Analysis of Mobile TV Acceptance Using The Integration of Technology Acceptance Model (TAM) and Uses and Gratification (U&G) Theory

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ABSTRACT: *The development of digital technology has spawned a convergence of technology, so that the cellular phone which initially serves as a communication tool has now evolved into a device that can receive television broadcasts or mobile tv. Mobile tv services allow users to watch television anywhere and anytime. Mobile tv service provides a variety of interesting content, and give an authority to the users to choose the desired video content. Currently, there are still many people who have not felt the benefits of mobile tv services. Therefore, research on the determination of factors that influence users to adopt mobile tv service is considerably important. This research combines theoretical model of TAM and U&G theory to analyse the factors that affect user acceptance of the mobile tv. The research is conducted in Daerah Istimewa Yogyakarta, Indonesia. This study presents a quantitative analysis based on SEMPLS method, involving 107 respondents. The results showed that latent variables such as normative pressure and attitude were factors that affected a person in using mobile tv. This research showed that the level of service availability was not a significant influence on a person's attitude in using mobile tv. This proves that the flexibility of mobile tv is not a major advantage of mobile tv.*

1. Introduction

Today, the world has evolved to form an information-based society. Information and communication have become essential for one's personal life and business communities with different forms of media and communication channels available (TV, internet, e-mail, mobile, etc)[1]. Nowadays, consumption of the internet across Indonesia has evolved very quickly. This is accelerated by the presence of inventions in the field of hardware and Information Technology (IT).

Currently, the development of the IT is one of the factors which changes the pattern of the broadcast television industry. At first, television broadcast can only be seen on the television set, but with the development of the IT people can watch television broadcasts via mobile devices such as smartphones and tablet PCs, known as mobile tv service [2]. The convergence between broadcasting telecommunications and mobile devices has changed cell phones into a device that can receive television broadcasts. Users can access, acquire and store the video into their mobile devices either by streaming or real time [3].

Mobile tv service allows users to view television broadcasts everywhere and anytime. The flexibility of mobile tv service is not unique, but the true value of mobile tv service is that users can use a single device to perform several functions at once. Mobile tv allows users to communicate, access the internet and enjoy television broadcasts [4].

As a new technology based on mobile communications and television broadcasting, the acceptance level of mobile tv services varies from one person to another, it is because each person has a different character [5]. Previous research works showed that there was a difference acceptance level of mobile tv service among countries differ from one another [6]. Research on the acceptance of mobile tv service in Indonesia and Japan concluded that the limitation provision of services has become the factor that affected the adoption of mobile tv.

This study aims to test the factors that affect the acceptance of mobile tv service in the special region of Yogyakarta, Indonesia, whether accessed via 3G network or WiFi. To test these factors, this study used TAM (Technology Acceptance Model) as a basic model to test the level of acceptance. This research uses the TAM modified by adding variables based on research about mobile tv [2] [5] [6] [7] and combined with the theory of Uses and Gratifications (U&G) [8]. By combining the TAM and U&G, this research looks at the acceptance of a technology that seen from the user's point of view so that it will strengthen the intrinsic factor in explaining TAM that affects a person's acceptance towards technology [8].

2. Research Model and Hypothesis

2.1 Intention to use mobile tv
Intention to Use (IU), either to do or not to do something is determined by attitude toward behaviour and normative pressure that a person should or should not do anything [9]. In this study, normative pressure and attitude are factor that determine the behavioural intention to use mobile tv.

Attitudes toward behaviour is positive or negative feelings towards the achievement of a person's behaviour [[9]. In TAM, a person's beliefs determine attitudes toward the use of a system and the attitude towards the development of behavioural intention to use a system [10]. Several studies have shown the positive influence Attitude toward Intention to Use [2] [5] [6] [7]. Hence we proposed a hypothesis:

H1 : Attitude towards mobile tv has significant effect to Intention to Use mobile tv

Normative Pressure (NP) is defined as a person's perception that most of the people who are important to her/him think she/he should or should not perform the behaviour in question [9]. People use mobile tv services in the social life of society, so that everyone adapt to the mutual interactions that occur in the community. Mobile tv service is a service with exclusive features that encourage users of mobile tv to show it in public. Positive social response will encourage others to use mobile tv [7]. Some studies indicate a positive effect of Normative Pressure toward Intention to Use [6] [7] [11]. Hence, we proposed a hypothesis:

H2 : Normative Pressure has significant effect to Intention to Use mobile tv

Perceived Cost (PC) is defined as a consumer's belief that using mobile tv will cost money [7] both cost amount of money spent in the form of a person or a person sacrifices incurred in using mobile tv services [12]. Mobile tv services can only be enjoyed in a mobile device that has an internet connection. Therefore, enjoying the services of mobile tv, users will have to invest the cost of buying a mobile device and subscribe to internet data packets. Although some studies showed that the cost factor did not affect significantly the service [11] [13] [14], but costs incurred to enjoy mobile tv services still have an influence on one's intention to use mobile tv. Based on previous studies, we proposed hypothesis:

H3 : Perceived Cost has significant effect to Intention to Use mobile tv

2.2. Attitude toward mobile tv

In this study, Perceived Usefulness (PU) is defined as the degree to which a person believes that a mobile tv would enhance his or her performance when utilized advantageously [7]. Some studies have suggested the existence of a positive influence between the perceived usefulness to attitude [5] [6] [7]. The positive influence between the perceived usefulness on behavioural intention to use was also raised by some studies [6] [7] [8] [13]. Hence, we proposed hypothesis:

H4 : Perceived Usefulness has significant effect to Intention to Use mobile tv
H5 : Perceived Usefulness has significant effect to Attitude towards mobile tv

Davis et al. [10] proposed definition of Perceived Enjoyment (PE) is an activity that aims to seek pleasure regardless of the consequences associated with user performance. In this study the activity of perceived enjoyment is defined as the use of a computer system that brings a sense of excitement to the user himself apart from the aspects of technology [7]. Mobile tv service is a system that aims to satisfy the users through entertainment content supplied (hedonic IT) [2]. Some studies indicate a positive relationship between the perceived enjoyment to the attitude [2] [7] [11]. Hence, we proposed hypothesis:

H6 : Perceived Enjoyment has significant effect to Attitude towards mobile tv

Perceived Availability (PA) is defined as the belief that a system can provide the relevant services at anywhere and anytime [7]. Perceived availability is not only directly affect the attitude but also has indirect effect on attitude through the perceived usefulness, as users may think that they can access content that is useful for performing wherever and whenever [7]. Shin in Qiantori [7] suggests a relationship between the perceived availability and perceived usefulness have also been studied in the context of the mobile internet. Hence, we proposed hypothesis:

H7 : Perceived Availability has significant effect to Attitude towards mobile tv
H8 : Perceived Availability has significant effect to Perceived Usefulness

Perceived Quality (PQ) is defined as the consumer's belief that the system can provide satisfactory performance and reliable service. Mobile tv services offer more personalized service, so as to get closer to the users, but the quality of the content does not match the expectations will affect user satisfaction [7]. Some research on the multimedia show that quality of service is an important factor in shaping the attitude of the users towards IT services and the perceived enjoyment of the service [7] [15]. In this study focuses on the quality of service functionality, video quality, and the quality of the network [7]. Content and network quality will either be able to increase the enjoyment of users of services [7]. Hence, we proposed hypothesis:

H9 : Perceived Quality has significant effect to Attitude towards mobile tv
H10 : Perceived Quality has significant effect to Perceived Enjoyment

Rubin and Perse in Cha [16] suggests that the instrumental use of media is the use that is deliberate, more selective towards the content and reflects the views remain on the specific content. Internet-based television services tend to provide more flexibility to the user to choose and plan which content you want to enjoy [16]. Motivation instrumental in using online tv (MIU) does not have significant effect on the intention to use the services [16] , but motivation can influence the perceived usefulness and perceived enjoyment directly [8]. Hence, we proposed hypothesis:

H11 : Motivation for Instrumental use has significant effect to Perceived Usefulness
H12 : Motivation for Instrumental use has significant effect to Perceived Enjoyment

2.3. Research model
Based on the proposed hypotheses in the research, then built the research model as shown in Figure 1.

3. Methodology and Results

This study is a quantitative analysis using structural equation modelling - partial least square method (SEMPLS). SEM-PLS chosen because it does not require a lot of samples to be analysed (30-100 samples). SEM-PLS can be used to make predictions of the model so that it does not require a strong theoretical basis. In addition, SEM-PLS do not require the data to be normally distributed.
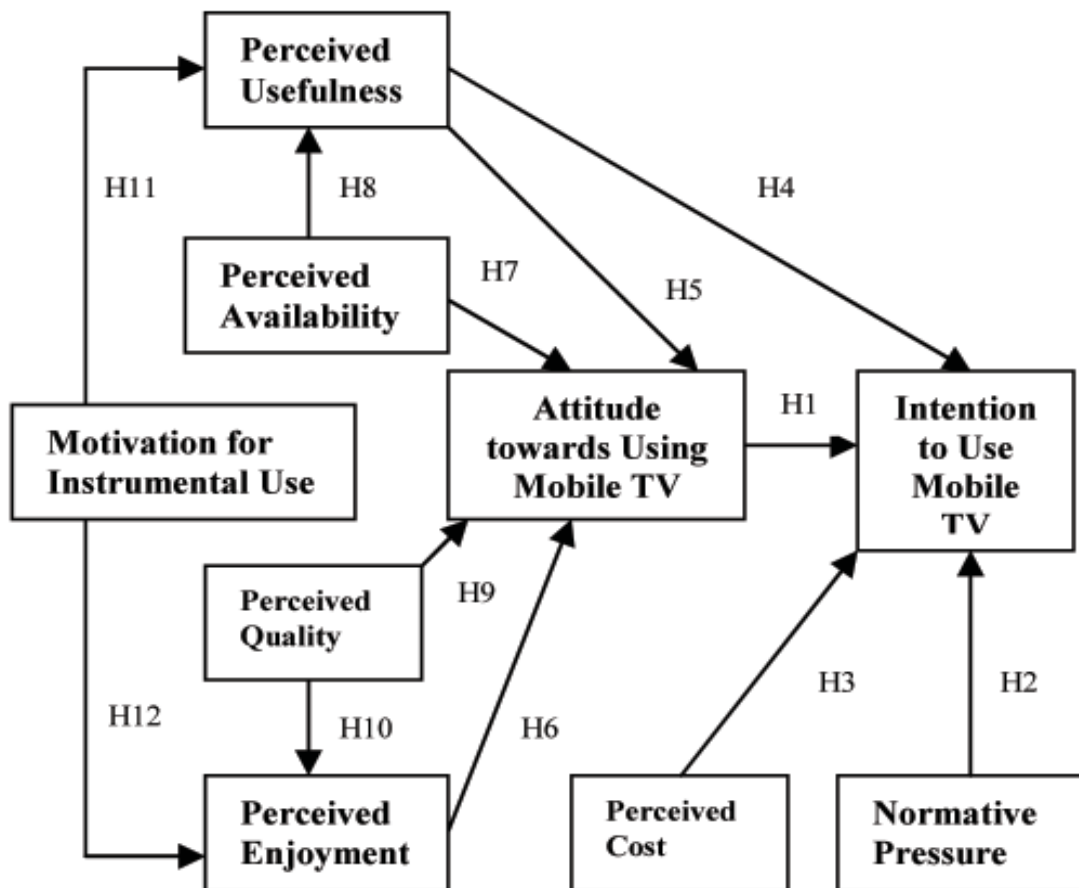
Figure 1. Research model

Data were obtained by questionnaire, containing 29 questions to gather information about the user acceptance of the mobile tv. The research population is people in Yogyakarta that ever access the mobile tv. The sampling technique was simple random sampling, which means that every sample in the population has an equal opportunity to be elected as the respondent. The number of respondents involved in the study amounted to 107 respondents. Male respondents amounted to 84 respondents and female respondents amounted to 23 respondents. Respondents involved in the study have an educational background from high school to the master degree.

The test results of the measurement model (outer model) with SEM-PLS was conducted to determine the relationship between indicators and its latent variables. Test of outer model was performed with the validity and reliability testing [17]. Test of loading factor on the indicator aims to determine whether valid or not valid the measurement of indicators to its latent variable. Loading factor is said to be good if it has a value of more than 0.7 [17]. The first test showed that there are some indicators that have values below 0.7 so the indicator is removed and did the second test. The second test against the loading factor shows that all indicators have been considered valid because it has a value above 0.7. Loading factors that have good value have been shown in the Table 1.

The validity test of the latent variable is done by testing the value of the discriminant validity of the latent variables. The value of discriminant validity showed that no operational similarities between the latent variables with each other. The value of discriminant validity is said to be good if the correlation of the latent variable against itself must be higher than the correlation to other latent variables [17]. Based on the research, the value of each discriminant validity of each latent variables are shown in Table 2. It can be seen that the discriminant validity tests showed good results.

Indicator	Loading Factor
ATT1 (*Attitude*)	0.873
ATT2 (*Attitude*)	0.873
ATT3 (*Attitude*)	0.767
IU1 (*Intention to Use*)	0.784
IU2 (*Intention to Use*)	0.788
IU3 (*Intention to Use*)	0.851
MI3 (*Motivation*)	0.790
MI4 (*Motivation*)	0.852
NP1 (*Normative Pressure*)	0.725
NP2 (*Normative Pressure*)	0.759
NP4 (*Normative Pressure*)	0.733
PA1 (*Availability*)	0.966
PA2 (*Availability*)	0.929
PC1 (*Cost*)	0.866
PC2 (*Cost*)	0.927
PE1 (*Enjoyment*)	0.742
PE2 (*Enjoyment*)	0.938
PE3 (*Enjoyment*)	0.873
PQ1 (*Quality*)	0.872
PQ2 (*Quality*)	0.840
PQ3 (*Quality*)	0.707
PU1 (*Usefulness*)	0.743
PU2 (*Usefulness*)	0.753
PU3 (*Usefulness*)	0.843

Table 1. The value of loading factor

	ATT	IU	MIU	NP	PA	PC	PE	PQ	PU
ATT	0.839								
IU	0.536	0.808							
MIU	0.432	0.291	0.822						
NP	0.245	0.515	0.219	0.739					
PA	0.126	0.211	0.269	0.254	0.948				
PC	0.102	0.047	0.090	0.181	0.007	0.897			
PE	0.488	0.469	0.497	0.310	0.240	0.217	0.855		
PQ	0.430	0.351	0.381	0.086	0.272	0.176	0.383	0.809	
PU	0.628	0.450	0.441	0.325	0.199	0.130	0.472	0.411	0.781

Table 2. The value of discriminant validity

Reliability test iss done at the level of latent variables. The purpose of reliability test is to determine the level of consistency of indicators to measure latent variables. In SEM-PLS reliability test is done by testing the value of composite reliability in each of the latent variables [17]. Reliability test is met if the value of each composite reliability latent variables above 0.7. Based on the research, the composite reliability values can be seen in Table 3.

Latent Variable	Composite Reliability
ATT	0.877
IU	0.849
MIU	0.806
NP	0.783
PA	0.871
PC	0.891
PE	0.890
PQ	0.850
PU	0.824

Table 3. The value of composite reliability

After the validity and reliability testing showed good result then we conduct the structural model test (inner model). Inner model test was conducted to determine the relationship between exogenous latent variables (independent) and endogenous latent variables (dependent) [17]. The test of inner model carried out by the method of bootstrapping on SEM-PLS. Bootstrapping method was done for calculating the t-value and coefficient R^2 (R-square). T-value is used to determine whether significant or not significant the effect of exogenous latent variables to endogenous latent varriable.

Bootstrapping done on two-tailed test at the significant level of 0.05. Exogenous latent variables is said to have a significant effect if the value of the t-value is greater than ttable (1.96) [17], if it has a significant influence then the hypothesis is accepted. Based on research, the value of the t-value and R^2 can be seen in Table 4 and Table 5.

Path	Path Coeficient	T-Value	Description
ATT -> IU	0.394	4.294	Significant
MIU -> PE	0.410	4.051	Significant
MIU -> PU	0.414	4.571	Significant
NP -> IU	0.406	5.509	Significant
PA -> ATT	-0.077	0.924	Not Significant
PA -> PU	0.096	1.071	Not Significant
PC -> IU	-0.077	0.899	Not Significant
PE -> ATT	0.221	2.001	Significant
PQ -> ATT	0.177	2.199	Significant
PQ -> PE	0.227	2.406	Significant
PU -> ATT	0.467	5.239	Significant
PU -> IU	0.080	0.803	Not Significant

Table 4. The value of t-value

R^2 is used to determine how much influence the latent exogenous variables to endogenous latent variables. For example, the latent variables Perceived Enjoyment (PE) possess the R^2 value of 0.291, meaning that perceived enjoyment was influenced by the motivation for the instrumental use and perceived quality in the amount of 29.1%, while 70.9% was influenced by other

variables outside of research [17].

Endogenous Variable	R-Square
ATT	0.465
IU	0.452
PE	0.291
PU	0.202

Table 5. The value of R^2

Based on Table 4, there are four hypotheses were not accepted because it has the t-value < t-table. Perceived availability has not significant effect on perceived usefulness and attitude toward using mobile tv (H7 and H8 are rejected). This happens probably because the quality of the Internet network in Yogyakarta uneven. Perceived cost has not significant effect to the intention to use (H3 is rejected), this occurs probably because the majority of respondents still use WiFi while enjoying streaming video through a smartphone or tablet PC. Perceived usefulness does not significantly influence the intention to use mobile tv (H4 is rejected), this occurs most likely because the frequency of respondents in enjoying mobile tv service is still low so that not provide significant benefits to them. These results support previous studies that the benefits of mobile-based services do not affect the intention of using the service [18]. Figure 2 illustrates the results of hypothesis test.
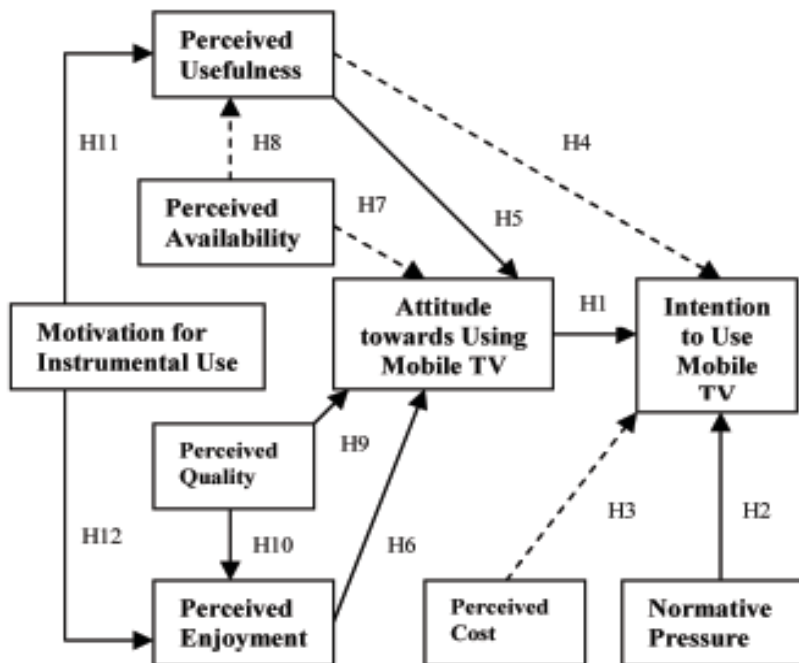

Figure 2. Hypothesis results

Description: The dotted arrows indicate no significant effect at significance level of 0.05 or hypothesis is rejected. While the straight arrow suggests the hypothesis is accepted at significance level of 0.05.

4. Discussion

TAM and U&G are two popular theories to explain the reasons why people adopt new technologies [8]. TAM is an effective model in explaining of extrinsic factors in the use of a technology, while the theory of U&G more focus on intrinsic factor in the use of technologies [8]. This study developed a research model that can explain the reason for a person using a mobile tv service. By combining TAM and U&G, the research model can explain the factors intrinsic and extrinsic factors that drive a person using a mobile tv.

The results showed that the flexibility of mobile television was not an appeal to users, it was supported by the rejection of the hypothesis that the availability of services did not affect the perceived usefulness and attitude in using mobile tv users. The result can be a recommendation to telecommunications operators to expand and improve the scope of the internet network, so the internet network in each area in Yogyakarta has same quality, so users can enjoy video streaming in every place smoothly.

Besides the issue of the availability of services, pricing is one of the factors for a person to select the internet network operators [19]. Expensive price of internet package will reduce a person's desire to enjoy video streaming, because these activities require a large quota of internet and stable internet speed [7]. One way that is done by ISP to increase public interest in the video streaming service is offering a special internet rate data package to access video.

The use of mobile tv was more oriented to the particular purpose, because the motivation of instrumental use of media will affect the perceived usefulness and perceived enjoyment. Based on this research, main purpose for someone to use mobile tv is for entertainment and to increase knowledge, it can be recommendation for video content providers to provide interesting video content to increase the motivation for someone to use a mobile tv. Integration of TAM and U&G has good analyse to user motivation, because it can assess the acceptance of the technology based on user requirements [8].

Based on reports from the ITU about IDI (ICT Development Index), Indonesia in 2012 and in 2013 ranks 106 of 166 countries surveyed (under Vietnam and the Philippines) [20]. IDI is a number that indicates the performance of a state seen from the level of adoption, infrastructure and expertise in the field of ICT. ICT development is slow in a country will affect the level of acceptance of new technologies. One way to increase the use of mobile tv is by optimizing the ability of ICT infrastructure in Indonesia, so that in future the slogan "Internet of Things" may apply in the television broadcast.

5. Conclusions and Suggestions

5.1. Conclusions
This study tested factors that affect the level of user acceptance of mobile tv in the special region of Yogyakarta, Indonesia. Taking into account the outcome and the purpose of this study, it can be taken a few conclusions as follows:

1. Attitude and Normative Pressure has significant effect to Intention to Use, while the perceived cost has not significant effect to intention to use mobile tv.

2. Perceived Usefulness, Perceived Quality, and Perceived Enjoyment has significant effect to attitude toward using mobile tv.

3. The flexibility of the services which are the main characteristics of the mobile tv has not yet to be felt by the user, so that its benefits are not capable of attracting someone to use mobile tv.

4. Motivation for instrumental use has significant effect to perceived usefulness and perceived enjoyment.

5.2. Suggestions
Recommendations that can be given as a follow-up of this research are as follows:

1. The results showed that the respondents more often to enjoy mobile tv while in the bed room, so that further studies can test mobile tv as a replacement for the role of television in the home.

2. Further research should consider the frequency of someone using mobile tv service.

3. The results can be used as consideration for an internet service provider in improving the availability and quality of internet network so that flexibility as main characteristics of mobile tv users can be felt.

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