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Pengembangan Instrumen untuk Mengukur Penerimaan Mahasiswa terhadap Sistem Informasi Akademik (SIAKAD) di UNS

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Abstrak

Penelitian ini bertujuan untuk mengevaluasi validitas dan reliabilitas model pengukuran serta menguji hubungan antar konstruk dalam model penerimaan Sistem Informasi Akademik (SIAKAD) dengan pendekatan Structural Equation Modeling (SEM). Instrumen penelitian mencakup konstruk Perfomance Expentancy (PE), Effort Expenctancy (EE), Sosial Influence (SI), Facilitating Conditions (FC), Behavioral Intention (BI), dan Use Behavior (UB). Hasil analisis menunjukkan bahwa sebagian besar indikator memenuhi syarat validitas konvergen (loading faktor ≥ 0,5), meskipun terdapat beberapa indikator lemah. Dari segi reliabilitas, hanya konstruk Use Behavior (UB) yang memiliki reliabilitas tinggi (CR = 0,796), sementara konstruk lain berada dalam kategori cukup hingga kurang. Evaluasi model struktural menunjukkan bahwa Perfomance Expentancy (PE), Social Inflence (SI), dan Faciliating Conditions (FC) signifikan terhadap Behavioral Intention (BI) maupun Use Behavior (UB), sedangkan Effort Expenctancy (EE) tidak berpengaruh signifikan. Behavioral Intention (BI) terbukti sebagai variabel mediasi yang kuat terhadap Use Behavior (UB) ($\beta = 0,832$; $p < 0,001$). Analisis goodness of fit mengonfirmasi bahwa model memiliki kesesuaian yang sangat baik dengan data empiris (CFI = 0,983; RMSEA = 0,030). Temuan ini menekankan pentingnya kepercayaan, dukungan sosial, dan fasilitas dalam meningkatkan pemanfaatan sistem informasi, serta perlunya peningkatan kualitas instrumen untuk pengukuran yang lebih akurat di masa mendatang.

Kata kunci: Structural Equation Modeling (SEM); Sistem Informasi Akademik (SIAKAD); Behavioral Intention; Validitas Konvergen; Use Behavior.

Developing an Instrument to Measure Student Acceptance of the Academic Information System (SIAKAD) at UNS

Abstract

This study aims to evaluate the validity and reliability of the measurement model and to examine the relationships among constructs in the acceptance model of the Academic Information System (SIAKAD) using Structural Equation Modeling (SEM). The research instrument includes the constructs of Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Behavioral Intention (BI), and Use Behavior (UB). Data analysis revealed that most indicators met the convergent validity requirement (factor loading ≥ 0.5), although several weak indicators were identified. In terms of reliability, only the Use Behavior construct showed high internal consistency (CR = 0.796), while the others ranged from moderate to low. Structural model evaluation indicated that PE, SI, and FC had significant effects on BI and UB, whereas EE was not statistically significant. Furthermore, BI demonstrated a strong mediating effect on UB (β = 0.832; p < 0.001). The goodness-of-fit indices confirmed an excellent model fit to the empirical data (CFI = 0.983; RMSEA = 0.030). These findings highlight the importance of trust, social support, and supporting facilities in encouraging the use of SIAKAD among students. The study also underlines the need for improving the quality of measurement instruments to enhance the accuracy of future assessments.

Keywords: Structural Equation Modeling (SEM); Academic Information System (SIAKAD); Behavioral Intention; Convergent Validity; Use Behavior

INTRODUCTION

The development of the digital world is synonymous with convenience and practicality. Universities are required to continue to adapt to advances in information technology in order to improve efficiency (Alenezi et al., 2023) and the quality of education management (Alenezi, 2023). One of the innovations that has been widely implemented in higher education is the digitization of the education system (Akour & Alenezi, 2022). In Indonesia itself, it is better known as the Academic Information System (Fitria, 2023). Academic Information System (SIAKAD) is an application that integrates all the main processes of education into an information system supported by information technology. This application was initiated by the Government through the Ministry of National Education in collaboration with service provider institutions as a way to improve the quality of education (Hikmawati et al., 2023). The web-based application Academic Information System (SIAKAD) is intended to manage academic data and other related data so that all academic activities can be managed and utilized for decision making, reporting, and university management (Mewengkang et al., 2021). The use of SIAKAD is not only beneficial for the administration and lecturers, but also provides convenience for students in accessing academic information, such as lecture status, grades, and schedules in real-time. In addition, SIAKAD can support a more precise decision-making process through centralized and integrated data (Ismail. Muhammad Fahreza et al., 2022). In addition to being an information resource on campus, SIAKAD can also be used as a means of communication media between lecturers and students, students and students, and

lecturers and campus officials.

The application of SIAKAD as one of the education management systems is becoming increasingly relevant along with the increasing complexity of the academic learning process (Luthfatul Qibtiyah & Desta Fitriyani, 2023) and the need for accurate and efficient data management (Setyowati et al., 2024). Several universities in Indonesia have adapted the use of SIAKAD. The following is data on universities that use the Academic Information System (SIAKAD).

Table 1. Data on the Use of SIAKAD in Several Indonesian Universities

No	University Name	Digital Academic System	Function
1	Gajah Mada University (UGM)	SIMASTER (Integrated Academic Information System)	Registration services, KRS (Study Plan Card) grade management, graduate student services, academic administration
2	University of Indonesia (UI)	SIAK NG (Next Generation Academic Information System)	Management of student academic data, course data, evaluation of study results, lecture attendance, and grade management.
3	Sepuluh Nopember Institute of Technology (ITS)	SIAKAD ITS	Management of academic services, KRS programming, curriculum management, attendance, evaluation, grade processing
4	Universitas Airlangga (UNAIR)	Cyber Campus	KRS service, KHS (Study Result Card) printing, exam registration, and evaluation of study results
5	Brawijaya University (UB)	SIAM (Student Academic Information System)	Student registration, KRS, KHS printing, exam scheduling, and evaluation of study results

Source: https://pddikti.kemdikbud.go.id/

In order to improve the quality of educational administration information services to both lecturers and students, as one of the Universities, Sebelas Maret University (UNS) Surakarta made an online Academic Information System (SIAKAD) which can be accessed via http://siakad.uns.ac.id/ (Sukatiman et al., 2019). SIAKAD has been introduced since 2008 with the aim of answering the demands of access to information in the digital world. Various conveniences can be obtained through this system. Through the integrated Learning Management System (LMS), students can take courses, register online, print study plan cards (KRS), print study result cards (KHS), and access lecture materials provided by lecturers. In addition, each study program has the ability to control and monitor student activities, registration status, grades, and attendance.

The existence of an information system can be said to be successful if the system is able to provide benefits to the organization (Pusparini & Sani, 2021). The development of information and communication technology has a 'revolutionary' impact on the quality of education through diversification of content and teaching methods (Fook & Sidhu, 2009). At least an evaluation must be carried out to find out that the system is functioning optimally and contributing to the organization. User (student) satisfaction with the use of information systems is one indicator of success. Lack of structure, technical difficulties, and financial barriers are some further instruments to improve activities and features (Rahiem, 2021)., and financial barriers are some further instruments to improve activities and features (Rahiem, 2021). The better the information system, the higher the level of user satisfaction. Research at UTP (Universitas Tunas Pembangunan) Surakarta shows the results that if student satisfaction increases, the University will benefit. Conversely, if there is no satisfaction, it will hinder the ability of students to study or study at the University (Anam et al., 2023). Other research on SIAKAD shows that a comprehensive system must be successful in its implementation and accepted by its users (Safkaur, 2024).

Despite the widespread implementation of SIAKAD across Indonesian universities, significant gaps remain in understanding its acceptance among social science students, particularly in the Sociology and Anthropology Education program at Sebelas Maret University (UNS). Preliminary observations identify several discipline-specific challenges, including technical difficulties with collaborative features essential for project-based learning, interface limitations that hinder qualitative research processes, and inadequate mobile accessibility during fieldwork activities. These concerns are particularly pressing given established findings (Anam et al., 2023; Rahiem, 2021) demonstrating how low technology adoption can systematically undermine educational effectiveness. The current study addresses these issues through three critical dimensions: practically, by generating targeted recommendations for SIAKAD optimization in social science contexts; theoretically, by examining the applicability of the UTAUT model in Indonesia's distinctive higher education environment; and strategically, by contributing to national digital education initiatives. Specifically, the research employs Structural Equation Modeling to analyze key acceptance factors - including performance expectancy, effort expectancy, social influence, and facilitating conditions - while developing empirically-grounded

proposals for system enhancement that address the unique needs of social science education.

METHODS

The selection of Sebelas Maret University (UNS) as the research locus was based on three primary considerations. First, as one of Indonesia's Legal Entity State Universities (PTN-BH), UNS has demonstrated strong commitment to digital transformation through its SIAKAD implementation since 2008 (Sukatiman et al., 2019), providing a mature system context for examination. Second, the Sociology and Anthropology Education program at UNS represents a leading social science program with unique learning characteristics involving intensive fieldwork and team collaboration, offering distinct perspectives compared to similar studies in STEM programs (Anam et al., 2023). Third, preliminary findings revealed a technology adoption gap between social sciences and exact sciences at UNS), which has not been identified in other universities based on literature review.

This study employed a quantitative approach with purposive sampling to evaluate SIAKAD acceptance among students in the Sociology and Anthropology Education program at UNS. The program selection was based on several considerations: the unique characteristics of social sciences requiring collaborative features and field access - aspects not yet optimized in current SIAKAD design; findings of technology adoption disparities where social science students face greater technical challenges than STEM students; and the strategic impact as future educators who will transfer digital literacy to their teaching schools. A total of 206 active students who had used SIAKAD for academic activities were selected as respondents.

Data were collected through questionnaires based on the UTAUT model (Dwivedi et al., 2019), measuring Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), Facilitating Conditions (FC), Behavioral Intention (BI), and Use Behavior (UB). The research instruments underwent validity and reliability testing prior to distribution, ensuring measurement accuracy for the structural equation modeling analysis. This methodological approach allows for comprehensive evaluation of both the technological and pedagogical aspects of SIAKAD implementation in social science education contexts.

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Data were collected through the distribution of closed questionnaires in the form of a five-point Likert scale, which had been developed according to the indicators in each construct. The questionnaire was tested first to ensure the validity and reliability of the instrument (Sugiyono, 2017; Hair et al., 2010).

Data analysis in this study was carried out in two main stages, namely measurement model evaluation and structural model evaluation. This stage is in accordance with the covariance-based Structural Equation Modeling (SEM) approach which aims to test the validity and reliability of constructs and the relationship between latent variables. The stages carried out include:

1. Measurement Model Evaluation

Convergent Validity Test is carried out to ensure that the indicators used truly reflect the construct being measured. This validity is assessed based on the standardized loading factor value of each indicator on the latent construct. An indicator is considered convergently valid if it has a loading factor value of at least 0.50. However, values above 0.70 are preferred because they indicate a strong and consistent contribution to the intended construct (Hair et al., 2010).

Furthermore, the construct reliability test is carried out to measure the internal consistency between indicators in representing the construct. This test uses the Composite Reliability (CR) value, which is a superior reliability measure compared to Cronbach's Alpha in the SEM context because it considers the actual factor loadings of each indicator. The construct is declared reliable if the CR value reaches or exceeds 0.70. However, in the context of exploratory research, CR values in the range of 0.60 are still acceptable (Abdurrahman & Mulyana, 2022).

As a complement to convergent validity, researchers can also calculate Average Variance Extracted (AVE). The AVE value reflects the proportion of indicator variance that is successfully explained by the latent construct. AVE is considered qualified if it is at least 0.50, which means that more than half of the indicator variance is successfully explained by the construct (Fornell & Larcker, 1981).

2. Structural Model Evaluation

The relationship between constructs was analyzed using Structural Equation Modeling (SEM) with AMOS software. The significance of the relationship is tested based on the path coefficient and p-value (Hooper, Coughlan, & Mullen, 2008 The model is declared fit if it meets the goodness of fit indicators (Handayani, 2013) such as RMSEA (< 0.08), CFI (> 0.90), TLI (> 0.90), GFI (> 0.90), and Chi-square/df value (< 3).

RESULT AND DISCUSSION

Equations Based on the results of the analysis, convergent validity is tested through the standardized factor loading value, and construct reliability is tested through the calculation of Composite Reliability (CR). (Sarstedt et al., 2022). It is known that most of the indicators used in this study have factor loading values ≥ 0.5, which indicates that these indicators meet the requirements of convergent validity. However, there are some indicators that have a loading value below 0.5 (such as PE1, EE2, SI3, FC3, and BI1), which are categorized as weak indicators. The existence of these weak indicators can affect the overall quality of construct measurement, so it needs to be a concern in further instrument development. The evaluation table of the model measurement results can be seen in the following table:

Table 2. Measurement Model Evaluation of UTAUT Constructs for SIAKAD Acceptance

Construct	Indicator	Loading	Description	Error Variance ($1-\lambda^2$)	CR	Description
Performance Expectancy (PE)	PE1	0,461	Weak	0,291	0,616	Fair
	PE2	0,665	Ideal	0,112		
	PE3	0,555	Ideal	0,198		
Effort Expectancy (EE)	EE1	0,569	Ideal	0,186	0,603	Fair
	EE2	0,420	Weak	0,336		
	EE3	0,710	Ideal	0,084		
	EE4	0,519	Ideal	0,231		
Social Influence (SI)	SI1	0,504	Ideal	0,246	0,511	Less
	SI2	0,725	Ideal	0,076		
	SI3	0,289	Weak	0,506		
Facilitating Conditions (FC)	FC1	0,621	Ideal	0,144	0,617	Fair
	FC2	0,561	Ideal	0,193		
	FC3	0,498	Weak	0,252		
Behavioral Intention (BI)	BI1	0,457	Weak	0,295	0,549	Less
	BI2	0,593	Ideal	0,166		
Use Behavior (UB)	UB1	0,712	Ideal	0,083	0,796	Fair
	UB2	0,582	Ideal	0,175		
	UB3	0,706	Ideal	0,086		

Source: Processed primary data from UNS student questionnaires (2024), analyzed with AMOS 26.0 using maximum likelihood estimation (Hair et al., 2010)

In terms of construct reliability, the Composite Reliability (CR) value is used to assess the internal consistency of each construct (Kline, R. B, 2016). The calculation results show that the User Behavior (UB) construct has a CR value of 0.796, which means its reliability is high and reliable. The other three constructs, namely Trust (PE), Convenience (EE), and Facility Conditions (FC) have CR values of 0.616, 0.603, and 0.617, respectively. These values are in the sufficient category, which is still acceptable in exploratory research, although further improvement is recommended.

The Social Environment (SI) and User Intention (BI) constructs show relatively low CR values of 0.511 and 0.549, respectively. This indicates that the internal consistency of the indicators in these constructs is still weak, so that the measurement of these constructs is not fully reliable. To increase construct reliability, it is necessary to further evaluate the indicators used, such as revising statements or replacing them with more representative indicators. Overall, the measurement model in this study has met the convergent validity requirements for most indicators.

However, in terms of reliability, some constructs still need to be improved in order to produce a stronger and more accurate model in measuring each latent variable.

Table 3. Structural Model Analysis: Path Coefficients and Significance of UTAUT Construct Relationships

Relationship Between Constructs	**Path Coefficient (β)**	**P-Value**	**Significance**	**Description**
PE → BI	0,379	0,027	Significant	PE has a significant positive effect on BI
EE → BI	0,131	0,414	Not Significant	EE has no significant effect on BI
SI → BI	0,398	0,032	Significant	SI has no significant effect on BI
BI → UB	0,832	0,000	Significant	BI has a very strong effect on UB
FC → UB	0,372	0,004	Significant	FC has a significant effect on UB

Source : Primary data analysis from survey of 206 Sociology and Anthropology Education students at Universitas Sebelas Maret (2024), processed using AMOS 26.0 with maximum likelihood estimation. Thresholds for significance: $p < 0.05$ (Sugiyono, 2022).

First, the Trust construct (PE) is shown to have a positive and significant influence on User Intention (BI) with a path coefficient value of 0.379 and a p-value of 0.027 (<0.05). This shows that the higher the user's trust in the system, the greater the user's intention to use the system.

Conversely, the Ease construct (EE) does not have a significant effect on User Intention (BI). This is indicated by a p-value of 0.414 (> 0.05) and a relatively low path coefficient of 0.131. This finding indicates that the ease of use of the system has not been the main determining factor in influencing user intentions.

Meanwhile, Social Environment (SI) shows a significant influence on User Intention (BI) with a path coefficient of 0.398 and a p-value of 0.032. This implies that social influences from the surrounding environment, such as coworkers or superiors, can encourage a person's intention to use the system.

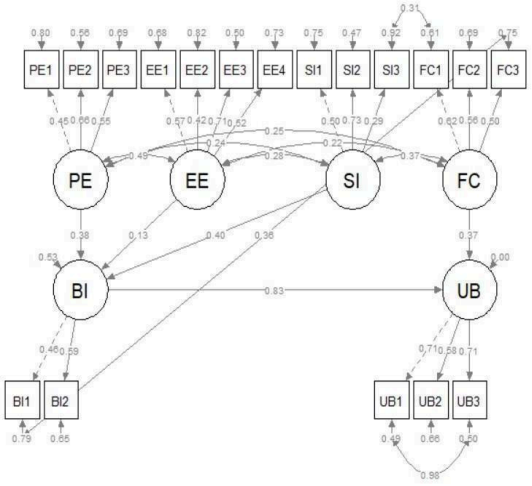
The relationship between User Intention (BI) and User Behavior (UB) shows the strongest results, with a path coefficient of 0.832 and a p-value of 0.000. This shows that user intention strongly influences the actual behavior of using the system, and is the main determining factor in this model.

Finally, Facility Condition (FC) also has a significant effect on User Behavior (UB) with a coefficient of 0.372 and a p-value of 0.004. This indicates that the availability of adequate supporting facilities also encourages users to actually use the system.

Overall, these results indicate that factors such as trust, social environment, user intention, and facility conditions have an important role in influencing user

behavior, while ease of use has not had a significant effect in the context of this study.

Figure 1. Measurement Model Results for UTAUT Constructs
in SIAKAD Acceptance Study



Source: Primary data collected from 206 Sociology and Anthropology Education students at Universitas Sebelas Maret (2024), analyzed using structural equation modeling (SEM) with AMOS 26.0 software

Tabel 4. Inter-Construct Correlation Analysis of UTAUT Variables

Construct Pair	Correlation Value	Interpretation
PE ↔ EE	0,494	Moderate correlation
PE ↔ SI	0,243	Weak correlation
PE ↔ FC	0,251	Weak correlation
EE ↔ SI	0,276	Weak correlation
EE ↔ FC	0,223	Weak correlation
SI ↔ FC	0,371	Weak correlation

Source : Primary data analysis from survey of 206 Sociology and Anthropology Education students at Universitas Sebelas Maret (2024). Analysis conducted using AMOS 26.0 with maximum likelihood estimation. Correlation thresholds: 0.1-0.3 = Weak, 0.3-0.5 = Moderate, >0.5 = Strong (Cohen, 1988)

The results of correlation analysis between constructs and path mapping in the structural diagram, it can be concluded that there is no significant multicollinearity problem between constructs in the model. All correlation values between constructs are below the 0.7 threshold, which indicates the relationship between constructs is relatively independent (Hair et al., 2010; Byrne, 2010; Ghozali, 2014; Diamantopoulos & Siguaw, 2000). The path diagram also supports this conclusion, where there is no pattern of multiple influences that dominate each other between predictor constructs on the dependent variable. Therefore, this model meets the multicollinearity-free

assumption and can be further analyzed with the designed structural approach.

Table 5. Goodness-of-Fit Indices for Structural Equation Model

Indeks Fit	Value	General Threshold	Model Fit Evaluation
Chi-square (χ^2)	143,874	*p > 0.05 (fit)*	**Fit (p = 0.076)**
Degrees of Freedom (df)	121	—	—
χ^2/df (CMIN/DF)	1,189	< 3 (good), < 5 (fair)	**Very good**
Root Mean Square Error of Approximation (RMSEA)	0,030	< 0.08 (good), < 0.05 (ideal)	**Ideal**
Comparative Fit Index (CFI)	0,983	> 0.90 (good), > 0.95 (ideal)	**Ideal**
Tucker-Lewis Index (TLI)	0,979	> 0.90 (good)	**Ideal**
Goodness of Fit Index (GFI)	0,929	> 0.90 (good), > 0.80 (fair)	**Ideal**
Adjusted GFI (AGFI)	0,900	> 0.90 (good), > 0.80 (fair)	**Ideal**

Source: Primary data analysis from 206 respondents using AMOS 26.0 (maximum likelihood estimation). Threshold criteria based on Kline (2015)

The evaluation results of various goodness of fit indicators, the structural model built in this study shows a very good fit with the empirical data. All indicators are within ideal or excellent limits, including RMSEA, CMIN/DF, CFI, TLI, GFI, and AGFI. Therefore, this model is suitable for use in further analysis and is reliable in testing the relationship between the constructs studied in this study.

CONCLUSION

The SEM analysis findings provide concrete solutions to the three main problems identified in this study. First, regarding social science discipline challenges, the low reliability of the Social Influence (SI) and Behavioral Intention (BI) constructs confirms that the current SIAKAD design does not fully accommodate the collaborative learning needs of social science students. Second, concerning technical barriers, the non-significant effect of Effort Expectancy (EE) on BI, along with several indicators showing low convergent validity, reinforces preliminary findings about mobile accessibility and fieldwork data upload difficulties. Third, the systemic impact is evident from BI's strong mediating role on Use Behavior (UB), indicating that enhancing usage intention could address adoption gaps.

These findings provide empirical evidence for SIAKAD improvements at UNS, specifically: (1) refining collaborative features to support social science pedagogy, (2) optimizing the mobile version for fieldwork facilitation, and (3) developing

discipline-specific training modules to enhance Performance Expectancy (PE). The good model fit indices (RMSEA <0.08, CFI >0.90) simultaneously validate the application of the UTAUT model in the Indonesian higher education context, addressing the theoretical needs identified in the research background.

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