Examining Healthcare Profesional's Acceptance of Electronic Medical Records System using Extended UTAUT2

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Abstract

This study aims to analyze user acceptance of the Electronic Medical Record system using the extended Unified Theory of Acceptance and Use Technology 2 model at PKU Muhammadiyah Bantul hospital. The UTAUT 2 model was chosen because it is the latest technology acceptance model which is a unification, synthesis, or summary of the eight pre-existing technology acceptance models. The subjects in this study were PKU Muhammadiyah Bantul hospital employees who used an electronic medical record system specifically for outpatient care. The object of this study is user acceptance of using the RME system in health services. Data collection techniques in this study are using questionnaires and observation. This research is a type of quantitative analytic research with data analysis using descriptive analysis. Data processing in this study used Smart-PLS software version 4.0 with SEM-PLS data analysis. The results showed that the aspects of the extended UTAUT2 model that had a positive and significant effect on user acceptance were performance expectancy (t=1.816), while the aspects of effort expectancy (t=0.419), social influence (t=0.635), facilitating conditions (t=0.139), hedonic motivation (t=0.909), price value (t=.304) habit (t=1.458), trust (t=0.032) and perceived risk (1.365) have no effect on user acceptance of the EMR system. Gender and age moderation variables were found to have no effect on the relationship between variables.

Keywords: EMR, Hospital, User, UTAUT2

I.   Introductions

Technology is developing rapidly in the current era of globalization. Advances in technology have penetrated into various fields including the health sector. Hospitals are required to build on quality of health services by utilizing currently developing technology. One of the implementations of technological advances in the health sector is the application of EMR in health services [1]. EMR is an electronic record that includes information such as a person's health that is created, collected, managed, used, and purchased by a doctor or health worker who is entitled to a health care institution. [1]. Quality electronic medical records will produce optimal patient health services and produce complete information to support organizational or hospital decision making [2]. Quality health services are supported by an optimal information system design [3]. In addition, user acceptance of the use of a system needs to be measured to produce a system that meets user needs [4]. User perceptions can help provide the right recommendations to maximize the development of electronic medical record systems [5]. One of the theory that can be used to measure the level of user acceptance of a system is using UTAUT2 theory [6].

UTAUT 2 was chosen to be used because this theory is the latest theory regarding user acceptance which adds new variables to support research in looking at acceptance of the use of new technology [7]. UTAUT2 was developed based on the UTAUT model which has four main constructs including 1) performance expectancy, 2) effort expectancy, 3) social influence, and 4) facilitating conditions which are then added again the three main constructs to support more accurate research include 1) hedonistic motivation, 2) price value, and 3) habit. Through UTAUT2 it can be understood that users' reactions and perceptions of a technology can influence their attitude in accepting and using technology [23]. A technology can increase productivity optimally if users can accept the use of a technology and according to user needs [8]. In this study also adds new variables to UTAUT 2 to optimize research results that

are appropriate in the field. The added variables are trust and perceived risk. There are moderator variables in this study, namely gender and age.

PKU Muhammadiyah Bantul Hospital is a private hospital that has implemented electronic medical records since 2018. The EMR system used was designed independently by the hospital. Currently EMR is implemented in outpatient services and continues to be developed in inpatient services. Electronic medical record system at PKU Muhammadiyah Bantul Hospital still has various kinds of obstacles, including system errors, duplication of data entry, incomplete data output, patient data missing from the system without a known cause, and other obstacles that impede health services provided to patients. This needs to be analyzed to produce an optimal electronic medical record system and according to user needs. A good electronic medical record system will make patient treatment more optimal due to the continuity of medical history data owned by the patient.

II. Methods

In conducting this research, to measure user acceptance of using new technology, the extended UTAUT2 research concept was used because it has variables that match the research being carried out. The extended UTAUT2 conceptual framework is as follows.
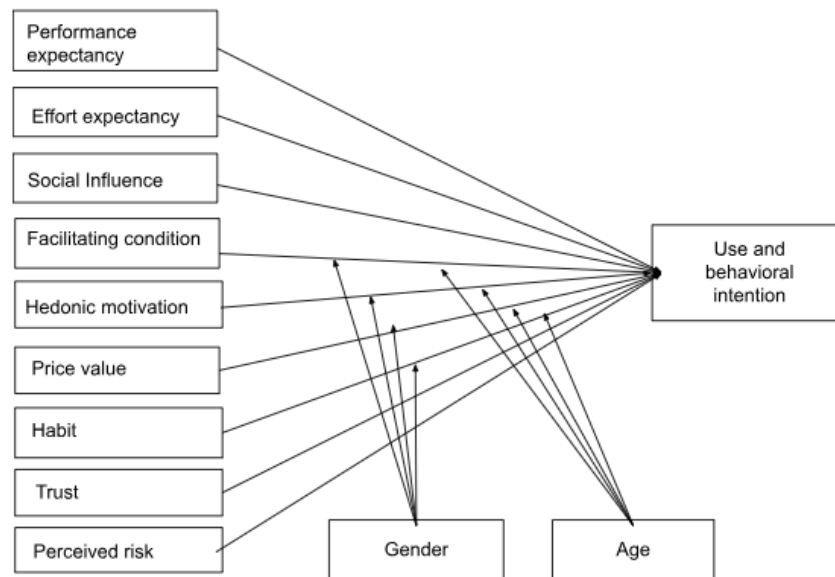

Figure 1. Research concept framework

Based on the Figure 1, it can be seen that there are 9 independent variables and one dependent variable, as well as two moderator variables in this study, namely gender and age that using in this research.

A type of quantitative analytical research is used in this study. This study used cross-sectional research. This research was conducted from May to July 2023. The population in this study were all PKU Muhammadiyah Bantul hospital staff who used the outpatient EMR system in health services. Total population in this study was 152 officers who work as doctors, nurses, medical recorders, laboratories, radiographers, pharmacists, and health insurance center officers.

Sample is the object under study and is considered to represent the entire population [8]. Sampling is the process of taking several elements from the population under study to be sampled, and understanding the various characteristics or characteristics of the subjects being sampled, which later can be generalized from the population elements [3]. Proportional stratified random sampling was used in this study. This technique is used for populations that have heterogeneous and proportionally stratified members or elements [21]. Utilizing the Slovin formula to determine the number of samples as shown below.

$$n = \frac{N}{1 + N\,(e)^2}$$

n = size of sample
N = size of population
e = percent allowance for sampling error that is acceptable for inaccuracy.
Calculation of the percent allowance in this study uses a percent of 10% and the sample calculation results are obtained as follows.

$$n = \frac{152}{1 + 152\,(0{,}1)^2}$$

$$n = \frac{152}{1 + 152\,(0{,}01)}$$

$$n = \frac{152}{1 + 1{,}52}$$

$$n = \frac{152}{2{,}52}$$

$$n = 60$$

Based on the above calculation, a minimum of 60 samples must be taken.

The research instrument is a tool that is observed [21]. The research instruments used in this study were questionnaires and observation sheets. Questionnaires are data collection techniques in the form of statements or questions given to respondents to answer [21]. The questionnaire used a Likert scale of 1 to 5. The Likert scale on the questionnaire is used to analyze the items in this variable research.

Questionnaire was distributed to employees of PKU Muhammadiyah Bantul who utilized an electronic medical record system for data collection. In this study, the processes of data analysis were SEM-PLS analysis and univariate analysis. To determine the tendency of respondents' responses to the statement items on the research questionnaire, univariate was used to describe the characteristics of the respondents and display the distribution of each variable. PLS is a variance based structural equation analysis that can test structural models and measurement models simultaneously.

III. Results And Discussions
1. The results of the description of the characteristics of the respondents

Characteristics respondents were divided based on gender, age, education background, and the profession of the respondents. Respondents in this study amounted to 60 respondents with the details of the respondents as shown in the following table.

Table 1. Gender of Respondents

Gender	Totals
Female	42
Male	18

The ages of the respondents in this study were grouped into five age groups, as follows.

Table 2. Ages Range of Respondents

Ages Range	Totals
17-25 years old	12
26-35 years old	18
36-45 years old	10
46-55 years old	14
>56 years old	6

The results of the study show that the last educational background of the respondents is as follows.

Table 3. Educational Background of Respondents

Graduate	Totals
Senior High School	1
Diploma III	31

	10
Bachelor	10
Masters	18

Respondents involved in this study shown in the following table.

Table 4. Profession of Respondent

Profession	Totals
Doctors	18
Nurses	9
Medical recorders	12
Radiographers	5
Pharmacists	4
Laboratories	7
Health insurance officers	5

2. SEM-PLS Analysis Results

The outer model test and the inner model test are the two methods that used in partial least square testing.

a. Outer model (measurement model)

1) Convergent Validity Test

Table 5. Result of Convergent Validity

Variabel	Item	Loading Factor	AVE
Performance Expectancy	PE1	0,804	0,536
	PE2	0,680	
	PE3	0,570	
	PE4	0,841	
Effort Expectancy	EE1	0,749	0,630
	EE2	0,914	
	EE3	0,882	
	EE4	0,590	
Social Influence	SI1	0,914	0,846
	SI2	0,957	
	SI3	0,887	
Facilitating Condition	FC1	0,739	0,601
	FC2	0,716	
	FC3	0,763	
	FC4	0,873	
Hedonic Motivation	HM1	0,882	0,726
	HM2	0,902	
	HM3	0,766	
Price Value	PV1	0,726	0,627
	PV2	0,714	
	PV3	0,919	
Habit	H1	0,806	0,604
	H2	0,717	
	H3	0,836	
	H4	0,745	
Trust	T1	0,823	0,623
	T2	0,768	
	T3	0,754	
	T4	0,810	
Perceived Risk	PR1	0,884	0,722
	PR2	0,844	
	PR3	0,821	
Acceptance and Use of Technology	AUS1	0,949	0,894
	AUS2	0,958	
	AUS3	0,930	
Gender	ZG	1,000	1,000

Variabel	Item	Loading Factor	AVE
Age	ZU	1,000	1,000

Table 5 shows the loading factor value of each item on the variable has a value of > 0,5 so that the instrument is declared valid according to convergent validity testing as well as the AVE value of each construct in the entire model has a value of > 0,5 so it can be concluded that all constructs are valid and fulfill validity converge well.

2) Discriminant Validity Test

	AUS	EE	FC	H	HM	PE	PR	PV	SI	T	ZG
AUS1	0.949	0.628	0.572	0.513	0.556	0.579	-0.351	0.309	0.523	0.603	0.029
AUS2	0.958	0.581	0.599	0.568	0.651	0.541	-0.336	0.322	0.576	0.630	0.073
AUS3	0.930	0.511	0.485	0.613	0.639	0.461	-0.274	0.416	0.496	0.582	-0.034
EE1	0.362	0.749	0.370	0.445	0.211	0.279	-0.267	0.017	0.321	0.443	-0.04?
EE2	0.477	0.914	0.377	0.305	0.392	0.424	-0.262	0.136	0.281	0.467	-0.008
EE3	0.635	0.882	0.538	0.405	0.381	0.352	-0.262	0.143	0.241	0.534	0.083
EE4	0.376	0.590	0.444	0.032	0.440	0.319	-0.191	0.376	0.368	0.324	0.067
FC1	0.330	0.365	0.739	0.359	0.249	0.282	-0.110	0.227	0.209	0.455	0.260
FC2	0.360	0.442	0.716	0.365	0.296	0.273	-0.201	0.219	0.322	0.482	0.118
FC3	0.521	0.478	0.763	0.151	0.664	0.393	-0.205	0.494	0.294	0.392	0.115
FC4	0.540	0.422	0.873	0.343	0.568	0.426	-0.192	0.454	0.367	0.594	0.157
H1	0.626	0.458	0.449	0.806	0.282	0.222	-0.196	0.074	0.341	0.568	-0.07?
H2	0.382	0.247	0.034	0.717	0.270	0.077	0.076	0.220	0.415	0.456	-0.000
H3	0.404	0.243	0.307	0.836	0.221	0.141	-0.077	0.115	0.419	0.541	-0.000
H4	0.342	0.149	0.278	0.745	0.103	0.092	-0.034	0.244	0.339	0.533	-0.020
HM1	0.546	0.420	0.551	0.156	0.882	0.507	-0.208	0.505	0.405	0.402	0.166
HM2	0.666	0.400	0.512	0.444	0.902	0.594	-0.271	0.472	0.535	0.564	0.077
HM3	0.407	0.326	0.524	0.075	0.766	0.373	-0.106	0.592	0.413	0.329	0.159
PE1	0.431	0.397	0.367	0.234	0.308	0.804	-0.023	0.094	0.279	0.324	0.028
PE2	0.386	0.045	0.276	0.240	0.451	0.680	-0.008	0.380	0.383	0.325	-0.06?
PE3	0.326	0.342	0.189	-0.106	0.413	0.570	-0.073	0.311	0.248	0.110	0.023
PE4	0.475	0.461	0.461	0.138	0.558	0.841	-0.103	0.310	0.303	0.276	-0.000
PR1	-0.322	-0.270	-0.126	-0.038	-0.272	-0.152	0.884	-0.254	-0.226	-0.381	-0.05?
PR2	-0.215	-0.262	-0.229	-0.132	-0.056	-0.011	0.844	-0.088	-0.060	-0.329	0.004
PR3	-0.305	-0.255	-0.253	-0.101	-0.241	0.001	0.821	-0.008	-0.050	-0.287	0.007
PV1	0.158	0.263	0.443	0.242	0.278	0.140	-0.116	0.726	0.257	0.473	0.224
PV2	0.166	0.092	0.245	0.222	0.255	0.290	-0.146	0.714	0.531	0.391	0.217
PV3	0.418	0.165	0.443	0.101	0.674	0.370	-0.111	0.919	0.366	0.383	0.103
SI1	0.505	0.383	0.414	0.429	0.555	0.418	-0.151	0.466	0.914	0.519	0.105
SI2	0.532	0.378	0.323	0.455	0.460	0.343	-0.175	0.398	0.957	0.456	0.100
SI3	0.516	0.242	0.345	0.438	0.463	0.379	-0.062	0.398	0.887	0.467	0.141
T1	0.624	0.486	0.546	0.675	0.404	0.335	-0.370	0.279	0.506	0.823	0.107
T2	0.323	0.314	0.383	0.646	0.268	0.123	-0.282	0.329	0.377	0.768	0.148
T3	0.522	0.505	0.509	0.332	0.621	0.442	-0.233	0.568	0.371	0.754	0.085
T4	0.460	0.429	0.469	0.508	0.296	0.159	-0.339	0.358	0.361	0.810	0.099
ZG	0.025	0.040	0.199	-0.040	0.148	-0.006	-0.019	0.186	0.125	0.134	1.000
ZU	-0.105	-0.179	-0.135	-0.093	0.117	0.250	0.468	0.094	0.030	-0.225	-0.02?

Figure 2. Discriminant Validity Test Result

The results in this study in Figure 2 show that all constructs have a construct correlation with measurement items that is higher than the other constructs. It means that the requirements for a good discriminant validity test have been fulfilled.

3) Reliability Test

Table 6. Reliability Test

Variabel	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Result
Acceptance and Use of Technology	0,941	0,942	0,962	Reliable
Effort Expectancy	0,795	0,857	0,869	Reliable
Facilitating Condition	0,783	0,810	0,857	Reliable
Habit	0,789	0,832	0,859	Reliable
Hedonic Motivation	0,814	0,860	0,888	Reliable
Performance Expectancy	0,701	0,728	0,819	Reliable
Perceived Risk	0,810	0,830	0,886	Reliable
Price Value	0,744	1,056	0,833	Reliable
Social Influence	0,908	0,909	0,943	Reliable
Trust	0,802	0,824	0,869	Reliable
ZG	1,000	1,000	1,000	Reliable
ZU	1,000	1,000	1,000	Reliable

Based on Table 6, all variables have met the reliability requirements, that is all variables have a value of > 0,7 so that the measurement model used in this study can be declared reliable.

b. Inner model (structural model)
1) Coefficient of Determination

Table 7. Coefficient Determination Result

Variable	(R^2)	Chategory
AUS	**0,756**	**Strong**

The results based on Table 7 show that (R^2) value on the dependent variable AUS of 0,712, meaning that this explains that all variables have an influence of 75,6% on Acceptance and Use of Technology.

2) Hypothesis test

Table 8. Hypothesis Test Result

		T Statistic	P Values	Result
H1	PE→ AUS	1.816	0.035	Accepted
H2	EE → AUS	0.419	0.338	Rejected
H3	SI → AUS	0.635	0.263	Rejected
H4	FC → AUS	0.139	0.445	Rejected
H4a	FC*ZG→AUS	0.290	0.386	Rejected
H4b	FC*ZU→AUS	0.691	0.245	Rejected
H5	HM → AUS	0.909	0.182	Rejected
H5a	HM*ZG→AUS	0.292	0.385	Rejected
H5b	HM*ZU→AUS	0.389	0.349	Rejected
H6	PV → AUS	0.304	0.381	Rejected
H6a	PV*ZG→AUS	0.713	0.238	Rejected
H6b	PV*ZU→AUS	0.231	0.409	Rejected

		T Statistic	P Values	Result
H7	H → AUS	1.458	0.073	Rejected
H7a	H*ZG→AUS	0.153	0.439	Rejected
H7b	H*ZU→AUS	0.407	0.342	Rejected
H8	T → AUS	0.032	0.487	Rejected
H9	PR → AUS	1.365	0.086	Rejected

H1: Performance expectancy have a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 1.816 (> 1.64) with a p value of 0.035 (< 0.05). Based on the test results, hypothesis 1 is accepted. Performance expectations have a positive and significant effect on user acceptance of the RME system. The results of this study are in line with [14], and [15]. which state that performance expectations affect user acceptance. The results of this study were also reinforced by researchers [12]. that this research shows that performance expectancy affects the acceptance and use of systems or technology.

H2: Effort expectancy have a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 0.419 (<1.64) and a p value of 0.338 (>0.05). Hypothesis 2 is rejected, effort expectations have no effect on user acceptance of the EMR system. The results of this study are in line with research [11] which states that effort expectations have no effect on user acceptance of the system. The results of this study are also reinforced by research conducted [25] which states that effort expectations do not have a significant effect on user acceptance of systems or technology.

H3: Social influence has a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 0.635 (<1.64) and a p value of 0.263 (>0.05). The t value and the p value show that hypothesis 3 is rejected so that social influence does not affect user acceptance of the RME system. This research is in contrast to research [19] in which social influence has a significant influence on the behavioral intention to use the system. However, the results of this study are in line with previous research [5] which states that social influence has no influence on someone in using a system.

H4: Facilitating conditions have a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 0.139 (<1.64) and a p value of 0.445 (>0.05). Based on the test findings, hypothesis 4 is rejected so that facilitating conditions do not affect user acceptance of the RME system. The results of this study are in line with research [2] which also found that facilitating conditions did not have a significant effect on behavioral interest in accepting the use of the system.

H4a: Gender moderates the effect of facilitating conditions on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.290 (<1.64) and p = 0.386 (> 0.05). The hypothesis is rejected so that gender has no effect in moderating conditions that facilitate user acceptance of the RME system.

H4b: Age moderates the effect of facilitating conditions on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.691 (<1.64) and p = 0.245 (> 0.05). The hypothesis is rejected so that age has no effect in moderating conditions that facilitate user acceptance of the RME system.

H5: Hedonistic motivation has a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 0.909 (<1.64) with a p value of 0.182 (>0.05). Hypothesis 5 is rejected. Hedonistic motivation has no effect on user acceptance

of the RME system. This research is in line with research conducted (Ismarmiaty and Etmy, 2018) which states that hedonistic motivation has no effect on system user acceptance. The results of the study which stated that hedonism motivation had no influence on user acceptance were also strengthened by research conducted by [3] who had the same research results.

H5a : Gender moderates the effect of hedonistic motivation on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.292 (<1.64) and p = 0.385 (> 0.05). The hypothesis is rejected so that gender has no effect in moderating hedonistic motivation on user acceptance of the RME system.

H5b: Age moderates the influence of hedonistic motivation on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.389 (<1.64) and p = 0.349 (> 0.05). The hypothesis is rejected so that age has no effect in moderating hedonistic motivation on user acceptance of the RME system.

H6: Price value has a positive and significant effect on user acceptance of Electronic Medical Records

The results of data processing obtained a t value of 0.304 (<1.64) and a p value of 0.381 (> 0.05). Based on the test findings, hypothesis 6 is rejected. The price value has no effect on user acceptance of the RME system. Research of (Ismarmiaty and Etmy, 2018) has the same results, price value has no effect on system user acceptance.

H6a: Gender moderates the effect of price value on acceptance of Electronic Medical Record users

The results of data processing obtained t = 0.713 (<1.64) and p = 0.238 (> 0.05). The hypothesis is rejected so that gender has no effect in moderating the value of prices on user acceptance of the RME system.

H6b: Age moderates the effect of price value on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.231 (<1.64) and p = 0.409 (> 0.05). The hypothesis is rejected so that age has no effect in moderating the price value on user acceptance of the RME system.

H7: Habits have a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 1.458 (<1.64) and a p value of 0.073 (>0.05). Hypothesis 7 is rejected, habit has no effect on user acceptance of the RME system. This results are in line with research [4] which suggests that habits have no effect on user acceptance of the system. The results of the study that habit has no effect on system user acceptance is also reinforced by research results [6] habit has no effect on system user acceptance.

H7a: Gender moderates the influence of habits on user acceptance of the Electronic Medical Record system

The results of data processing obtained t = 0.153 (<1.64) and p = 0.439 (> 0.05). The hypothesis is rejected so that gender has no effect in moderating habits on user acceptance of the RME system.

H7b: Age moderates the influence of habits on acceptance of users of the Electronic Medical Record system

The results of data processing obtained t = 0.407 (<1.64) and p = 0.342 (> 0.05). The hypothesis is rejected so that age has no effect in moderating habits on user acceptance of the RME system.

H8: Trust has a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 0.032 (<1.64) a p value of 0.487 (> 0.05). Hypothesis 8 is rejected, trust has no effect on user acceptance of the RME system. The results of this study are in line with research [11] which also obtained the result that trust does not have a significant effect on user acceptance of the system.

H9: Perceived risk has a positive and significant effect on user acceptance of the Electronic Medical Record system

The results of data processing obtained a t value of 1.365 (<1.64) with a p value of 0.086 (<0.05). Hypothesis 9 is rejected, meaning that risk perception has no effect on user acceptance of the RME system. This research is supported by research (Anggraeni et al, 2023) which explains that perceptions of risk have no effect on user acceptance of systems or technology. The results of this study are reinforced by research conducted [22] and [8] which state that risk perception has no effect on system user acceptance.

Test analysis on the influence of moderating variables

Gender and age moderation has no effect in this study. This was also found in other studies where there were several factors that could cause the moderating variable not to affect the independent variable on the dependent variable. In research conducted by [10] it was also found that gender had no effect in moderating the independent variable on the dependent variable UTAUT2. [13] stated that gender and age have no effect due to the evolution of individuals into modern society. This makes there is no difference or no difference between gender and age level in using technology from the user's perspective. In terms of gender [7] states that gender roles can no longer be used as a benchmark in predicting the use of new technology. In terms of age, the reason why age does not moderate the relationship between variables is because there is a balanced age grouping of respondents where a balanced age distribution will better describe the gender effect.

IV. Conclusions

In this study, based on the tests that have been carried out, interesting results are obtained that the factors that can influence a person to accept and use a system or technology are aspects of business expectations. Based on this research, it can be concluded that in making a new innovation in a system or technology, developers must pay attention to aspects of user performance efficiency in order to increase work productivity.

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