

## **Patient Acceptance of Educational Contents in Asma Droid for Learning Asthma Self-Management**

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### **Abstract**

Education on proper asthma self-management is important in the management of asthma. It is a strategy to improve the quality of life and clinical outcomes of asthmatics. In this modern era, almost all digital contents, including health promotion and patient education, can be simply carried out through a smartphone app. Unfortunately, not all patients accept this approach. A well-validated method, known as the Technology Acceptance Model, was adopted to ensure the acceptance of the contents by users, in this case, patients. This study aimed to determine the perceived usefulness and perceived ease of use in the patient acceptance of educational contents of an asthma self-management app, known as AsmaDroid. The design of this study was an explanatory model with a quantitative approach. The respondents were asthmatics with the following criteria: aged 19–22 years old, having a history of asthma, and having installed and used the AsmaDroid app for a month. The purposive sampling approach was adopted with 100 study respondents, and the instruments of the study were AsmaDroid and a TAM questionnaire. Additionally, a descriptive statistic was also adopted with the use of multiple linear regression to prove the study hypothesis. The results of this study showed that both perceived usefulness and perceived ease of use had a positive and significant effect on the user or patient acceptance, with a significant value of 0.00 and 0.02, respectively. This study concluded that asthma educational contents in AsmaDroid provided benefits and convenience for users. Therefore, the educational contents were accepted as an alternative medium to learn asthma self-management.

## **Keywords**

AsmaDroid, Perceived Usefulness, Perceived Ease of Use, Technology Acceptance Model, User Acceptance.

## **Introduction**

Asthma is a long-term, non-communicable disease reportedly affecting more than 339 million people around the world (Krishnan, Cloutier and Schatz, 2021; Reddel, 2021). The disease is the most common among children; however, most deaths occur among older groups (Kearney *et al.*, 2020). In Indonesia, the prevalence of the disease reached up to 2.4%, with a recurrence proportion of 57.5% (Faisal and Yunus, 2020). Unfortunately, this requires a very large number for doctors, pharmacists, nurses, and other health professionals to handle the condition. This is why active participation of patients and their families in care and treatment is required in the long-term management of asthma (Khajeh Mahmoud *et al.*, 2019).

The most common first-line standard medical treatment of asthma includes a combination of rapid-onset, short-acting inhalers containing short-acting beta-agonists and long-term control medications containing inhaled corticosteroids or ICS (Lycett *et al.*, 2018; Welker *et al.*, 2018). Additionally, to improve the asthmatic quality of life and to prevent medication non-adherence, education on self-management skills should be included in the asthma management (Butz *et al.*, 2007). It is generally known that medication non-adherence is due to a number of factors, including lack of patient-centered care, caregivers, family members, friends, misunderstanding, and lack of knowledge regarding asthma self-management (Muangpaisan *et al.*, 2014).

A good education on asthma self-management includes teaching patients to appropriately control their asthma condition and modify their lifestyle. Studies found that education helped not only in improving quality of life, but also in reducing the risk of asthma exacerbation, achieving better asthma control, and eliminating missed school or work days (Carpenter *et al.*, 2013; Liptzin and Szeffler, 2016; Schneider *et al.*, 2020). In this modern digital era, self-management education based on information technology can significantly help control the prevalence of asthma. Keeping asthma symptoms under control could be achieved through an information system able to clinically monitor patients as well as to improve their awareness, quality of life, and self-management. Studies found that good support for asthma self-management improved the control of asthma, and the availability of the support in the form of a smartphone app or mHealth and other digital platforms could serve as a support.

An asthma self-management education utilizing a smartphone or mHealth app is considered effective. However, a good mHealth app is measured not only by its sophistication, but also the extent to which the app can be accepted and used by its users. This study aimed to determine the effect of perceived usefulness and perceived ease of use on user (patient) acceptance of asthma self-management educational contents in AsmaDroid by adopting the Technology Acceptance Model (TAM) approach.

## **1. Technology Acceptance Model**

TAM defines an approach of an information system that models how users come to accept and use a technology. A study by Davis et al. (1989) developed this approach to examine the determinant factors of the use of an information system by users. The results of this study indicated that the use of an information system was significantly influenced by the intention to use an information system, in which the intention to use was influenced by perceived usefulness and perceived ease of use. Another study confirmed that both perceived ease of use and perceived usefulness positively affected the user acceptance of an information technology.

### **1.1. Perceived Usefulness**

Perceived usefulness is applied to determine to what extent users believe that using a technology will improve their job performance. Previous studies found that the constructs of perceived usefulness positively and significantly affected the use of an information system. The studies also confirmed that perceived usefulness was a construct that greatly influenced attitude, behavioral intention, and behavior in the use of an information system compared to other constructs. To develop the perceived usefulness, Davis et al. (1989) adopted six main items: work more quickly, job performance, increased productivity, effectiveness, makes job easier, and useful.

### **1.2. Perceived Ease of Use**

Perceived ease of use is adopted to determine to what extent users believe that using a technology will be free from effort. Previous studies showed that the constructs of perceived ease of use significantly affected perceived usefulness, attitude, behavioral intention, and behavior. Similar with perceived usefulness, perceived ease of use adopted six items to develop the construct. The items consist of easy to learn, controllable, clear and understandable, flexible, easy to become skillful, and easy to use.

### 1.3 User Acceptance

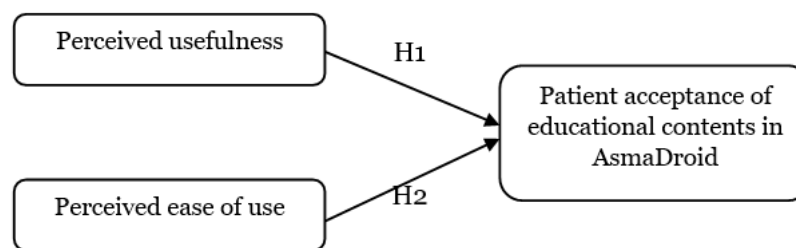
User acceptance is applied to examine positive or negative feelings of users regarding a new information system or technology after using it in a certain span of time. It can be described as willingness of users to use a new information system or technology to help their work. The construct of user acceptance of the technology is significantly influenced by ease of use and usefulness, thereby becoming an important factor for users to accept and use a new technology. The development of the construct of user acceptance involved four items: intention to use, user satisfaction, use, and provide feedback.

## 2. Hypothesis

To find out whether users (patients) accepted the educational contents of an asthma self-management app, known as AsmaDroid, it is important to conduct research on the perceptions of patients who use the app. The approach adopted in this study was a TAM, a model that is often used and appropriate to describe the process of user acceptance of a new system or technology (Vaidyanathan, Ganesh; Bargellini, 2005). This model explains that perceived ease of use and perceived usefulness are stated to be the basis in determining the acceptance and use of various new information systems. The hypotheses in this study are as follows:

H1: Perceived usefulness significantly affects patient acceptance of educational contents in AsmaDroid.

H2: Perceived ease of use significantly affects patient acceptance of educational contents in AsmaDroid.



## Material and Methods

This study adopted a descriptive quantitative approach, conducted from January to March 2020 in the Special Region of Yogyakarta Province, Indonesia. Instruments used in the study were the asthma self-management app AsmaDroid and a TAM questionnaire with four Likert scales, namely strongly agree (4), agree (3), disagree (2), and strongly disagree (1). A purposive sampling technique was utilized for the recruitment of study participants. This recruitment resulted in 121 participants. Unfortunately, 21 of them were eliminated

due to inclusion and exclusion criteria. In total, 100 study participants were involved in the analysis. Most participants were female, aged 20 years old, and with the education level of an undergraduate student. In terms of mHealth experience, all participants were active smartphone users who have been operating a mHealth app. Table 1 summarizes the profile of respondents involved in this study.

**Table 1 Summary of Study Respondent Profiles**

Demographic Variables	Categories	Frequency (%)
<b>Gender</b>	Male	48 (48.00%)
	Female	52 (52.00%)
<b>Age</b>	19	2 (2.00%)
	20	60 (60.00%)
	21	33 (33.00%)
	22	5 (5.00%)
<b>Education</b>	Undergraduate	97 (97.00%)
	Graduate	3 (3.00%)
<b>mHealth experience</b>	Yes	100 (100.00%)
	No	0 (0.00%)

## Results

### 1. Descriptive Analysis

Table 2 represents a descriptive analysis of the constructs. The average value of each was higher than 2, meaning that study participants had positive evaluations for educational contents in the AsmaDroid app.

**Table 2 Descriptive Analysis of the Constructs**

Constructs	Minimum	Maximum	Mode	Mean	SD
<b>Perceived Usefulness</b>					
PU1	2	4	3	3.25	0.67
PU2	1	4	3	3.08	0.64
PU3	2	4	3	3.00	0.68
PU4	1	4	3	3.07	0.68
PU5	1	4	3	3.05	0.60
Average PU				<b>3.09</b>	<b>0.65</b>
<b>Perceived Ease of Use</b>					
PU1	1	4	3	3.05	0.61
PU2	1	4	3	3.05	0.62
PU3	2	4	3	3.06	0.64
PU4	1	4	3	3.08	0.63
PU5	1	4	3	2.97	0.68
Average PEU				<b>3.04</b>	<b>0.63</b>
<b>User Acceptance</b>					
UA1	1	4	3	3.02	0.72
UA2	2	4	3	3.05	0.61
UA3	1	4	3	2.99	0.75
Average UA				<b>3.02</b>	<b>0.69</b>

## 2. Questionnaire Validity

In this study, the validity of a TAM questionnaire is directly related to how the questionnaire measures what it intends to measure; thus, it is considered valid when its construction and applicability allow it to measure its target (Perroca and Gaidzinski, 1998). A content validity test, which was conducted by three experts with doctoral degrees and four professionals with bachelor's degrees, showed that all the question items (n=13) were good, and no item received a score of less than two of the four Likert scales. Additionally, the construct validity employing Pearson's correlation confirmed that all the question items presented high or strong correlations with the r value of each item, ranging from 0.7 to 0.89. An r value ranging from 0.7 to 0.89 indicates a high or strong correlation (De Laat *et al.*, 2011). Table 3 shows the result of classification of Pearson's correlation employed in this study.

**Table 3 Classification of Pearson's Correlation of the TAM Question Items**

Classification	Question (r)
Low $r=0.26-0.49$	-
Moderate $r=0.50-0.69$	-
High or strong $r=0.70-0.89$	PU1 ( $r=0.881$ ) PU2 ( $r=0.884$ ) PU3 ( $r=0.848$ ) PU4 ( $r=0.871$ ) PU5 ( $r=0.774$ ) PEU1 ( $r=0.831$ ) PEU2 ( $r=0.885$ ) PEU3 ( $r=0.832$ ) PEU4 ( $r=0.885$ ) PEU5 ( $r=0.780$ ) UA1 ( $r=0.838$ ) UA2 ( $r=0.850$ ) UA3 ( $r=0.849$ )

## 3. Questionnaire Reliability

A reliability test employing Cronbach's alpha was conducted to determine the questionnaire's internal consistency in terms of reliability. The test shows how consistent the questionnaire is and how much it can be trusted. According to Table 4, the results of the reliability test show that the Cronbach's alpha value of each construct has a value greater than 0.60, meaning that all three constructs are reliable or trustworthy.

**Table 4 Reliability Analysis of the Constructs of the TAM Question Items**

Constructs	Item	Cronbach's $\alpha$
<b>Perceived Usefulness</b>	PU1	0.900
	PU2	
	PU3	
	PU4	
	PU5	
<b>Perceived Ease of Use</b>	PEU1	0.898
	PEU2	
	PEU3	
	PEU4	
	PEU5	
<b>Patient Acceptance</b>	PA1	0.795
	PA2	
	PA3	

#### 4. Multiple Regression Analysis

This study resulted in a regression equation of  $Y = 2.185 + 0.140X_1 + 0.306X_2 + e$ . This means that if the value of perceived usefulness and perceived ease of use is equal to 0.000, the value of patient acceptance is equal to 2.185. Meanwhile, the value of 0.140 means that if the value of perceived usefulness increases by one unit, then the value of patient acceptance increases by 0.140, assuming the other variables are constant. The value of 0.306 describes that if the perceived ease of use increases by one unit, then the value of patient acceptance will increase by 0.306, assuming the other variables are constant. Table 5 is the complete result of the multiple regression analysis.

**Table 5 Result of the Multiple Regression Analysis**

Model	Unstandardized Coefficient		Unstandardized Coefficient	t	Sig.
	Beta	Std. Error			
(Constant)	2.185	0.877		2.493	0.014
<b>Ease of Use</b>	0.140	0.059	0.219	2.374	0.020
<b>Usefulness</b>	0.306	0.058	0.488	5.279	0.000
<b>R<sup>2</sup> = 0.398</b>	<b>Adjusted R<sup>2</sup> = 0.386</b>		<b>F = 32.077</b>	<b>Sig. 0.000</b>	

#### 5. Hypothesis Test

##### F-test

The F-test explains a simultaneous linear relationship between independent variables and dependent variables. If the significance level is less than 0.05, it means that the hypothesis of the study is accepted and vice versa. According to Table 5, the calculated F value is 32.077, with a significant value of 0.000. It can be concluded that all independent

variables, namely perceived usefulness and ease of use, significantly affect the user acceptance.

### **T-test**

The t statistic test determines how significant the influence of independent variables is on the dependent variables to analyze the regression coefficient of each variable. If the significance level is less than 0.05, it means that the hypothesis of this study is accepted and vice versa. According to Table 5, the significance level of t on the variables of perceived ease of use is 0.020, meaning that the variables positively affect the user acceptance. Additionally, the variables of perceived usefulness also have a significance level of 0.000, meaning that the variables positively affect user acceptance.

### **Adjusted R<sup>2</sup>-test**

The adjusted R<sup>2</sup> test is generally used to determine how significant the dependent variables can be explained by the independent variables together. In Table 5, it can be seen that the value of adjusted R<sup>2</sup> is 0.386. This means that the ability to explain the variables of perceived usefulness and perceived ease of use to patient acceptance is 38.6%, while 61.4% were influenced by other variables not analyzed in this study.

### **Discussion**

This study mainly aimed to determine the effect of perceived usefulness and perceived ease of use on the patient acceptance of educational contents in an asthma self-management smartphone app, known as AsmaDroid, using a TAM. The mode value of Table 2 shows that the most common answer choice on the perceived usefulness indicators (PU1–PU5) was 3 (agree), with an average overall mean value of 3.09 and standard deviation value of 0.659. It describes that almost all respondents agreed that educational contents in AsmaDroid make it easier to learn about monitoring asthma symptoms and daily symptoms. In addition, most respondents also agreed that the contents were one of alternative media for learning asthma self-management, and information provided by the contents was accurate and very useful for them. This finding was in line with previous research (Ghozali *et al.*, 2021), which concluded that perceived ease of use significantly affected patient acceptance of a new information system, or an asthma self-management app, in this case.

The average overall mean value of the perceived ease of use indicators (PEU1–PEU5) was agree (3.04). According to the mode value of Table 2, almost all participants agreed



that they had no difficulty in using the educational contents in the AsmaDroid app. In addition, the contents were also easily understood and used by the users, information browsing on the contents could be easily accessed, and information on controlling asthma symptoms could be obtained easily and quickly. Unfortunately, some respondents found problems when accessing the contents due to poor Internet connection, or they had no access to the Internet. The solution to the problem was to create an offline version of the educational contents, although it might need more space to save the files. This is in line with this research (Bendary and Al-Sahouly, 2018), which confirmed that if someone believed in the ease of use of an information technology or system, it will greatly affect the patient acceptance of and positive attitude toward the technology.

The average overall mean value of patient acceptance indicators (PA1–PA3), as shown in Table 2, was 3.02 (agree). Most respondents accepted educational contents in the AsmaDroid app and intended to use them continuously. Unfortunately, the contents still have not met the needs of the respondents. The solution was to add more contents according to their needs, such as tutorial videos on how to use a nebulizer, peak flow meter, and Spiriva.

### **Limitation of the Study**

This study provides valuable findings affecting patient acceptance of educational features of AsmaDroid, a Google Android OS app that provides educational contents and supporting features regarding asthma self-management. However, it should be evaluated in the context of study limitations. The study was limited to the respondents who have experiences in using mHealth apps. Comparative research should be conducted to determine whether there were any differences between users who have mHealth app experiences and those who did not have such experiences. A further study with more detailed analysis is needed to address this problem.

### **Conclusion**

This study found that both variables of perceived usefulness and ease of use significantly affect the patient acceptance of educational contents of the AsmaDroid app, with a significance level of 0.020 for perceived usefulness and 0.000 for perceived ease of use. User acceptance was found to have a significance level of 0.000, meaning that most study respondents accepted the educational contents of AsmaDroid. A further study with more detailed analysis is needed to determine whether there were any differences between users having mHealth app experiences and those who did not have such experiences.

## **Declaration of Competing Interests**

The authors declare no conflicts of interests relative to this study.

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