Intention to use mobile-based partograph and its predictors among obstetric healthcare providers working at public referral hospitals in the Oromia region Ethiopia 2022

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Abstract

Background: partograph is a pictorial representation of the relationship between cervical dilatation and time used to diagnose prolonged and obstructed labor. However, its utilization is still low and prone to documentation errors and improved with the use of electronic partograph. However, information is limited on the proportion of intention to use mobile-based partograph and its predictors.

Objective: the main objective of the study was to determine the proportion of intention to use mobile-based partograph and its predictors among obstetric healthcare providers at public referral hospitals in Oromia Ethiopia 2022.

Methods: institution-based cross-sectional study design was conducted from June 1 to July 1, 2022. Census was conducted. A self-administered structured English questionnaire was used and a 5% pretest was performed. Data were entered into Epi data 4.6 and exported to SPSS 25 and AMOS 23. Descriptive and SEM analysis was performed. The hypothesis was tested using a path coefficient and a p-value.

Results: about 65.7% (95% CI, 61.9%-69.4%) of the participant intended to use mobile-based electronic partograph with a 97% of response rate. Perceived usefulness had a positive influence on intention to use () and attitude (Perceived ease of use had a positive influence on attitude (), perceived usefulness (), and intention to use (). Job relevance had a positive influence on perceived usefulness () and intention to use (? = 0.185, p= 0.008). Attitude positively influences intention to useSubjective norms insignificant influence perceived usefulness (? =0.020 and p =0.613) and intention to use (? = -0.066 and p =0.066).

Conclusions: two-thirds of obstetrics healthcare providers' had the intention to use mobile-based partograph. Perceived usefulness, perceived ease of use, job relevance, and attitude positively and significantly influence intention to use mobile-based electronic partograph. The development of a user-friendly mobile-based partograph that meets job and user expectations can enhance the intention to use.

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Intention to use mobile-based partograph and its predictors among obstetric healthcare providers working at public referral hospitals in the Oromia region Ethiopia 2022

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Abstract

Background: partograph is a pictorial representation of the relationship between cervical dilatation and time used to diagnose prolonged and obstructed labor. However, its utilization is still low and prone to documentation errors and improved with the use of electronic partograph. However, information is limited on the proportion of intention to use mobile-based partograph and its predictors.

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Results: about 65.7% (95% CI, 61.9%-69.4%) of the participant intended to use mobile-based electronic partograph with a 97% of response rate. Perceived usefulness had a positive influence on intention to use (β = 0.184, p = 0.017) and attitude (β = 0.521, p = 0.002) ,Perceived ease of use had a positive influence on attitude (β = 0.382, p = 0.003),

perceived usefulness (β = 0.503, p = 0.002), and intention to use (β = 0.369, p = 0.001). Job relevance had a positive influence on perceived usefulness (β = 0.408, p = 0.001) and intention to use (β = 0.185, p = 0.008). Attitude positively influences intention to use (β = 0.309, p = 0.002). Subjective norms insignificant influence perceived usefulness(β = 0.020, p = 0.613) and intention to use (β = - 0.066, p = 0.066).

Conclusion and recommendation: two-thirds of obstetrics healthcare providers' had the intention to use mobile-based partograph. Perceived usefulness, perceived ease of use, job relevance, and attitude positively and significantly influence intention to use mobile-based electronic partograph. The development of a user-friendly mobile-based partograph that meets job and user expectations can enhance the intention to use.

Keywords: mobile-based partograph, modified TAM, intention to use, obstetric healthcare providers, Ethiopia

Introduction

Globally, maternal mortality remains a persistent and potentially preventable issue of great concern. In 2020 every two minutes, a women pass away from pregnancy related avoidable cause.This figure indicates that about 800 women pass away every day, resulting in a maternal mortality ratio of 223 deaths per 100,000 live births[1]. By lessening maternal mortality to roughly 70 per 100,000 live births between 2016 and 2030, the SDG initiatives hoped to avert it[2].

Contrary to goals set according to the SDG 3.1 the global maternal mortality rate raised from 151 in 2019 to 152 per 100,000 live births in 2020[3]. In Ethiopia, maternal death was 412 per 100,000 live births in 2016[4]. It stayed high accounting for 412 per 100,000 live births in 2019[5]. In Ethiopia prolonged and obstructed labor accounted for 22% of all maternal deaths [6]. Although prolonged and obstructed labors were among the leading causes of death in resource-poor settings, they can be diagnosed and averted with correct partograph use [7, 8]. A partograph is a graphic representation of the labor's progress that includes pertinent information about the mother and the fetus[9]. In this regard, one of the most important stages in assuring high-quality care for both the mother and the newborn during labor is to use the partograph[10].

Despite its significance, partograph use by obstetric healthcare providers is still low in Ethiopia [6, 7, 11-15]. In addition to this, the paper-based approach was prone to recording errors, due to care providers' overburdened and retrospective data entry [16]. Paper-based partograph were also exposed to the problem of completing a parameter. In Uganda, 24.6% of the partograph parameters demonstrate completed[17]. About 64% of the partograph characteristics in the study in Jigjiga and Degehabur were partially recorded [11]. The study in the West Shoa zone reveals Only three percent of the partograph examined was recorded according to the standard [7]. The rapid progress of technology is one of many drivers now impacting healthcare systems[18] and offering healthcare services via mobile devices is now seen as a promising technological advancement[19]. The widespread availability of smartphones and tablets provides an opportunity for a well-designed electronic Partograph [16]. Following this, a different attempt was made to digitize the partograph to improve adherence and overcome the limitation of paper-based [10, 16, 20-22]. The electronic partograph, is a

contemporary instrument for capturing labor data in real-time that improve mother and infant outcomes [23]. It makes it possible to improve the labor management system's record of labor progress statistics and care given to maternal and fetal especially in low-income nations [10, 20, 24, 25]. It also resulted in a significant reduction in the rate of prolonged labor from 42% to 29% and has a far greater usage rate than paper-based [21]. In addition, It was chosen over paper-based by clinicians due to its easiness to use and took less time, improved performance, decreased referral rates, assured prompt referral when necessary, facilitated reporting obligations, and agreed that it enhanced service quality [26, 27].

Studies show using of mobile-based health services in the health sector has the potential to increment health service access, quality, adherence, and efficiency [28-35]. However, the technological benefit obtained depends on the rate of use and adherence of users. Human activities mainly depend on their behavioral intention and the intention to use digital tools is a determinant factor of actual user behavior. Therefore, determining the behavioral intention to use and its predictors before the adoption of technology is important and prevents implementation failure[36]. Behavioral intention is the degree to which a person has made intentional plans to engage or abstain from engaging in peculiar future conduct[37]. To facilitate future implementation it is vital to ascertain the degree of intention to employ any digital tools in the health sector[36]. A variety of technology acceptance models have been applied to identify and predict end-user behavioral intention to utilize technology. Among these, Davis' TAM is significant and effective at predicting users' intent to use. [38].

To increase understanding of factors affecting behavioral intention, modification of the original TAM had been carried out by different scholars [39-45]. In this regard, increasing understanding of the predictors that influence the behavioral intention of obstetric healthcare providers to use mobile-based partograph by modifying TAM is important. To the extent of investigator knowledge information is limited on the proportion of intention to use mobile-based partograph and its predictor. Therefore, this study is intended to fill this gap.

Theoretical model and hypothesis development

TAM is the most well-known methodology for establishing and evaluating each person's

intent to embrace new technology [46]. It is a commonly used model that is used to anticipate possible users' behavioral intentions to use a technological innovation[47].

TAM had been altered nevertheless to boost its capacity for predicting variation in usage intention. According to a study in Turkey on doctors' approval of digital personal aid[48], in China on smart healthcare services among medical practitioners [49], in Greek on health information system acceptance by hospital personnel[50], in Ghana on the intention to use technology to attend to clients' by health professionals[51], and in Ethiopia on sustainable adoption of electronic health systems by healthcare professionals[39] using modified TAM explain about 71%,71.5%, 87%, 97%, and 56% of the variance in intention to use respectively.

TAM was initially established with two key dimensions termed perceived utility and perceived ease of use to identify the potential drivers of intention. The extent to which a person thinks using a given system would improve his or her performance at work is known as perceived usefulness[38]. According to studies [18, 38, 39, 48, 52] in the healthcare setting perceived usefulness had a significant and positive influence on intention to use. Perceived ease of use is another factor that establishes the end-users behavioral intentions. The degree to which someone perceives a system to be simple to use is known as perceived ease of use[38]. The greater the user's propensity to use something, the friendlier the user experience [53]. Perceived ease of use significantly and positively influence intention to use [39, 48, 50, 54] and end-users of attitude toward using[55]. The attitude is described as an individual's impression of the positive or negative implications of embracing technology[56]. Attitude towards using positively and significantly influence intention to use[52, 57, 58] and is influenced by perceived usefulness[58, 59] and ease of use[39].

According to the core construct of TAM, it is possible to add antecedents to improve predictive power and understand the potential factor influencing behavioral intention. To this end, Subjective norms and Job relevance are important predictors added to the original TAM.

Subjective Norm refers to "a person's view that the majority of influential individuals in his life believe he should or should not engage in the behavior in question"[60]. Study revealed subjective norms influence perceived usefulness[61] and intention to use[49,

62]. The perception of whether or not technology is suitable for their jobs can also have an impact on whether or not they intend to use it. Job relevance examines how users view using the system for work and is found to influence perceived usefulness and intention to use [44, 45, 63]. Whether the specified concept will mediate the link between constructs is another key factor to take into account. The mediators act as a channel for latent concept effects to reach the dependent variables[64]. It was found that perceived usefulness[65, 66] and attitude[53, 67, 68] acted as a mediator in the TAM studies.

The following hypothesis is formed in light of the information presented above.

Hypothesis 1: Perceived usefulness will have a positive effect on the intention to use mobile-based partograph.

Hypothesis 2: Perceived usefulness will have a positive effect on obstetric healthcare providers' attitudes toward mobile-based partograph.

Hypothesis 3: Perceived ease of use will have a positive effect on obstetric healthcare providers' attitudes towards mobile-based partograph.

Hypothesis 4: Perceived ease of use will have a positive effect on the perceived usefulness of mobile-based partograph.

Hypothesis 5: Perceived ease of use will have a positive influence on the intention to use mobile-based partograph.

Hypothesis 6: Obstetric healthcare providers' attitudes towards using mobile-based partograph will positively influence intention to use.

Hypothesis 7: Job relevance will have a positive effect on the intention to use mobile-based partograph.

Hypothesis 8: Job relevance will have a positive effect on the perceived usefulness of mobile-based electronic partograph.

Hypothesis 9: Subjective norm will have a positive effect on the perceived usefulness of mobile-based partograph.

Hypothesis 10: Subjective norm will have a positive effect on the intention to use mobile-based partograph.

Hypothesis 11: Perceived usefulness mediates the relationship between job relevance and intention to use.

Hypothesis 12: Perceived usefulness mediates the relationship between subjective norm and intention to use.

Hypothesis 13: Perceived usefulness mediates the relationship between Perceived ease of use and intention to use.

Hypothesis 14: Attitude mediates the relationship between Perceived usefulness and intention to use.

Hypothesis 15: Attitude mediates the relationship between Perceived ease of use and intention to use

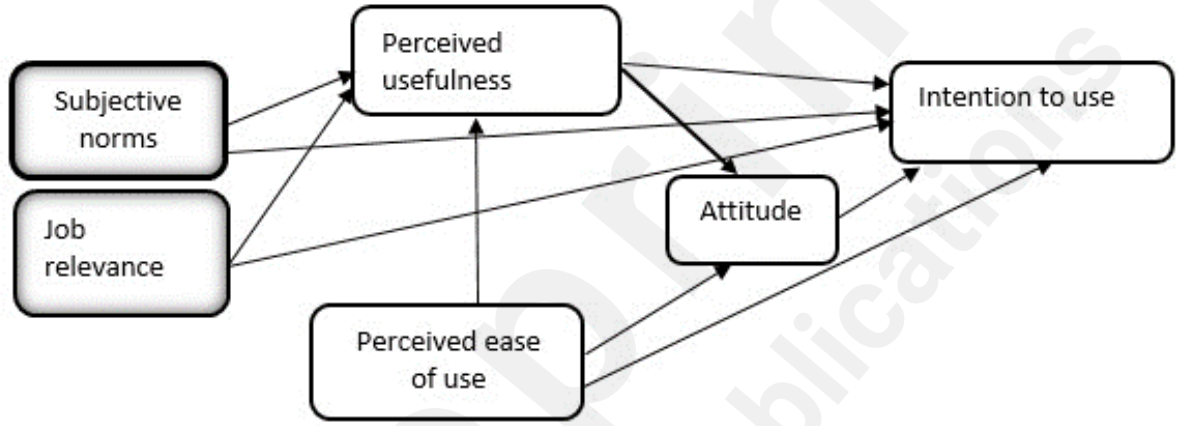

Figure 1. The proposed modified TAM is based on the original TAM of Davis [69]

Methods

Study design and setting

An institution-based cross-sectional study was conducted from June 1 to July 1, 2022, at public referral hospitals in the Oromia region of Ethiopia. The study was carried out in Ethiopia's Oromia region. There are 30 municipal administrations and 23 zones in the region. The 13 public referral hospitals, 33 general hospitals, 67 primary hospitals, 1383 health centers, and 6797 health posts are located in the region. In the thirteen public referral hospitals, there were about 649 obstetric healthcare professionals employed. Midwives, nurses, Integrated Emergency Obstetrics and Surgery, general practitioners, obstetricians, and gynecologists are trained, obstetric healthcare professionals.

Study participants and sample size determination

All obstetric healthcare providers who were working at Oromia region public referral hospitals were the source and study population of the study. All obstetric healthcare providers who were working at the Oromia public referral hospitals and were available

at the time of data collection were included in the study. The sample size for the study was calculated based on the rule of thumb of the SEM. The most widely used rule of thumb is for one free parameter 10 observation is required[70, 71]. The proposed model of the study had 55 free parameters. Therefore, n= the number of free parameters ^{x}10= 55 $\times 10 = 550$. Where n, represents the sample size. Considering a 10% non-response rate the final minimum sample size was 605.

Sampling procedure

In the thirteen public referral hospitals of the Oromia region, there were 649 obstetric healthcare providers. From the onset, this study required large sample size to test the developed hypothesis using the maximum likelihood estimator of SEM. However, the number of study participant to be involved in this study was not adequate for sampling. For this reason, a census was conducted.

Study variables

The outcome variables of the study are the Intention to use mobile-based partograph whereas attitude towards using and perceived usefulness are mediator variables. The independent variables of the study include technology acceptance related exogenous latent variables (Perceived ease of use, Subjective norm, and Job relevance), Socio-demographic and other related factors of obstetric healthcare providers **(**Age, Sex, Marital status, religion, profession, qualification, and Years of experience), Access to mobile devices, partograph learning, and in-service training, computer courses

Operational definition

Behavioral intention is the extent to which an individual has made intentional plans to engage in or refrain from engaging in specific future conduct[37]. The intention to use, in this case, refers to the likelihood of obstetric healthcare providers whether they intended or not to use mobile-based partograph if they will be offered. The construct had four items and each was measured with a five-point Likert scale response. The median score was used as a cutoff point. The obstetric healthcare provider who scores median and above on intention to use construct was considered as intended to use a mobile-based partograph otherwise unintended.

Data collection and procedure

A self-administered structured English questionnaire was used to collect data.

Regarding the latent variable, the questionnaire was adapted from different literature [44, 53, 63, 72-77]. The adapted questionnaire was modified to fit the context of the study. The structured questionnaire had four parts, the first part includes the socio-demographic characteristics of the obstetrics healthcare providers, the second part related to access to mobile devices, the third part related to partograph and computer courses, and the fourth part includes technology acceptance related (Perceived usefulness, Perceived ease of use, Intention to use, attitude, job relevance, and subjective norm).

A total of 21 items were used in this study to test the proposed hypothesis. A Likert scale ranging from strongly disagree (1) to strongly agree (5) was used to rate the level of participant agreement towards the prepared close-ended questions.

Data quality assurance

A pretest was done on 5% of the sample size among obstetric healthcare providers who were working out of the study area. One day of training was given to four data collectors and four supervisors on the objective of the study, data collection procedures, data confidentiality, and respondents' rights. The data collectors were BSc. Graduate of three midwives, two health officers, and three Nurses. Supervision was continuous and made by the supervisors and principal investigator throughout the data collection. After data collection, completeness was checked.

Data processing and analysis

Before data analysis, the coded data were entered into Epi-data version 4.6. Finally exported into SPSS version 25 for descriptive analysis and AMOS version 23 for structural and measurement model assessment (SEM). SEM is a multivariate statistical analysis technique that is used to analyze structural relationships. The data set was checked for missing values and there was no missing data. The socio-demographic data were analyzed descriptively using SPSS and the results were presented using a frequency table. Descriptive statistic was used to compute the proportion of intention to use mobile-based partograph and the result was presented using the bar graph.

The maximum likelihood estimation method was considered and the assumption was checked. One assumption is the presence of multiple measurements for a construct. Perceived ease of use, perceived usefulness, and intention to use each have four items.

However, attitude, subjective norms, and job relevance each have three items. Multicollinearity among the independent variable was assessed using the variance inflation factor. The result obtained (VIF ranged from 1.6 to 2.027) proved that there was no Multicollinearity among independent variables.

Another assumption was univariate normality which was assessed using kurtosis and skewness value and the result shows there was univariate normality. The kurtosis value of less than 5, a critical ratio between -1.96 and + 1.96 was used to declare the presence of multivariate normality. Unfortunately, the assumption of multivariate normality was not fulfilled. Therefore, bootstrapping technique was used to manage multivariate none normality.

Confirmatory factor analysis was used to perform measurement model assessment. Construct reliability was tested using Cronbach's alpha and composite reliability. A cutoff point greater than 0.7 was used to declare the presence of internal consistency of the item that measured construct[78]. The recommended Cronbach's alpha value should be 0.7 and above[79, 80]. Furthermore, the composite reliability should be greater than 0.7[36]. The average variance extracted and factor loading was used to measure Convergent validity. In measurement model assessment, the AVE value greater than 0.50 [45, 64] and factor loading at least 0.6[75] should be used to establish convergent validity. Discriminant validity assesses the distinctness of construct when measured by their respective items. The discriminant validity was determined using the square root of AVE and the value should be greater than the inter-construct correlations to declare whether the discriminant validity of the construct was achieved [64]. The degree to which one construct differs from every other construct in the instrument is indicated by its discriminant validity[81].

Model goodness of fit was checked both for measurement and structural model assessment. A model fit indices of the ratio of chi-square to degrees-of-freedom ≤ 3 [36], the comparative fit index $¿0.90$, the goodness-of-fit index $¿0.90$, adjusted the goodness-of-fit index $¿0.85$, the normalized fit index $¿0.90$, the standardized root mean square residual $¿0.08$, and the root means a square error of approximation $¿0.08$ indices value were used to measure and declare the model's goodness-of-fit [39, 50]. It was planned to perform model modification to improve the model fitness if the initial model did not fit

by either deleting the factor loading value with ¿0.5 or covariate the error terms [82]. In this regard, even if the measurement model fitness was achieved initially, the model modification was performed since the chi-square to the degree of freedom for the structural model was 3.128. Therefore, to increase the model fitness we covariate the error term 15 and 16 on the intention to use the latent variable. Finally, the overall model fits the data well.

After measurement model assessment, structural model fitness was checked and the model fit the data well. Then, the structural model assessment was performed. Based on AMOS output, the standardized Path coefficient and the level of significance were used to test the developed hypothesis and determine the association between latent variables of the study. The standardized regression weights show the strength of association between latent variables[83], and the p-value ¿0.05 show the level of significance considered. The square multiple correlations were used to report the proportion of variances in endogenous latent variables explained by exogenous variables. The bootstrap method was used to test the mediation effect.

Results

A total of 649 participants were planned to be included in the study from all public referral hospitals in the Oromia region for the assessment of intention to use mobile-based partograph and its predictors. Among these, Six hundred thirty gave their consent and complete the questionnaire with a response rate of 97%. The result of the study shows that almost more than half 344 (54.6%) of the study participants were male and 286(45.4%) were female.

The median age of the study participant was 32 years with an interquartile range of 9 years old. The majority of the participants were found in the age group of 30 to 39. About 217(34.4%) of the respondents were orthodox in religion. Among the study participants, 371(58.9%) respondents were married and 218(36.4%) were single.

Regarding their profession, more than half 351(55.7%) were midwives, 96 (15.2%) were nurses and 95(15.10 were general practitioners. Of the total study participants, 497(78.9%) of them were bachelor's degree holders and 78(12.5%) were a specialist in their qualifications. Almost half 328(52.1%) of the study participants had ≤4 years of working experience with the qualification they had. All the socio-demographic

characteristics of the study participant are displayed in table 1.

Table 1. Socio-demographic characteristics of obstetric healthcare providers who were working at public referral hospitals of Oromia region, Ethiopia, 2022.

Socio-demographic Characteristics	**Categories**	**Frequency**	**Percentage (%)**
Sex	Male	344	54.6
	Female	286	45.4
Age	20-29	232	36.8
	30-39	299	47.5
	40 and above	99	15.7
Religion	Orthodox	217	34.4
	Muslim	167	26.5
	Protestant	208	33.0
	Others R	38	6.0
Marital status	Married	371	58.9
	Single	218	34.6
	Divorced	25	4.0
	Separated	10	1.6
	Widowed	2	.3
	Others M	4	.6
Profession	Midwives	351	55.7
	Nurses	96	15.2
	General practitioner	95	15.1
	Obstetrician and Gynecologist	78	12.4
	Other P	10	1.6
Level of qualification	BSC.	497	78.9
	Masters	48	7.6
	Specialist	79	12.5
	Other Q	6	1.0
Years of working experience	≤4	328	52.0
	5-9	195	31.0

	≥10	107	17.0

Note: Others R= wake feta, Adventist and catholic Others M= in relationship Other P= Integrated Emergency Obstetric Surgery Other Q= Diploma

In this study, 625(99.2%) of participants had access to mobile devices. 582(93.1%) of obstetric healthcare providers had an access to a smartphone. About 490(77.8%) of the study participants were study partograph. However, only 326(51.7%) of the study participants had taken in-service training on the paper-based partograph. Regarding the computer course, 310(80.7%) had taken basic computer training. Table 2. Shows the frequency of access to mobile devices, partograph learning, partograph in-service training, and computer courses.

Table 2. Access to mobile devices, partograph training, and computer course-related among obstetric healthcare providers who were working at the public referral hospitals in the Oromia region, Ethiopia 2022.

Variables	Categories	Frequency	Percentage (%)
Access to mobile devices	Yes	625	99.2
	No	5	0.8
Which mobile devices	Smartphone	582	93.1
	Tablet	33	5.3
	Other W	10	1.6
Study partograph	Yes	490	77.8
	No	140	22.2
In service training on partograph	Yes	326	51.7
	No	304	48.3
Computer courses	Yes	384	61
	No	246	39
Which computer course	Basic course	310	80.7
	Advanced training	74	19.3

Note: Other W= basic phones, feature phone

According to the result of this study among 630 obstetric healthcare providers,

414(65.7%) had an intention to use mobile-based partograph. This means that about two-thirds (65.7% [95% CI, 61.9%-69.4%]) of the study participants scored median and above of intention to use. The median score of intention to use mobile-based partograph was 16 with an interquartile range of 1.5. The minimum and maximum scores for intention to use were 4 and 20 respectively. Figure 4. Show the proportion of intended and unintended use of mobile-based electronic partograph among obstetrics healthcare providers who were working at public referral hospitals in the Oromia region in 2022.

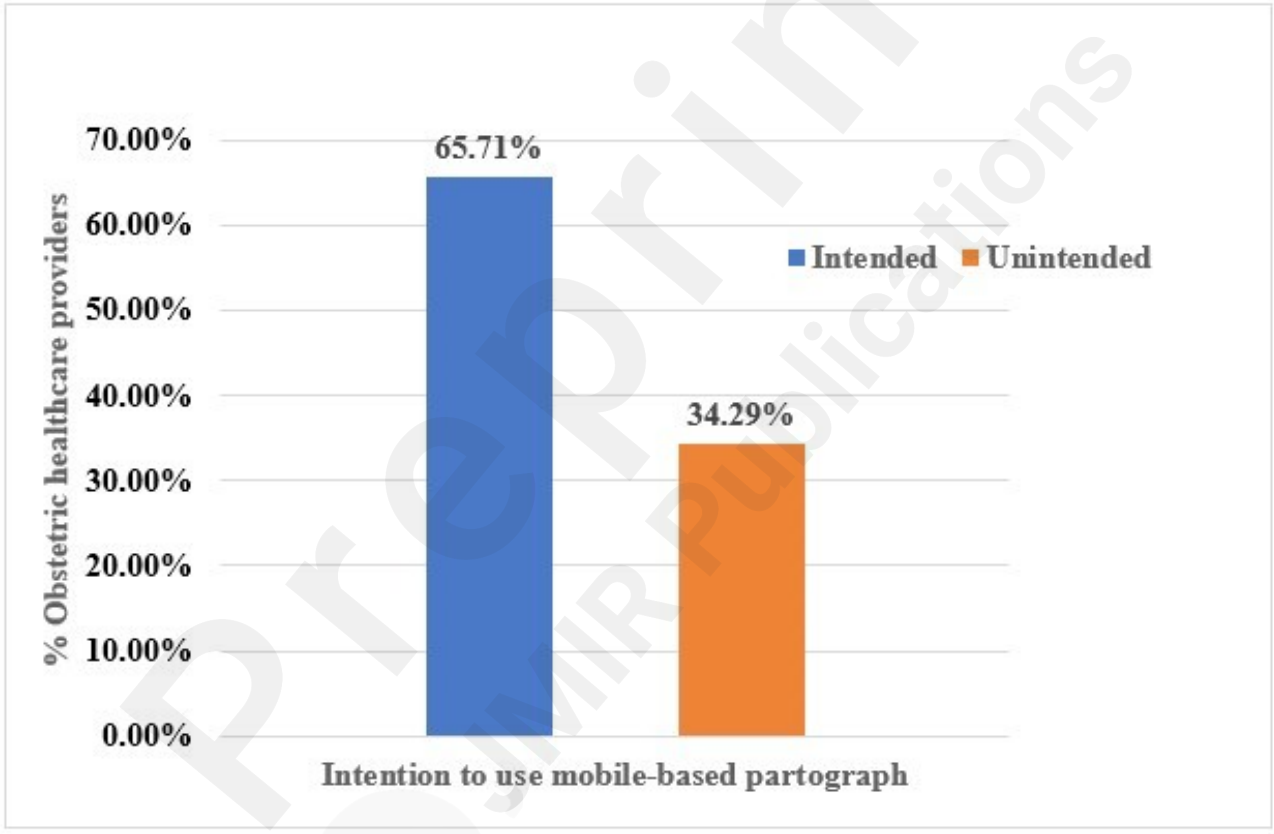

Figure 1.The proportion of intention to use mobile-based partograph among obstetric healthcare providers who were working at public referral hospitals in Oromia region Ethiopia 2022 (n=630).

In this study, Cronbach's alpha and composite reliability values were greater than 0.9. All the factor loading values were found in the range of 0.843 to 0.946 and the AVE value was found in the range of 0.761 to 0.840. Hence, construct reliability and convergent validity of the measurement model were achieved.

Discriminant validity

The finding of this study indicates the square root of the average variance extracted value was greater than the value of the inter-construct correlations. Therefore, the discriminant validity of the measurement model is achieved. Table 4. Demonstrates the discriminant validity of the model. The bolded value in the table represents the square root of the average variance extracted.

Measurement indices of the goodness of fit of the model

In this study, all the obtained values of the measurement model fit indices were in an acceptable range. Hence, the result of this study indicated that the modified proposed model fitted the data well Table 3. Shows the result of model fit indices.

Table 3. The result of indices goodness of fit of the measurement model assessment

Model fit indices	Range	authors	Result obtained	fit decision
CMIN/DF	≤3	[36]	2.245	Accepted
GFI	¿0.9	[50]	0.945	Accepted
AGFI	¿0.85	[50]	0.927	Accepted
NFI	¿0.9	[50]	0.974	Accepted
CFI	¿0.9	[50] [39]	0.985	Accepted
SRMR	¿0.08	[50] [39]	0.022	Accepted
RMSEA	¿0.08	[50]	0.044	Accepted

Structural model assessment

Among the ten proposed hypotheses of the direct relationship, eight were supported by the collected data. However, Hypothesis 9 and Hypothesis 10 failed to support the proposed hypothesis.

The result of the study finding showed that perceived usefulness positively influences intention to use ($\beta=0.184, p=0.017$¿. In addition, perceived usefulness had a positive influence on attitude with $(\beta=0.521, p=0.002)$.

According to the study finding Perceived ease of use positively influences attitude ($\beta=0.382, p=0.003$), perceived usefulness ($\beta=0.503, p=0.002$), and intention to use ($\beta=0.369, p=0.001$) respectively. Perceived ease of use had the strongest path coefficient in influencing intention to use mobile-based partograph.

The result of the study also shows that job relevance in the structural model had a positive and significant influence ($\beta=0.408, p=0.002$) on perceived usefulness. In addition, job relevance with $(\beta=0.185, p=0.008)$ positively and significantly influences

the intention to use.

The results of the study also indicated that attitude at $(\beta=0.309, p=0.002)$ positively and significantly influence intention to use.

In this study, subjective norms had insignificant influences on perceived usefulness $(\beta=0.020, p=0.613)$ and intention to use $(\beta=-0.066, p=0.066)$. Therefore, hypotheses 9 and 10 failed to support the developed hypothesis.

The study result shows that perceived ease of use, attitude, and job relevance had a 0.369, 0.309, and 0.185 path coefficient in association with intention to use respectively.

Results from the AMOS output of the proposed model show perceived usefulness was influenced by both job relevance and perceived ease of use. However, perceived ease of use $(\beta=0.503)$ had high path coefficient than job relevance $(\beta=0.408)$ in influencing perceived usefulness. In other ways, perceived usefulness and perceived ease of use influence attitude towards using. Perceived usefulness $(\beta=0.521)$ had high path coefficient than perceived ease of use $(\beta=0.382)$ in influencing attitude towards using.

Table 4. Shows the result of the hypothesis testing of the direct path analysis of the proposed model.

Table 4. The result of the Hypothesis testing of the proposed model

Hypothesis	Causal Path	β	CR	P-value	Decision
1	ITU ← PU	0.184	3.294	0.017	Supported
2	AT ← PU	0.521	9.918	0.002	Supported
3	AT ← PEOU	0.382	7.279	0.003	Supported
4	PU ← PEOU	0.503	11.097	0.002	Supported
5	ITU ← PEOU	0.369	7.160	0.001	Supported
6	ITU ← AT	0.309	6.351	0.002	Supported
7	ITU ← JR	0.185	3.969	0.008	Supported
8	PU ← JR	0.408	8.476	0.002	Supported
9	PU ← SN	0.020	0.540	0 .613	Not supported
10	ITU ← SN	-0.066	-2.060	0.066	Not supported

Note: $\beta-¿$ Path coefficient, CR-critical ratio

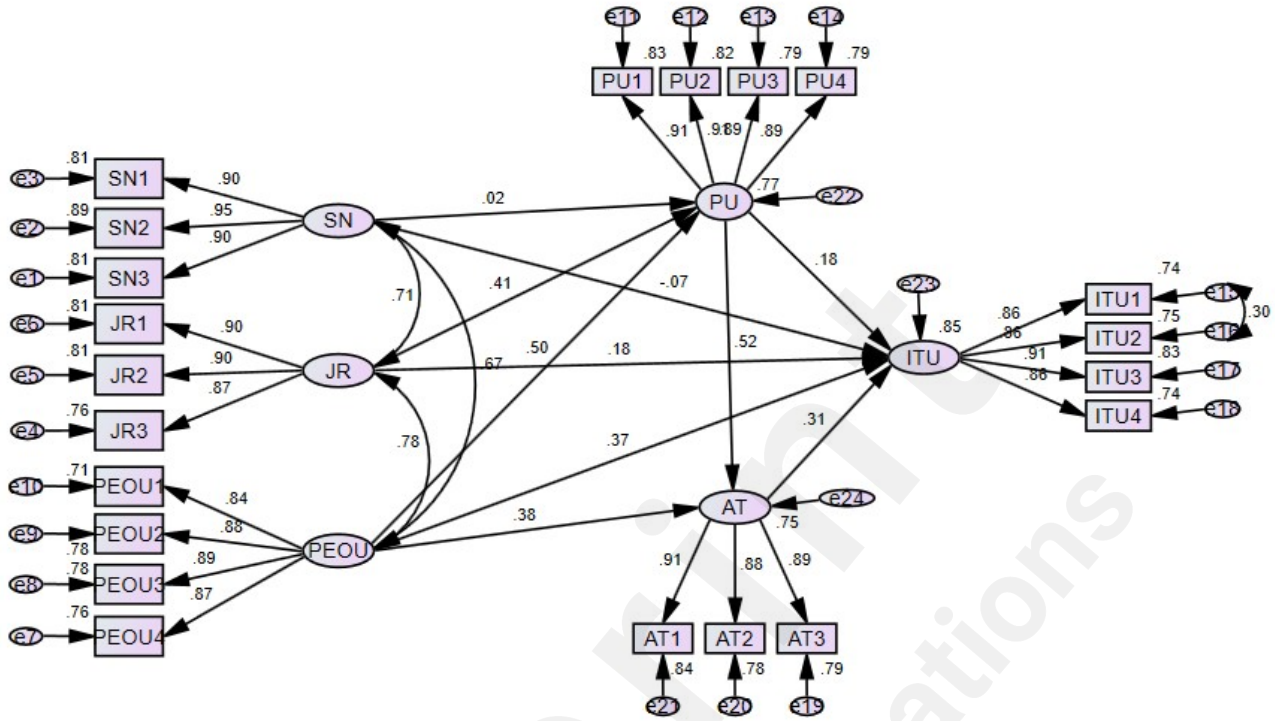

Figure 3. Structural equation model AMOS version 23 result output of the standardized estimate.

Among fifteen developed hypotheses five of them deal with the mediation effect of perceived usefulness and attitude between the exogenous latent variables and outcome variable of the study. Table 5. Shows the result of mediation analysis using the bootstrapping method. The 95% biased confidence interval and p-value level were used to test the presence of a mediation. According to the study finding perceived usefulness partially mediates between job relevance and intention to use. Hence, hypothesis 11 was supported.

However, perceived usefulness did not mediate the relationship between subjective norms and intention to use. Therefore, hypothesis 12 was not supported. In another way perceived usefulness partially mediates perceived ease of use and intention to use. Therefore, hypothesis13 was supported. Furthermore, attitude partially mediates the relationship between perceived usefulness and intention to use as well as perceived ease of use and intention to use. Consequently, hypothesis14 and hypothesis15 were supported. Table 5. Illustrates the result of the mediation analysis.

The squared multiple correlations indicate the predictive power of the model. In this

study, the proposed model explains 85% of the variance in intention to use mobile-based partograph. In another way, perceived ease of use and job relevance aggregately explain 77% of the variance in perceived usefulness. However, perceived ease of use and perceived usefulness explain about 75% of the variance in attitude towards use. Table 6. Shows the result of the predictive power of the proposed model.

Discussion

This study examines the proportion of intention to use mobile-based partograph and its predictors among obstetrics healthcare providers. The result of this study revealed that about two third (65.7%) of obstetric healthcare providers had the intention to use mobile-based partograph. Even if no similar study was conducted on the intention to use a mobile-based partograph, ascertaining the end user's level of acceptance to use technology before execution serves as a prerequisite to judging the accomplishment of the execution[39]. In this regard, a study in north Gondar indicates that 44% of obstetrics healthcare providers were willing to use mobile-based partograph [84]. Together these studies' finding signifies and assists the concerned body to promote the execution of mobile-based partograph in a clinical setting for enhancing care given in the management of labor.

The results of this study finding of the TAM part were in line with the original TAM[69]. In this study, perceived ease of use with (β=0.503, p ¿0.002) significantly and positively influence the perceived usefulness of the obstetric healthcare providers. This study's finding is in line with the study in Omaha on telemedicine acceptance(β=0.56)[18] and Ethiopia on electronic health acceptance (β=0.385) [39]. Again this study finding is supported by a study conducted in Tanzania in which skilled birth attendants found that electronic partograph was useful, easy to use, and improved the quality of care[24]. This indicates that obstetric healthcare providers who perceive that mobile-based partograph is easy to use, easy to interact with, and easy to learn are more likely to perceive it as useful and consequently will lead to a high intention to use it[39].

Another association in this study shows that Perceived usefulness with (β=0.184, p=0.017) positively influences intention to use. This positive and significant relationship of the construct is in agreement with a study in Turkey on personal digital assistance acceptance(β=0.41)[48], in Uganda on mobile phone adoption in maternal

healthcare(β=0.186)[54], and in Ethiopia on electronic health adoption (β=0.387)[39]. The study finding indicates that the obstetric healthcare providers' perception of mobile-based partograph usefulness is a valuable predictor of behavioral intention to use. It is important to find out how users measure an increase in the usefulness of the technology because the more the obstetric healthcare providers perceive that a mobile-based partograph improves productivity, performance, and effectiveness, and decreases the duration of recording, the more likely they will be intended to use it.

In another way, this study indicates that perceived ease of use positively (β =0.382) and significantly at (p=0.003) influences attitude towards using. This direct effect of perceived ease of use on attitude is in line with a study in Ethiopia(β =0.347) and has almost approached strength of association[39]. These findings inform us if users perceive that the use of electronic partograph is easy they will develop a positive attitude towards using and consequently impact behavioral intention to use it.

The study also discovered that the perceived ease of use of mobile-based partograph significantly affects intention to use (β =0.369, p= 0.001). This showed that the likelihood of intention to use the mobile-based partograph will increase with an increase in the impression of ease of use. The outcome is consistent with a study on the adoption of health information systems that was conducted in Greek (β = 0.29) [50] and in Ethiopia(β =0.339[39] demonstrating that requiring less effort will boost the system's ability to influence people's intentions to use electronic health systems. Perceived ease of use in this study has the highest path coefficient and a significant impact on usage intention. The more obstetric healthcare professionals are intended to use the mobile-based partograph, the less effort it is thought to take to operate it on both a mental and physical level. To meet user expectations, electronic partograph developers should concentrate on the device's user-friendliness. This might increase the uptake and ongoing use of mobile-based partograph.

Additionally, this study discovered that attitudes about adopting mobile-based partograph are influenced by perceived usefulness, with (β =0.521, p= 0.002). This finding is consistent with studies on telemedicine acceptability done in China (β =0.43) [85] and Ethiopia(β =0.26)[39]. The obstetrics healthcare providers' attitude towards use impacted more likely, as far as they believe this technology improves performance

and productivity in their job.

Another way to put it is that intention to use is directly influenced by attitude toward use (β =0.309, p=0.002). The study's conclusion is consistent with a study on the intention of health professionals in Ethiopia to use electronic health (β = 0.526) and indicates that actions that improve perspectives, such as ongoing training and support and information sharing on eHealth innovations, should be prioritized heavily[39]. The more positive perception the obstetric healthcare provider develop and had, the higher they intended to use.

In this study, Job relevance significantly and positively (β=408, p= 0.002) influences perceived usefulness. This study path relationship is in line with a study that focuses on the adoption of technology using modified TAM[44, 86]. There should be adequate information provision strategies for end users about the applicability and usefulness of this mobile-based partograph in labor management. A study on PDA acceptance by healthcare professionals supports this evidence in a way that information provision about the technology applicability by healthcare institutions promotes technology acceptance[80].

Additionally, job relevance significantly influences intention to use at (β = 0.185, p= 0.008). This finding is in line with the study conducted on health information technology acceptance[44]. This means that the more probable obstetrics healthcare professionals expected to use a mobile-based partograph, the more they believed it was appropriate, relevant, and vital to their work. Because of this, it's crucial to let obstetric healthcare professionals know about the use of mobile-based partograph in labor management.

According to this study, subjective norms have an insignificant impact on perceived usefulness (β= 0.020, p= 0.613). This insignificant influence is in line with the findings of the study on hospital information systems(= -0.18, p-value > 0.05)[87]. This might be because obstetric healthcare professionals are more likely to establish their independent judgments and may therefore pay less heed to what other people think. Another factor is that regardless of what is important others may think all obstetric healthcare providers will be forced to use mobile-based partograph as long as the government mandates their usage in healthcare facilities for labor management.

Subjective norms also insignificantly influence intention to use(β = -0.066, p ¿0.066). The

result of this study is inconsistent with the other studies [34, 62, 75]. This might be the nature of electronic partograph preventing retrograde documentation and requiring them to utilize it, therefore they refuse to use it out of a desire to avoid accountability. Thus, that significant other may not think and may not convince others to use it. To affect the belief that most significant others consider he or she should utilize the mobile-based partograph, the healthcare system should strengthen the concept of teamwork.

In contrast to a study on the adoption of electronic health in the Amhara region, where the attitude was the strongest predictor of intention, in this study perceived ease of use was the strongest predictor of intention to use[39]. To maximize the likelihood of initial and ongoing usage, mobile-based partograph should be provided with an easy function.

The association between job relevance and intention to use, as well as the relationship between perceived ease of use and intention to use, is partially mediated by perceived usefulness in the study's proposed model. That is consistent with[88]. However, perceived utility is unable to buffer the link between subjective norm and usage intention.

Perceived ease of use and intention to use was partially mediated by attitude and consistent with the study conducted using modified TAM [83]. Attitude toward using mediate the relationship between perceived usefulness and intention to use. To maximize the benefits of the additional capabilities, makers of e-health platforms should actively work to change how physicians feel about using them[68].

The proposed modified TAM explained about 85% variance in the obstetric healthcare provider’s intention to use mobile-based partograph. This shows that the model's overall predictive ability was high, and the proportion came very approach to matching a study utilizing modified TAM in a healthcare scenario[50].

Limitation of the study

It is difficult to discuss the proportion of intention to use mobile-based partograph as either high or low due to the lack of similar previous studies.This study was a one-time study.

Again it is difficult to establish a cause-effect relationship in this study due to the cross-sectional nature of the study.

As the respondents were only from the government and tertiary care levels, caution

must be exercised when applying the findings to all obstetric healthcare providers in the area.

Conclusion

Two-thirds of the obstetrics healthcare providers' had the intention to use mobile-based partograph. Perceived usefulness, perceived ease of use, job relevance, and attitude positively and significantly influence intention to use mobile-based electronic partograph. Among these perceived ease of use was the strongest potential predictor of intention to use. The connection between exogenous latent variables and intention to use was partially mediated by perceived usefulness and attitude toward usage, except for subjective norms. The modified TAM is an effective model for forecasting the intention of the obstetric healthcare professional to use a mobile-based partograph.

Abbreviation

AVE: Average Variance Extracted**, AT**: Attitude**, AMOS**: Analysis of moment structure, **ITU**: Intention to Use, **JR**: Job Relevance**, PU**: Perceived Usefulness, **PEOU**: Perceived Ease of Use**, SDG**: Sustainable Development Goal**, SN**: Subjective Norms**, SPSS**: Statistical Package for Social Sciences**, TAM**: Technological Acceptance Model**, WHO**: World Health Organization

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Authors' contribution

All the authors of this study involved starting from problem identification, proposal development, data collection, and analysis, and thesis write-up to final approval for publication. They accept responsibility for this study.

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Availability of data and materials

The dataset used for the analysis of the study can be obtained with the request of the

author

Ethical consideration

Ethical clearance was obtained from the university of Gondar and approved by its ethical review board with Ref No / IPH / 2129 / 2014. A letter of support was obtained from the department of health informatics and written consent was taken from each study participant.

Consent for publication

Not applicable

Competing interests

The authors declare that we have no competing interests

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Annex

List of tables and figure

Table 3. Factor loading, composite reliability, average variance extracted, and Cronbach's alpha of the construct of the proposed model

Constructs	Items	Factor Loading	CR	AVE	CA
Intention to use	ITU4	0.844	0.933	0.776	0.932
	ITU3	0.904			
	ITU2	0.887			
	ITU1	0.883			
Subjective Norm	SN3	0.902	0.940	0.840	0.940
	SN2	0.946			
	SN1	0.901			
Job Relevance	JR3	0.872	0.921	0.795	0.920
	JR2	0.897			
	JR1	0.906			
Perceived ease of use	PEOU4	0.871	0.927	0.761	0.926
	PEOU3	0.887			
	PEOU2	0.888			
	PEOU1	0.843			
Perceived usefulness	PU4	0.890	0.945	0.810	0.944
	PU3	0.886			
	PU2	0.909			
	PU1	0.914			
Attitude	AT3	0.896	0.924	0.802	0.924
	AT2	0.884			
	AT1	0.907			

Table 4. The result of discriminant validity of the proposed model

	ITU	SN	JR	PEOU	PU	AT
ITU	**0.881**					
SN	0.622	**0.917**				
JR	0.830	0.711	**0.892**			
PEOU	0.861	0.657	0.766	**0.872**		
PU	0.844	0.636	0.799	0.835	**0.900**	

AT	0.864	0.674	0.885	0.804	0.826	**0.896**

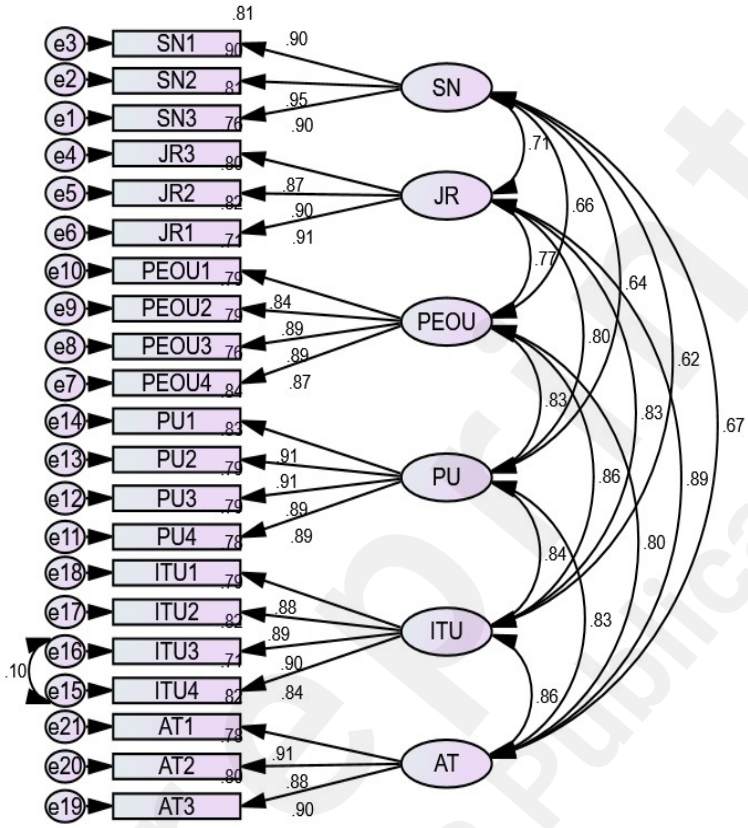

Figure 2. Confirmatory factor analysis of standardized estimate of AMOS version 23 output

Table 5. The direct, indirect, total effect, types of mediation, and the result of the hypothesis test regarding the obstetrics healthcare provider's intention to use and its predictors

Hypothesis	Path	Effect	Significance	Mediation	Decision
H11	JR → *PU* → ITU	Total	Significant	Partial	Supported
		Indirect	Significant		
		Direct	Significant		
H12	SN → *PU* → ITU	Total	insignificant	No relationship	Not supported
		Indirect	insignificant		

		Direct	insignificant		
H13	PEOU → PU → ITU	Total	Significant	Partial	Supported
		Indirect	Significant		
		Direct	Significant		
H14	PU → AT → ITU	Total	Significant	Partial	Supported
		Indirect	Significant		
		Direct	Significant		
H15	PEOU → AT → ITU	Total	Significant	Partial	Supported
		Indirect	Significant		
		Direct	Significant		

Note: *H-hypothesis, AT-attitude, JR-job relevance, PU-perceived usefulness, PEOU-perceived ease of use, SN-subjective norms, ITU-intention to use*

Table 6. The result of squared multiple correlations (R^2) of AMOS 23 output based on data obtained from obstetrics healthcare providers Oromia region Ethiopia 2022.

Variables	R^2
Perceived usefulness	0.765
Attitude	0.749
Intention to use	0.854

Supplementary Files