Xplore, 2013, *Vol. 2(1):e8(1-8)* © 2013 Departemen Statistika FMIPA IPB

Structural Equation Modeling In Determining Factors that Influence User Satisfaction of KRS Online IPB

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***Abstract*—Nowadays, Information and Communication Technology (ICT) cannot be separated in our lives, it becomes a basic necessity to us whether in daily life and even in organization or institution. Bogor Agricultural University (IPB) as one of the top five universities in Indonesia, uses one of ICT's form which is Infomation System (IS) Services for their organizational activities. One of the IS Services in IPB is KRS Online IPB. KRS Online IPB is a website that facilitates academic study plan registration for students and it is a very important website for students in IPB. In order to maintain the good quality and the satisfaction of KRS Online, Structural Equation Model is used to analyze the factors that influence satisfaction and the relationship between indicators and construct based on EGOVSAT model. The result shows that utility and flexibility are the factors that influence user satisfaction of KRS Online IPB significantly.**

***Keywords**: Information System Services, Structural Equation Modeling, User Satisfaction.*

I. INTRODUCTION

A. Background

The development of Information and Communication Technology (ICT) is increasing rapidly in the past 10 years and it also brings significant impact in our daily life. ICT may increase the efficiency and effectivity of institutional management. Information system (IS) is a combination among people, hardware, software, communication networks, data resources, policies and procedures that stores, retrieves, transforms, and disseminates information in organization. In theory, IS can be a paper based, but now ICT is taking part of the IS. IS is all the components and resources necessary to deliver information and functions to the organization while ICT is the hardware, software, networking and data management, so it becomes Computer-based Information System. Bogor Agricultural University (IPB) also uses Computer-based information system for organizational activities.

The Computer-based IS in Bogor Agricultural University is managed by Direktorat Komunikasi dan Sistem Informasi (DKSI) IPB. DKSI IPB provides IS services in Bogor Agricultural University. One of the IS services that has been very popular is Kartu Rencana Studi (KRS) Online. KRS Online is a website that allows students to fill their study plan by choosing the course that they planned to take in current semester. Students have to fill their study plan between the period time given by IPB, usually before (KRS A) and one week after (KRS B) the new semester begins. Because all of the students are required to fill their study plan by using KRS Online, KRS Online is considered as the most important website for all the students in IPB so it needs good maintenance in order to keep the students (users) satisfied. In order to maintain the best quality and performance of KRS Online in IPB, continuous evaluation is required. The evaluation of the services can be interpreted by measuring the user satisfaction of the services. ([1]) stated that they have defined the list of indicators to measure user satisfaction on e-government initiatives which is similar to KRS Online in IPB. The indicators are utility, reliability, efficiency, customization, and flexibility. These five variables is used as the latent variables in this study. User emotional composition of satisfaction is also defined by pleasantness, frustrated, and confidence. In order to know both the factors that influence user satisfaction and the relationship between them, Structural Equation Modeling is implemented. ([2]) stated that Structural Equation Modeling (SEM) is a family of statistical models that seek to explain the relationships among multiple variables. The researcher used SEM to explain the causal relationship between latent and measured variables and also between latent variables to see which factors influence user satisfaction.

B. Objectives of The Study

The objectives of the study are to see the factors that influence user satisfaction in KRS Online IPB and explain causal relationship between latent variables (utility, reliability, efficiency, customization, flexibility, and satisfaction) in KRS Online IPB structural model.

II. METHODOLOGY

The procedures of this study are:

1) Defining the variables (construct and indicators) based on theory of the previous study, i.e utility, reliability, efficiency, customization, flexibility, and satisfaction (Table I). Based on ([2]) Construct is a variable that cannot be observed directly so it will be measured by indicators or observed variables.
2) Developing a path diagram using the defined variables. There are two models which will be made in Structural

Table I
THE CONSTRUCT AND INDICATOR VARIABLES OF KRS ONLINE IPB USER SATISFACTION

Type of variables	Construct variables	Notation for construct	Indicator variables	Item name	Notation for indicator
Exogen	Utility	ξ_1	Ease of Use	EOU	x_1
			Ease of Navigation	EON	x_2
			Completeness	COM	x_3
			Usefullness	USE	x_4
Exogen	Reliability	ξ_2	Uptime	UPT	x_5
			Accuracy	ACC	x_6
Exogen	Efficiency	ξ_3	Ease of Access	EOA	x_7
			Presentation	PRE	x_6
Exogen	Customization	ξ_4	Customized Access	CAC	x_9
			Customized Content	CCN	x_{10}
Exogen	Flexibility	ξ_5	Flexibility Guidance	FGD	x_{11}
			Dynamic Content	DCN	x_{12}
Endogen	Satisfaction	η	Confidence	SAT1	y_1
			Pleasantness	SAT2	y_2
			Not Frustrated	SAT3	y_3
			Satisfaction	SAT4	y_4

Equaton Modeling, which are measurement model and structural model.

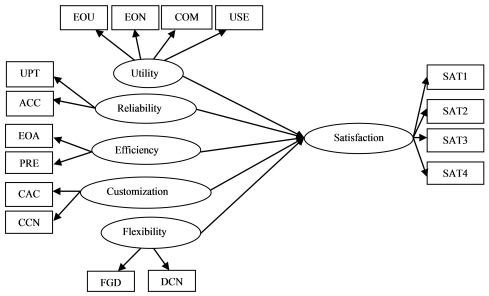

Figure 1. Structural Model of E-government Satisfaction ([1]) and ([3])

The model in Figure 1 is a combined model from ([1]) and ([3]). Satisfaction is the dependent factor in this study while utility, reliability, Efficiency, customization, and flexibility are performance construct that considered to be the factor that influences satisfaction positively.

In the measurement model, Confirmatory Factor Analysis is used, ([4]) stated that the main goal of CFA is to confirm or test the measurement model which is formulated based on a theory. Path analysis is used in the structural model, path analysis will show the strength of path or relationship between construct ([2]). The overall structural model used in this study can be seen in Figure 1. The Structural Equation for Structural Model ([5]):

$$\eta = \gamma_1\xi_1 + \gamma_1\xi_2 + \gamma_3\xi_3 + \gamma_4\xi_4 \quad (1)$$

Assumptions: E(η) = 0, E(ξ) = 0, E(ζ) = 0; ζ uncorrelated with ξ and (I-B) non singular. The definition of notation can be seen in Table II.

Table II
NOTATION FOR STRUCTURAL MODEL

Symbol	Name	dimension	Definition
η	eta	m x 1	Latent endogenous variables
ξ	xi	n x 1	Latent endogenous variables
ζ	zeta	m x 1	Latent errors in equations
B	beta	m x m	Coefficient matrix for latent endogenous variables
Γ	gamma	m x n	Coefficient matrix for latent endogenous variables
ϕ	phi	n x n	E($\xi\xi'$)(covariance matrix of ξ)
ψ	psi	m x m	E($\zeta\zeta'$)(covariance matrix of ζ)

And the structural equation for measurement model:

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \\ x_9 \\ x_{10} \\ x_{11} \\ x_{12} \end{bmatrix} = \begin{bmatrix} \lambda_{11} & 0 & 0 & 0 & 0 \\ \lambda_{21} & 0 & 0 & 0 & 0 \\ \lambda_{31} & 0 & 0 & 0 & 0 \\ \lambda_{41} & 0 & 0 & 0 & 0 \\ 0 & \lambda_{12} & 0 & 0 & 0 \\ 0 & \lambda_{22} & 0 & 0 & 0 \\ 0 & 0 & \lambda_{13} & 0 & 0 \\ 0 & 0 & \lambda_{23} & 0 & 0 \\ 0 & 0 & 0 & \lambda_{14} & 0 \\ 0 & 0 & 0 & \lambda_{24} & 0 \\ 0 & 0 & 0 & 0 & \lambda_{15} \\ 0 & 0 & 0 & 0 & \lambda_{21} \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \\ \xi_4 \\ \xi_5 \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \\ \delta_{10} \\ \delta_{11} \\ \delta_{12} \end{bmatrix}$$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} \lambda_{16} \\ \lambda_{26} \\ \lambda_{36} \\ \lambda_{46} \end{bmatrix} + \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \\ \epsilon_4 \end{bmatrix}$$

Assumptions: E(η) = 0, E(ξ) = 0, E(ϵ) = 0, and E(δ) = 0; ϵ uncorrelated with η, ξ, and ϵ; δ uncorrelated with η, ξ, and ϵ. The definition of notation can be seen in Table III.

3) Model identification: Based on t-Rule, calculate the df, the calculation of degree of freedom (df):

Table III
NOTATION FOR MEASUREMENT MODEL

Symbol	Name	dimension	Definition
y	-	p x 1	Observed indicators of η
x	-	q x 1	Observed indicators of ξ
ϵ	epsilon	p x 1	Measurement errors for y
δ	delta	q x 1	Measurement errors for x
Λ_y	lambda y	p x m	Coefficient relating y to η
Λ_x	lambda x	q x n	Coefficient relating x to ξ
θ_ϵ	theta-epsilon	p x p	E($\epsilon\epsilon'$)(covariance matrix of ϵ)
θ_δ	theta-delta	q x q	E($\delta\delta'$)(covariance matrix of δ)

$$\mathbf{df} = \frac{\mathbf{1}}{\mathbf{2}}(\mathbf{p}+\mathbf{q})(\mathbf{p}+\mathbf{q}+\mathbf{1}) - \mathbf{t} \tag{2}$$

Where:
p = directly exogenous observed
q = directly endogenous observed
t = number of distinct parameters to be estimated
After the df has been calculated, model can be identified as follow:

- If the df = 0 then it is a just-identified model which means model can estimate all of the model parameter and the value is likely the same as sample data.
- If the $df > 0$ then it is an over-identified model which means the number of all the parameters in the model fewer than the number of estimated parameters.
- If the $df > 0$ then it is an under-identified model which means parameter cannot be estimated because the number of all the parameters in the model less than the number of estimated parameters.

4) Defining the minimum sample size, the model in this study have 6 constructs which some of the constructs are underidentified constructs (construct with fewer than three indicators), so based on ([2]) the minimum sample size is 300, but ([6]) stated that it is alright just to have minimum of 200 data as it already represent the population.
5) Constructing the type of data to be analyzed (select matrix input and the estimation method). The correlation matrix input will be used in this study. Pearson correlation coefficient, polyserial and polychoric correlation are being used to calculate the correlation matrix. Pearson correlation coefficient for correlation between interval variables, polyserial correlation for interval and ordinal variables, and polichoric correlation for correlation between ordinal variables. The Calculation of the sample correlation coefficient ([7]) or pearson correlation coefficient:

$$\mathbf{r} = \frac{\sum(\mathbf{Xi}-\overline{\mathbf{X}})(\mathbf{Yi}-\overline{(\mathbf{Y})})}{\sqrt{\sum(\mathbf{Xi}-\overline{\mathbf{X}})^{\mathbf{2}}\sum(\mathbf{Yi}-\overline{\mathbf{Y}})^{\mathbf{2}}}} \tag{3}$$

whereas,
r : Pearson correlation coefficient
Xi : i^{th} data observed of x variable
Yi : i^{th} data observed of y variable
$\overline{X}$: Sum of observed data x per sample size
$\overline{Y}$: Sum of observed data y per sample size
In order to know that the estimation is close as possible, we need a minimized function, the estimation method will be Unweighted Least Square (ULS) fitting function ([5]):

$$F_{ULS} = (\frac{1}{2})tr\left|(S-\sum(\theta))^2\right| \tag{4}$$

S is the sample covariance matrix and $\sum(\theta)$ is the implied covariance matrix. As in OLS the sum of square is minimized, F_{ULS} minimize each element of the residual matrix sum of square and this leads to a consistent estimator of θ.

6) Making questionnaire based on the defined variables. In this research, the content of the questionnaire is adopted from a research about e-government satisfaction by ([3]). There are two types of questionnaire, online and offline questionnaire. The online questionnaire is made by using google drive questionnaire form and sent via email or social media straight to the respondent. The offline questionnaire is just using usual paper and the questionnaire paper was sent straight to the respondent.
7) Choosing the respondents using simple random sampling. Faculty of Mathemathics and Natural Sciences IPB which includes eight departments i.e Statistics, Geophysics and Meteorology, Biology, Chemistry, Mathematics, Computer Science, Physics, and Biochemistry is the biggest stakeholder in IPB since it has most students than any other faculties in IPB, so the researcher decides to conduct the research in Faculty of Mathematics and Natural Science IPB. The population in this research is KRS Online Users (students) in Faculty of Mathematics and Natural Sciences IPB in the year of 2009-2011, only students enroll in the year of 2009-2011 in IPB who have been using KRS Online when this research is conducted.
8) Distributing the questionnaire to the respondents.
9) Collecting and exploring the data using descriptive statistics.
10) After sufficient data is collected, then estimate the parameter model.

11) Assessing measurement model validity. If the measurement model is valid, then test the structural model. If the measurement model is not valid then revise the measures and design a new study. The validity of measurement model depends on goodness of fit of the model and constructs validity. Goodness of fit is used to indicate how similar covariance matrix of the sample data and covariance matrix from the model estimation are. The goodness of fit used in this study are:

- Root Mean Square Error (RMSEA)

$$RMSEA = \frac{\overline{F}}{df} \tag{5}$$

F is the estimated value of fitting function and df is degree of freedom and n is sample size. RMSEA's value 0.08 is considered a good fit for model. The smaller RMSEA value indicates a better fit model. ([2]).

- Root Mean Residual (RMR)

$$RMR = 2\sum_{i=1}^{q}\sum_{j=1}^{i}\frac{(S_{ij} - \widehat{\sigma_{ij}})}{q(q+1)}^{2^{1/2}} \tag{6}$$

q is the sum of total indicators variables. RMR values ≤ 0.08 means that the model is a good fit model. The smaller RMR values indicates a better fit model ([2]).

- Goodness of Fit Index (GIF)

$$GFI_{ULS} = 1 - \frac{tr\left|(S - \widehat{\sum})\right|^2}{tr(S^2)} \tag{7}$$

GFI's value greater than 0.90 are already considered as a good fit model and higher values of GFI means better fit model ([2]).

- Adjusted Goodness of Fit Index (AGFI)

$$AGFI_{ULS} = 1 - \left|\frac{q(q+1)}{2df}\right|[1 - GFI_{ULS}] \tag{8}$$

AGFI's value greater than 0.90 means that the model fit with data ([4]).

Validity of the indicator defined by t-test and also the standardized loading factor 0.50 means that the indicator individually valid and reliable to measure the construct. The t-test is testing the hypothesis H0: $\lambda_{ij} = 0$ vs H1: $\lambda_{ij} \neq 0$, if the p-value less than 0.05 then it means reject H0 at the 5 % level. The reliability of construct defined by ([4]):

- Construct Reliability (CR):

$$\mathbf{CR_i} = \frac{(\sum_{\mathbf{i=1}}^{\mathbf{k}} \lambda_\mathbf{i})^\mathbf{2}}{(\sum_{\mathbf{i=1}}^{\mathbf{k}} \lambda_\mathbf{i})^\mathbf{2} + \sum_{\mathbf{i=1}}^{\mathbf{k}} \mathbf{e_i}} \tag{9}$$

- Variance Extracted (VE):

$$\mathbf{VE_i} = \frac{(\sum_{\mathbf{i=1}}^{\mathbf{k}} \lambda_\mathbf{i}^\mathbf{2})}{\mathbf{k}} \tag{10}$$

Whereas: λ_i : i^{th} indicator's standardized loading factor
e_i : i^{th} indicator's measurement error
k : total indicator of latent

CR's value greater than 0.70 and or variance extracted values greater than 0.50 indicates that the indicator simultaneously reliable to measure the construct (latent variables) ([2]) in ([4]).

12) Specifying the structural model (convert the measurement model to structural model).
13) Assessing structural model validity. If the structural model is valid then draw substantive conclusions and recommendations, if the structural model is not valid then revised the model.

III. RESULTS

A. Exploration of the Data

There are 1914 students who enroll in Faculty of Mathematics and Natural Science in year of 2009-2011. By implementing simple random sampling, 400 students has been chosen as the respondent, but only 248 students give a response to fill in the questionnaire.

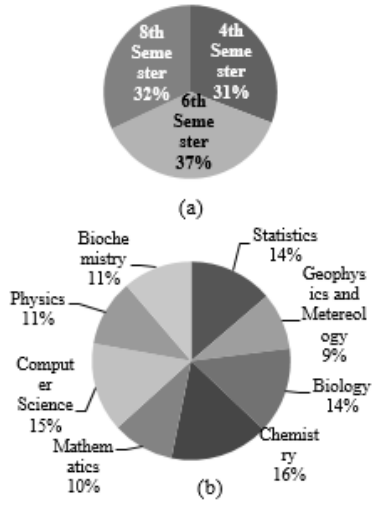

Figure 2. Percentage of respondent based on Semester (a) and Department (b)

Figure 2.a. explain that the students in the 6th semester has the highest percentage (37%) while the rests are almost similar, it means the questionnaires are quite fair distributed. Figure 2.b. shows that Chemistry Department has the highest percentage of respondents (16%) from the total sample and it also shows just a slight difference between the eight

departments, so based on departments, the questionnaires are also quite fair distributed. Most of the respondents is female (62%).

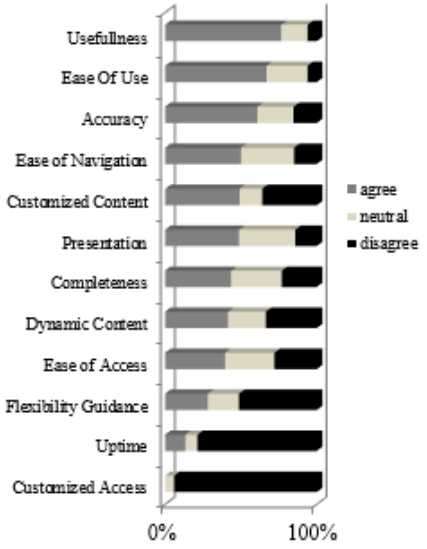

Figure 3. Percentage of students who agree, neutral, disagree in KRS Online performance satisfaction of each indicators

Figure 3 indicates the student's satisfaction; i.e students who are agree, neutral and disagree in every indicators. It shows that the best indicators that student mostly score for a good satisfaction is Usefullness with 76.6%, it means that the 76.6% of total sample satisfied with Usefullness in KRS Online and after that we have ease of use (66.9%), accuracy (60.9%), ease of navigation (50%) respectively as the 2^{nd} to 4^{th} best indicators and the worst indicators is Customized Access indicators that only have 0% on its score. The worst satisfaction is Customized Access (94%) and it means that 94% of the sample are not satisfied with Customized Access in KRS Online. Uptime (78.6%), Flexibility Guidance (51.2%), and Customized Content (35.9%) are respectively taken place as 2nd to 4th position of the worst satisfaction. There are 9 variables from Ease of Navigation to Customized Access which the agree rate is less than 50%, it means less than 50% student in the sample is not satisfied with the performance in those 9 variables. Students's satisfaction of all the question variables in the questionnaire can be seen that less than 50% of student are agree with the website is not complex, has a good feature operational, online transaction, the website and its feature is easily accessible in KRS period, visually attractive, custom notification, customized content, flexibility guidance, dynamic content. It means there are more than 50% students in the sample think that the website is lacking in those variables.

Figure 4 shows that most of the students agree to confidence in using KRS Online (72.2%), it means that 72.2%

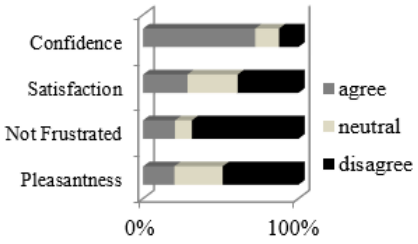

Figure 4. Percentage of students who agree, neutral and disagree in each indicators of emotional satisfaction

of total sample confidence using the website because they feel save when their KRS Online are already filled. It also shows that 68.5% of total sample frustrated in using the KRS Online, this probably because of the difficult access to KRS Online in the period of KRS Online itself. Most of the students disagree in pleasantness (48.8%) and it means that 48.8% of the sample having an unpleasant experience while using KRS Online. Less than 30% students in the sample agree with satisfaction, not frustrated, and pleasantness, it means more than 70% student do not feel satisfy with the KRS Online system.

There are 129 students suggest that the KRS Online have to be easy for log in and no loading for a long time, they suggest that way because in fact, there are a lot of students who cannot log in after waiting for a long time, and this problem leads to the unfilled KRS Online, when user cannot log in to the website, it means that there is no transaction happen so they cannot filled the KRS Online. The cause of this problem is overloading and it usually happen in the first day on KRS Online because most of the users have to choose the supporting courses (SC) for completing their credits to graduate.

SC can be freely taken by any students and has a limited quota so the students have to choose and take the SC as fast as possible before the quota is full, some students who are late to fill the KRS Online has to give up and ended picks a courses that they do not want because they have no choice. So the "cannot log in" problem and "long time loading" problem basically a critical problem needs to be solved in order to help the students fill their KRS Online. The students also suggest some feature that need to be included in the website such as course description, help centre, etc.

B. Structural Equation Modeling in KRS Online Satisfaction

Researcher chooses the correlation matrix as the matrix input for the structural equation model. The parameter is estimated by using Unweighted Least Square (ULS). Based on Bollen (1989), ULS is one of estimation method that can produce a consistent estimator and it can be used without concerning particular distribution assumption that the data have. The estimated parameters of the measurement model

Table IV
KRS ONLINE SYSTEM SUGGESTIONS

No	System Suggestions	Total (students)
1	Easy login and speed up (no loading for a long time)	129
2	More visually attractive	20
3	No overloading	12
4	Easily accessible	12
5	Scheduled KRS Online per faculty/department	9
6‘	Uptodate information	8
7	No more problem	7
8	Longer time in filling KRS	3
9	Course not to be shown if the quota is full	2
10	Scheduled KRS Online per enrollment year/semester	2
11	No overlap schedule	1
12	Better service	1
13	No payment online	1
14	KRS Offline	1
15	Maximum 15 minutes log in time, after that cannot login for an hour	1
16	Email integrated	1

can be seen in Table V.

In the measurement model (Confirmatory Factor Analysis) before modification, there are some indicators with standardized loading factor ≤ 0.5 such as Uptime (UPT), Customized Content (CCN), Confidence (SAT1) and Frustrated (SAT3), it means that these indicators are not valid to measure the construct, so Uptime, Customized Content, Confidence and Frustrated are removed from the model in order to make a better fit model, all of the standardized loading factors can be seen in Table IV, Researcher also found out that after the error of Ease of Use (EOU) and Ease of Navigation (EON) are correlated, so does the correlation between error of pleasantness (SAT2) and satisfaction (SAT4), the model become a better fit, so the model became a better fit model, so there are within-construct error covariance in utility and satisfaction construct, it means ease of use and ease of navigation can be one indicator or a composite indicator for Utility construct, pleasantness satisfaction can also be one of the indicator or composite indicator for Satisfaction construct. All of the indicators are valid based on the t-test which the t-values can be seen in Table V, valid indicator means that the indicators can measure the construct.

Table VI shows that after the modification, the root mean square error (RMSEA) and root mean square residual (RMR) decreased and the goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) increase, it indicates that the estimated covariance matrix after modification model is closer to the observed covariance matrix than before modification model. The value of RMSEA, RMR, GFI and AGFI is in the criteria of a good fit model, which means the estimated covariance matrix is close fit to the observed covariance matrix.

In Figure 5, after measurement model (CFA), Researcher put in the relationship between construct based on the theory to make a structural model. It can be seen in Table VII that the t-test of estimated coefficients shows that the estimated coefficients of utility to satisfaction, reliability to satisfaction, efficiency to satisfaction, and customization to satisfaction are not significant, it means those relationships

Table V
STANDARDIZED LOADING FACTOR AND T-VALUES FOR INDICATORS BEFORE AND AFTER MODIFICATION (MEASUREMENT MODEL)

Indicators	Standarized loading factor before modification	t-value	Standarized loading factors after modification	t-value
Ease of use	0.51	12.65^b	0.43	9.79^b
Ease of Navigation	0.64	15.40^b	0.56	12.61^b
Completeness	0.54	14.54^b	0.55	13.46^b
Usefuleness	0.65	16.06^b	0.66	14.09^b
Uptime	0.48^a	7.19^b	-	-
Accuracy	0.51	7.44^b	1	24.18^b
Ease of Access	0.57	9.46^b	0.64	12.09^b
Presentation	0.54	8.86^b	0.68	11.84^b
Costumized Access	0.58	8.24^b	1	23.86^b
Customized Content	0.47^a	7.62^b	-	-
Flexibility Guidance	0.58	11.02^b	0.59	7.82^b
Dynamic Content	0.68	10.39^b	0.46	7.75^b
Confidence	0.49^a	13.38^b	-	-
Pleasantness	0.70	15.91^b	0.96	17.79^b
Not Frustated	0.14^a	4.08^b	-	-
Satisfaction	0.75	16.16^b	0.85	14.02^b

Table VI
GOODNESS-OF-FIT MEASUREMENT MODEL BEFORE AND AFTER MODIFICATION

Goodness-of-fit	Good fit criteria based on Hair et al. (2010)	Values before modification	Values after modification
RMSEA	< 0.080	0.112	0.049*
RMR	≤ 0.080	0.076*	0.059*
GFI	≥ 0.900	0.960*	0.980*
AGFI	≥ 0.900	0.930*	0.950*

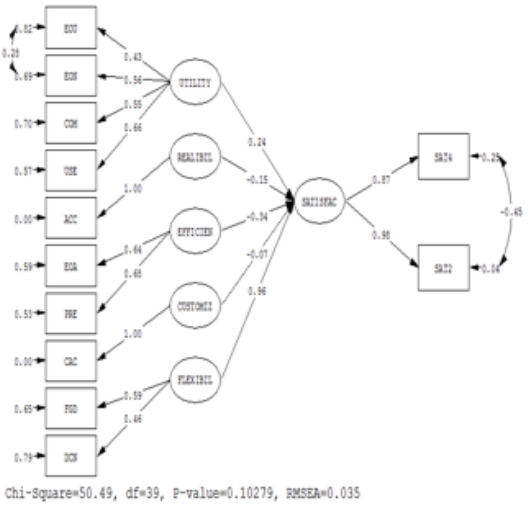

Figure 5. Structural model of KRS Online IPB

Table VII
ESTIMATED PATH COEFFICIENT OF CONSTRUCT RELATIONSHIP

Relationship between exogen to endogen contruct	Estimated path coefficient	t-value	Conclution
Flexibility to Satisfaction	0.96	1.96	Significant
Utility to Satisfaction	0.24	0.28	Not Significant
Realibility to Satisfaction	-0.15	-0.86	Not Significant
Efficiency to Satisfaction	-0.34	-0.30	Not Significant
Customization to Satisfaction	-0.07	-0.36	Not Significant

are not valid at the 5% level and for reliability, efficiency, and customization, the coefficient is negative even though the coefficient should be positive according to the ideal model. So the valid relationship in the structural model is only flexibility to satisfaction. Flexibility includes flexibility guidance and dynamic content. Flexibility guidance refers to flexibility of the administrators to be contacted by the students when there are problems or questions regarding the KRS Online website and dynamic content refers to the flexibility of information, whether the information is in a real time update or rarely update in the KRS Online website, so to increase the satisfaction of KRS Online greatly, the performance of flexibility guidance and dynamic content has to be increased. All of the indicators that are used in the model are valid based on the t-test.

The negative relationship can happen because in the case of KRS Online, most of the user score the reliability quite high, but when they score the satisfaction is not as high as the reliability score, as for the case of customization, most of the users score customization really low and they score the satisfaction so-so (not too high and not too low), not as low as the customization and it is the same case for efficiency. Based on the phenomenon happen in KRS Online, researcher assumed that there is another indicator that needs to be added in efficiency construct which is speed of the system, because most of the student complained that KRS Online is low for its system speed that caused by the lack of server and overflowing user who access KRS Online at the same time, so most of the student is not satisfied with the system. RMSEA, RMR, GFI, and AGFI shows a good fit value for the model as it can be seen in Table VIII.

Table VIII
GOODNESS-OF-FIT STRUCTURAL MODEL OF KRS ONLINE IPB

Goodness-of-fit (GOF)	Criteria based on Hair et al. (2010)	GOF Values	Conclution
RMSEA	< 0.080	0.035	Good fit
RMR	≤ 0.080	0.059	Good fit
GFI	≥ 0.900	0.980	Good fit
AGFI	≥ 0.900	0.950	Good fit

Table 9 shows that utility's, efficiency's, and flexibility's construct reliability values $\leq$ 0.70 it means that those construct are not reliable. The indicator not simultaneously reliable to measure the construct for utility, efficiency, and flexibility construct. The variance extracted value of utility, efficiency, and customization $\leq$ 0.50. It means that the indicators in utility's, efficiency's, and flexibility's construct are also not individually reliable to measure the construct itself, and vice versa for reliability, customization, and satisfaction.

From Table 10 It is shown that satisfaction is influenced by flexibility positively as much as 0.9216 and flexibility indirectly influenced satisfaction because it relationship with realibility, efficiency, customization, and utility as much as 0.219 so the total effect of flexibility influenced satisfaction is 0.7026 which is the highest total effect of the model. Utility influenced satisfaction as much as 0.0576 and and indirectly utility influenced satisfaction because it relationship with realibility, efficiency, customization, and flexibility as much as 0.0212, so total effect of utility influenced satisfaction is 0.0788.

Efficiency influenced satisfaction negatively as much as 0.1156 and effected by it relationship with utility, reliability, customization, and flexibility, it also influenced satisfaction indirectly as much as -0.2668 so the total effect of reliability influenced satisfaction is -0.1512. Realibility and customization influenced satisfaction negatively respectively

Table IX
VARIANCE EXTRACTED AND CONSTRUCT RELIABILITY VALUES FOR EACH CONSTRUCT IN STRUCTURAL MODEL AFTER MODIFICATION

Contruct	Variance extracted	Conclusion	Contruct reliability	Conclusion
Reability	1.00	reliable	1.00	reliable
Customization	1.00	reliable	1.00	reliable
Satisfaction	0.86	reliable	0.92	reliable
Utility	0.31	not reliable	0.64	not reliable
Efficiency	0.44	not reliable	0.61	not reliable
Flexibility	0.28	not reliable	0.43	not reliable

Table X
DIRECT EFFECT AND INDIRECT EFFECT TO SATISFACTION

Relationship between construct	Direct effect ($x10^{-2}$	Indirect effect ($x10^{-2}$)	Total effect ($x10^{-2}$)
Flexibility	92.16	-21.90	70.26
Utility	5.76	2.12	7.88
Efficiency	11.56	-26.68	-15.12
Reliability	2.25	-6.18	-3.93
Customization	0.44	-2.44	-2.00

as much as 0.0225 and 0.044 also because it relationship with each other construct, reliability and customization indirectly influenced satisfaction as much as -0.0618 and -0.0393 respectively, so the total effect of reliability and customization influenced satisfaction are -0.0393 and -0.02.

IV. CONCLUSION

After the structural model is modified flexibility are proved to be the factors that influence the satisfaction significantly based on Faculty of Mathematics and Natural Science IPB's user. Only the relationship between flexibility to satisfaction significant at the 5% level and the others (utility, reliability, efficiency, and customization to satisfaction) are not significant. Flexibility and utility influence satisfaction positively and has total effect of 0.7026 and 0.0788 respectively. Efficiency, reliability, and customization influence satisfaction negatively and has a total effect -0.1512, -0.0393, and -0.0200 respectively, it has negative influences to satisfaction while it supposed to be a positive influences for satisfaction based on the ideal model. This can happen because in the case of KRS Online, many users do not have an ideal answer, when they score reliability high, they possibly score the satisfaction not as high as the reliability and vice versa for efficiency and customization. Researcher also suggests that speed of the system should be added in the model. KRS Online needs to improve most of their performance, especially their flexibility which includes flexibility guidance and dynamic content to improve the user satisfaction in KRS Online IPB.

REFERENCES

[1] Horan TA, Abhichandani T, *Evaluating User Satisfaction in an E-Government Initiative: Results of Structural Equation Modeling and Focus Group Discussing*, Virginia (US): Maximilian Press Publishing Company.

[2] Hair JF, Black WC, Babin BJ, Anderson RE, *Multivariate Data Analysis* 7^{th} *Edition*, New Jersey (US): Prentice Hall.

[3] Abichandani T, Horan TA, Rayalu R, Toward a Robust Measure of E-Government Service Satisfaction in Transportation. Inside, Edited by Remeyi D Ottawa (Canada): *International Conference on e-Government*, 2010.

[4] Kusnendi, *Model - Model Persamaan Struktural Satu dan Multigroup Sampel dengan Lisrel*, Bandung (ID): ALFA-BETA, cv

[5] Bollen KA, *Structural Equations with Latent Variables*, Canada (US): John Wiley & Sons, Inc.

[6] Santoso S, *Structural Equation Modeling*, Jakarta (ID): PT Elex Media Komputindo.

[7] Huntsberger DV, Billingsley P, *Elements of Statistical Inference Sixth Edition.*, Massachusetts (US): Allyn and Bacon, Inc.