውጭ ለማንም የማይገለጹ እና የማይሰጡ ይሆናሉ። ቃለ-መጠይቁን መሰረት በማድረግ የሚወጡ ሪፖርቶች/ዘገባዎችም የርስዎን ስም የማይጠቅሱ ይሆናሉ።

እኔ የሰጠሁት መረጃ ወደ ፊት ለሌላ ጥናት ይሰጣልን?

ከዕርሶ የምናገኘዉን መረጃ ለማንም እና ወደ ፊት ለሌላ ጥናት በፍፁም እንደማይሰጥ እናረጋግጣለን።

ለተሳትፎዬ የከፈለኛል ወይ?

በዚህ ጥናት በመሳተፍዎ የሚያገኙት ክፍያ አይኖርም።

ለዚህ ጥናት ለመሳተፍ የማወጣዉ ወጪ ይኖራል ወይ?

በዚህ ጥናት ለመሳተፍ ምንም ዓይነት ክፍያ አይጠየቁም። ለዚህ ጥናት ለሚወጣ ወጪም እንዲሁ ኃላፊነት አይወስዱም።

ከዚህ ጥናት መዉጣት እችላለሁ?

በዚህ ጥናት ለመሳተፍ ከወሰኑ በኋላ ቃለ-መጠይቁ ወቅት ከጥናቱ ለመዉጣት ሀሳብዎን በቀየሩ ሰዓት መዉጣት ይችላሉ።

የተሳታፊ ስምምነት

ከላይ የተቀመጡትን ሃሳብ በማገናዘብ፤ በዚህ ጥናት ለመሳተፍ ስምምኔትን አስቀምጣለሁ። የዚህን የስምምነት ሰነድ ቅጂ የሚሰጠኝ የሆናል።

የተሳታፊ ስምምነት:_____

የተሳታፊ

ፊርማ:_____**ቀን:**

_____

የአጥኚዉ ስም:_____

የአጥኚዉ

ፊርማ:_____**ቀን:**

_____

Annex 5: Amharic version of the qualitative interview guide

ስለ ቃለመጠይቅ ሰጪው አጠቃላይ መረጃ፡

ጾታ
ዕድሜ (በዓመት)
የትምህርት ደረጃ
ሙያ
መሥሪያ ቤት
ውስጥ ያለዎት ሃላፊነት/የሥራ ድርሻ
በዚህ ሃላፊነት ከመቼ ጀምሮ እየሰሩ ይገኛሉ?

1. <u>የቃለ-መጠይቅ መምሪያ</u>

1. በአሁኑ ጊዜ ለስራህ የሚረዳዎትን ማንኛውንም የኤሌክትሮኒክ መተግበሪያ ትጠቀማለህ/?

   (አጠቃቀሙን ያስተዳድራሉ/ ያስተዋውቁሉ- ከ MOH ወይም RHB ምላሽ ሰጪዎች ከሆነ)

   1.1.በጤና ተቋምዎ ውስጥ እየተጠቀሙበት ስላለው የኤሌክትሮኒክስ መተግበሪያ አጠቃቀም መጠን ምን አስተያየት አለዎት?

2. በአሁኑ ጊዜ ኤሌክትሮኒክ HCMIS እየተጠቀሙ ነው?

2.1.…ካልሆነ፣ ለምን ኤሌክትሮኒክ HCMIS እንደማይጠቀሙ አስተያየትዎን መስማት እፈልጋለሁ?

3. በእርስዎ አስተያየት የ e-HCMIS የጤና ተቋማት አጠቃቀም ደረጃ ምን ያህል ነው?

   3..1. በዚህ መደምደሚያ ላይ እንድትደርስ ያደረገህ ምንድን ነው?

4. ኢ-ኤች.ሲ.ኤም.አይ.ኤስን ለመጠቀም የሚያመቻቹ ነገሮች ምንድን ናቸው?

5. በእርስዎ አስተያየት የኢ-ኤች.ሲ.ኤም.አይ.ኤስ.ን የበለጠ ለመጠቀም የሚስችለው የትኛው ምክንያት ነው?

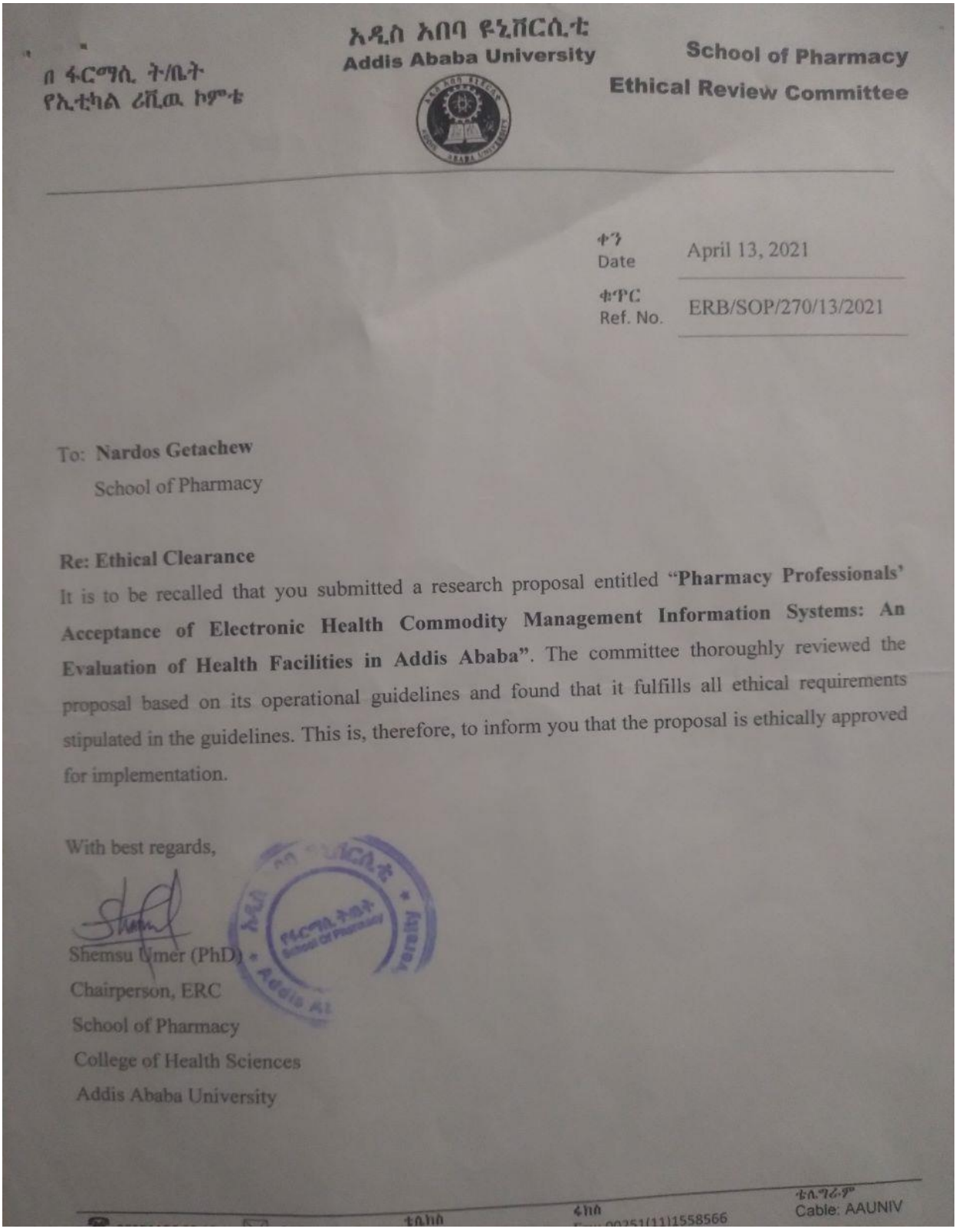
6. በእርስዎ አስተያየት የፋርማሲ ባለሙያዎች ስለ ኢ-ኤች.ሲ.ኤም.አይ.ኤስ ምን አመለካከት አላቸው?

   6.1 በዚህ መደምደሚያ ላይ እንድትደርስ ያደረገህ ምንድን ነው?

7. በእርስዎ እይታ፣ መስተካከል ወይም መካተት አለባቸው የሚሏቸው ፣ ነገር ግን እስካሁን

8. ያልተጠቀሱ ጠቃሚ ጉዳዮች ወይም ጥያቄዎች አሉ?

Annex 6: Institutional Ethical Clearance Letters



አዲስ አበባ ዩኒቨርሲቲ
Addis Ababa University

ፋ/ቤት
የኢቲካል ሪቪው ኮሚቴ

School of Pharmacy
Ethical Review Committee

ቀን Date: April 13, 2021

ቁጥር Ref. No.: ERB/SOP/270/13/2021

To: **Nardos Getachew**
School of Pharmacy

Re: Ethical Clearance

It is to be recalled that you submitted a research proposal entitled "**Pharmacy Professionals' Acceptance of Electronic Health Commodity Management Information Systems: An Evaluation of Health Facilities in Addis Ababa**". The committee thoroughly reviewed the proposal based on its operational guidelines and found that it fulfills all ethical requirements stipulated in the guidelines. This is, therefore, to inform you that the proposal is ethically approved for implementation.

With best regards,

Shemsu Umer (PhD)
Chairperson, ERC
School of Pharmacy
College of Health Sciences
Addis Ababa University

ፋክስ Fax: 00251(11)1558566
ቴሌግራም Cable: AAUNIV

አዲስ አበባ ከተማ አስተዳደር ጤና ቢሮ
City Government of Addis Ababa Health Bureau

Ref.N.o. ፃ/ል/10934/2017
Date 14/8/13

TO:

- Zewuditu Memorial Hospital
- Menilik II Referral Hospital
- Terunesh Beijin Hospital
- Ras Desta Damtew Hospital
- Gandhi Memorial Hospital
- Yekatit 12 Medical College Hospital

Subject: Request to access Facilities to conduct approved research

This letter is to support **Nardos Getachew** of **"PHARMACY PROFESSIONALS' ACCEPTANCE of ELECTRONIC HEALTH COMMODITY MANAGEMENT INFORMATION SYSTEMS: AN EVALUATION OF HEALTH FACILITIES IN ADDIS ABABA"** The study proposal was duly reviewed and approved by Addis Ababa Health Bureau IRB, and the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required. Therefore we request the facility and staffs to provide support to the principal investigator.

The Addis Ababa City Administration Health Bureau

With Regards

Ethical Clearance Committee

Cc

- NardosGetachew
- To Ethical Clearance Committee

Annex 7: DECLARATION

I, the undersigned agree to accept responsibility for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the research.

Principal investigator: Nardos Getachew (B.Pharm)

E-mail: nardosgetachew98@gmail.com

Phone: +251-910990942

Signature _____Date_____

Approval of advisors

1. Eskinder Eshetu (PhD)

E-mail: eskinder.eshetu@aau.edu.et

Signature _____Date_____

Addis Ababa, Ethiopia

January, 2023

Annex 8: Factor Loading Result

No	Variables		Measurements	Factor Loading
1	bi1	<---	BI	0.802
2	bi2	<---	BI	0.781
3	pu4	<---	PU	0.834
4	pu3	<---	PU	0.799
5	pu2	<---	PU	0.896
6	pu1	<---	PU	0.84
7	pe1	<---	PE	0.67
8	pe3	<---	PE	0.645
9	pe4	<---	PE	0.65
10	sn4	<---	SN	0.591
11	sn3	<---	SN	0.622
12	sn2	<---	SN	0.639
13	sn1	<---	SN	0.617
14	imj3	<---	IMG	0.663
15	imj2	<---	IMG	0.776
16	imj1	<---	IMG	0.745
17	jr3	<---	JR	0.781
18	jr2	<---	JR	0.715
19	jr1	<---	JR	0.798
20	out3	<---	OUT	0.653
21	out1	<---	OUT	0.728
22	rd3	<---	RD	0.659
23	rd2	<---	RD	0.737
24	rd1	<---	RD	0.691
25	cse2	<---	CSE	0.621
26	cse3	<---	CSE	0.548
27	pec1	<---	PEC	0.589
28	pec2	<---	PEC	0.5
29	pec3	<---	PEC	0.54
30	PEj1	<---	PEJ	0.722
31	PEj2	<---	PEJ	0.736
32	PEj3	<---	PEJ	0.63
33	can4	<---	CAN	0.831
34	can3	<---	CAN	0.935

35	can2	<---	CAN	0.796
36	ms1	<---	MS	0.694
37	ms2	<---	MS	0.779
38	ms3	<---	MS	0.745
39	ms4	<---	MS	0.753
40	ms5	<---	MS	0.733
41	ts1	<---	TS	0.696
42	ts2	<---	TS	0.671
43	ts3	<---	TS	0.751
44	ts4	<---	TS	0.703
45	ts5	<---	TS	0.668
46	ts6	<---	TS	0.713
47	ts7	<---	TS	0.639
48	cplay3	<---	CPLAY	0.514
49	cplay2	<---	CPLAY	0.805

Annex 9: Model Fit Summary of CFA or Measurement Model

MODEL	MODEL FIT	RESULT	RECOMMENDED VALUE
1	NPAR	199	
	CMIN	1980.073	
	DF	1127	
	P	0	
	CMIN/DF	1.757	<3 Good
2	IFI	0.858	> 0.9 acceptable
3	CFI	0.855	>0.9 acceptable
4	RMSEA	0.057	< 0.8 Good
5	STANDARDIZED RMR	0.0546	<0.8 Good

Annex 10: Construct Reliability

Results of Cronbach's Alpha (α)

	Construct	Cronbach's Alpha (α)
1	CAN	0.885
2	PU	0.906
3	PE	0.692
4	BI	0.77
5	CSE	0.544
6	PEC	0.565
7	PEJ	0.565
8	SN	0.74
9	IMG	0.77
10	JR	0.81
11	OUT	0.644
12	RD	0.738
13	MS	0.854
14	TS	0.864
15	CPLAY	0.562

Annex 11: Results of Confirmatory Factor Analysis

Variable No	Indicator Variable		Latent Variable	Standardized Loading (SDL) Or factor loadings	RD Square	Sum Of The Squared SD	No of Indicators	Ave= Sum Of The Squared SD/ No Of Indicators	Square Root AVE
1	pu1	<---	PU	0.838	0.70224	2.84107	4	0.71027	0.84277
	pu2	<---	PU	0.899	0.8082				
	pu3	<---	PU	0.799	0.6384				
	pu4	<---	PU	0.832	0.69222				
2	pe1	<---	PE	0.667	0.44489	1.29383	3	0.43128	0.65672
	pe3	<---	PE	0.656	0.43034				
	pe4	<---	PE	0.647	0.41861				
3	bi1	<---	BI	0.802	0.6432	1.25317	2	0.62658	0.79157
	bi2	<---	BI	0.781	0.60996				
4	PEj1	<---	PEJ	0.711	0.50552	1.45721	3	0.48574	0.69695
	PEj2	<---	PEJ	0.738	0.54464				
	PEj3	<---	PEJ	0.638	0.40704				

5	sn1	<--	SN	0.678	0.45968	0.98531	2	0.49266	0.70189
	sn2	<--	SN	0.725	0.52563				
6	imj3	<--	IMJ	0.666	0.44356	1.59922	3	0.53307	0.73012
	imj2	<--	IMJ	0.791	0.62568				
	imj1	<--	IMJ	0.728	0.52998				
7	jr3	<--	JR	0.78	0.6084	1.75803	3	0.58601	0.76551
	jr2	<--	JR	0.715	0.51123				
	jr1	<--	JR	0.799	0.6384				
8	out3	<--	OUT	0.674	0.45428	0.95271	2	0.47636	0.69019
	out1	<--	OUT	0.706	0.49844				
9	rd3	<--	RD	0.645	0.41603	1.45398	3	0.48466	0.69617
	rd2	<--	RD	0.744	0.55354				
	rd1	<--	RD	0.696	0.48442				
10	ms5	<--	MS	0.745	0.55503	2.7449	5	0.54898	0.74093
	ms4	<--	MS	0.757	0.57305				

	ms3	<--	MS	0.739	0.54612				
	ms2	<--	MS	0.772	0.59598				
	ms1	<--	MS	0.689	0.47472				
11	ts5	<--	TS	0.699	0.4886	3.15163	7	0.45023	0.67099
	ts4	<--	TS	0.623	0.38813				
	ts3	<--	TS	0.697	0.48581				
	ts2	<--	TS	0.703	0.49421				
	ts1	<--	TS	0.746	0.55652				
	ts6	<--	TS	0.656	0.43034				
	ts7	<--	TS	0.555	0.30803				
12	cplay3	<--	CPLAY	0.589	0.34692	0.80255	2	0.40127	0.63346
	cplay2	<--	CPLAY	0.675	0.45563				
13	can4	<--	CAN	0.83	0.6889		3	0.73297	0.85613
	can3	<--	CAN	0.937	0.87797	2.19889			
	can2	<--	CAN	0.795	0.63203				