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Likert scale vs semantic scale: Comparing the use of Mendeley application for the journal editors

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ABSTRAK

Abstrak: Penelitian ini bertujuan untuk mengidentifikasi keunggulan penggunaan dua jenis skala dengan membandingkan Skala Likert dan Skala Diferensial Semantik. Selain itu, penelitian ini juga bertujuan untuk mengidentifikasi konstruk aplikasi Mendeley beserta indikator-indikator yang membentuknya. Penelitian ini merupakan penelitian pengembangan. Instrumen untuk Skala Likert dan Skala Diferensial Semantik dikembangkan dengan mengacu pada pedoman yang sama. Responden dalam penelitian ini berjumlah 59 pengelola jurnal di seluruh Indonesia. Setelah data terkumpul, data dianalisis menggunakan analisis faktor eksploratori dan analisis faktor konfirmatori. Hasil penelitian menunjukkan bahwa terdapat empat faktor yang terbentuk dalam konstruk aplikasi Mendeley dengan menggunakan kedua skala tersebut. Berdasarkan hasil pengukuran, ditemukan bahwa Skala Diferensial Semantik lebih unggul dalam hal validitas dan reliabilitas.

Abstract: *The study aims to identify the excellence in the use of two types of scale by comparing the Likert Scale and the Semantic Differential Scale. In addition, the study aims to identify the constructs of the Mendeley application as well as the indicators that it has shaped. The study itself is developmental research. The instruments for the Likert Scale and the Semantic Scale have been developed by referring to the same guidelines. Then, the respondents in the study are 59 journal administrators throughout Indonesia. After the data have been gathered, the data are analysed by using the exploratory factor analysis and the confirmatory factor analysis. The results of the study show that four factors that have been formed in the construction for the Mendeley application using the two scales. Based on the measurement results, it is found that Semantic Differential Scale is more excellent in terms of validity and reliability.*

Introduction

Journal is one of the primary forms of scientific writing that has been inherently associated with citation practices, including the compilation of reference lists (Mardin et al., 2020). Proper journal management adheres to established standards and conventions of scientific publication (Nashihuddin & Aulianto, 2016). In Indonesia, journal management standards are regulated through several key guidelines and these guidelines include *Buku Pedoman Publikasi Ilmiah* (Lukman, Ahmadi, et al., 2017),

Pedoman Akreditasi Jurnal Ilmiah (Kementerian Riset Teknologi dan Pendidikan Tinggi Republik Indonesia, 2018), *Pedoman Tata Kelola Jurnal Menuju Jurnal Internasional* (Lukman, Soewono, et al., 2017), and *Buku Panduan Editorial Pengelolaan Jurnal Ilmiah* (Lukman et al., 2020). All of these guidelines have been published by the Ministry of Research and Technology / National Research and Innovation Agency.

One of the key standards and conventions within the scientific publication is that the language used in articles must be formal and adhere to standardized formats in terms of writing style, structure, citation practices, and reference formatting (Nashihuddin & Aulianto, 2016). The referencing system (citation) and the compilation of reference lists constitute essential elements evaluated in journal accreditation (Mardin et al., 2020). Both elements are explicitly outlined in the journal accreditation guidelines, which stipulate that citation practices and reference list preparation must utilize standardized citation management tools. Scientific journal administrators who publish articles with non-standardized and inconsistent referencing systems will receive lower evaluation scores.

In addition to being a crucial component in accreditation assessment, the use of reference management applications offers numerous benefits. These benefits include the prevention of plagiarism (Patak & Akib, 2012; Patak & Tahir, 2019; Salija et al., 2016; Wijaya, 2018), improvement of article quality (Rahmawati et al., 2018), enrichment of research sources (Pramiastuti et al., 2020), facilitation of proper citation and referencing procedures (Mardin et al., 2020), effective management of reference documents (Kosasi, 2019; Pinem, 2021), and assistance for authors in tracking current research developments (Pramiastuti et al., 2020), among others.

Mendeley is a software application designed to integrate citation and reference management within a social networking environment, enabling researchers across the world to collaborate and share research data (Handayani et al., 2019). Mendeley is a free reference management application with a large user base (Nurisani et al., 2019; Sijabat & Riandari, 2021). Its users are primarily students, librarians, lecturers, researchers, and journal administrators. The increasing number of Mendeley users has led to a wide range of user perceptions regarding its utilization. Journal administrators, in particular, are expected to adopt reference management applications as part of efforts to improve journal quality. To explore how Mendeley is utilized in reference management by journal administrators, the researchers developed a questionnaire employing two types of scales, namely the Likert Scale and the Semantic Scale.

The use of these two scaling models aims to compare the responses generated through the Likert Scale and the Semantic Scale. Several studies that have been previously conducted also make comparisons between different scaling models. These comparisons include the ones between the Likert Scale and the Semantic Scale in the context of the Silla assessment model (Sadtyadi, 2018), the ones within the accuracy between the Likert Scale and multiple-choice formats in measuring self-regulated learning (Retnawati, 2015), and the ones within the psychometric properties of two versions of scales used to measure resilience (Friborg et al., 2006).

The use of the Likert Scale and the Semantic Scale in this study is not intended to problematize or critique these two scaling models; rather, it aims to provide a comparative perspective and to identify the degree of alignment or consistency in the data obtained and analysed. This approach ensures that the instrument employed is truly valid, reliable, and objective. In addition, the use of these scaling models seeks to offer practical insight for the broader community regarding the application of different measurement scales. The objective of this study is to examine the advantages of employing two types of scaling models by comparing the Likert Scale and the semantic differential scale. Furthermore, the study aims to identify the construct of the Mendeley application and to determine the indicators that constitute it.

Method

The subjects of this study consisted of 59 journal administrators from various journals across Indonesia. The data sources were derived from the respondents' perceptions regarding the use of the Mendeley application in reference management by journal administrators, collected using both the Likert Scale and the Semantic Scale.

The journal administrators were surveyed in two stages. First, a perception questionnaire on the use of the Mendeley application was administered using a Likert Scale. The respondents were asked to rate 20 items on a five-point scale ranging from "strongly agree" to "strongly disagree." Several days later, the same respondents were asked to evaluate the use of the Mendeley application using a Semantic Scale, also consisting of 20 items rated on a scale from 1 to 5.

The data collected from the questionnaires were subsequently analyzed using Exploratory Factor Analysis (EFA) with SPSS 21 to identify the underlying factors or dimensions derived from the measurements.

Results and Discussions

This study aims to compare two scaling models, namely the Likert Scale and the Semantic Differential Scale, in the context of measuring the use of the Mendeley application. Based on the results of the analysis—using both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA)—a number of significant findings have been obtained and these findings may serve as the basis for the development of more valid and reliable measurement instruments.

Comparing the Reliability and the Standard Error of Measurement (SEM)

Table 1. Results of Reliability and Standard Error of Measurement (SEM)

	Likert	Semantic
Reliability	0.946405129	0.970599768
√1- rxx'	0.231505661	0.171464957
Standard Error of Measurement (SEM)	2.514519995	2.210327247

Table 1 shows that both scales (Likert and Semantic Differential) demonstrate excellent levels of reliability, with reliability coefficients exceeding 0.90. This finding indicates that both scales can be effectively used to measure the construct of the Mendeley application. The Semantic Differential Scale exhibits a slightly higher reliability coefficient (0.9706) compared to the Likert Scale (0,9464), suggesting that the semantic differential scale is more consistent in measuring the same variable. Although there is a minor difference in reliability levels, this difference is not significant in the context of using both scaling models for the purposes of this study.

In addition, the results of the Standard Error of Measurement (SEM) analysis indicate that the Semantic Differential Scale has a lower SEM value (2.210) compared to the Likert Scale (2.514). This suggests that the semantic instrument provides greater measurement accuracy for the intended variable.

Comparing the Exploratory Factor Analysis (EFA) Model

Table 2. Results of Kaiser-Meyer-Olkin Measure of Sampling Adequacy from Both Scaling Models

		Likert		Semantic	
		Original	Scaled	Original	Scaled
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.764	0.774	0.920	0.924
Bartlett's Test of Sphericity	Approx. Chi-Square	930.841	947.376	1107.017	1157.873
	df	190	190	190	190
	Sig.	0.000	0.000	0.000	0.000

Based on the EFA results presented in Table 2, the Kaiser–Meyer–Olkin (KMO) values for both scaling models indicate a very good level of sampling adequacy. The semantic differential scale demonstrates a higher KMO value (0.924) compared to the Likert Scale (0.774). This suggests that the semantic differential scale is more suitable for factor analysis in measuring the construct of the Mendeley application.

The EFA results also indicate that both the Likert Scale and the Semantic Differential Scale yield four main factors namely: (1) understandability; (2) operability; (3) learnability; and (4) attractiveness. Although both scales produce the same number of factors, the Semantic Differential Scale contributes more substantially to the total variance, with a notable difference in the first factor. This suggests that the semantic differential scale is more effective in capturing the dimensions of the *Mendeley* application in a more comprehensive manner.

Variance Comparison

Table 3. Variance Comparison between the Likert Scale and the Semantic Differential Scale

Dimension	Likert	Semantic	Deviation (%)
	% of Variance	% of Variance	
	Original		
1	49.16	62.71	13.55
2	7.60	5.93	(1,67)
3	7.25	5.37	(1,87)
4	5.74	3.79	(1,96)
Total	69.75	77.80	8,05
	Scaled		
1	50.24	64.88	14.64
2	7.41	5.62	(1,79)
3	7.14	5.35	(1,79)
4	5.53	3.28	(2,24)
Total	70.32	79.14	8,82

Table 3 indicates that, in the original data, the Semantic Differential Scale contributes a greater proportion of variance (77.80%) compared to the Likert Scale (69.75%), with a difference of 8.05%. A similar pattern is observed in the scaled data, where the semantic differential scale again accounts for a larger proportion of variance (79.14%) than the Likert Scale (70.32%), with a difference of 8.82%. These results suggest that the Semantic Differential Scale is more sensitive in capturing variability within the data, making it more effective for use in measurement instruments for technology-based applications.

Comparing the Fit Model and the Confirmatory Factor Analysis (CFA)

The CFA results, as presented in Table 4 and Figures 1–2, indicate that neither the Likert Scale model nor the Semantic Differential Scale Model fully meets the criteria for a perfect model fit. However, both models fall within the category of marginal fit, suggesting that they remain applicable within the context of this study despite some indications of misfit across several goodness-of-fit indices. The semantic differential scale demonstrates slightly better values on certain indices, such as the Comparative Fit Index (CFI) and the Incremental Fit Index (IFI), although these values remain below the desired threshold of 0.95.

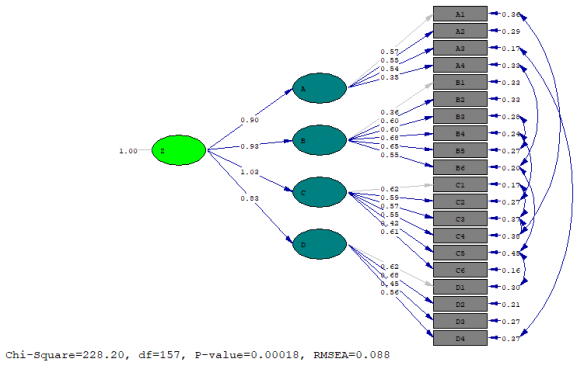

Figure 1. Likert Scale Estimates Model

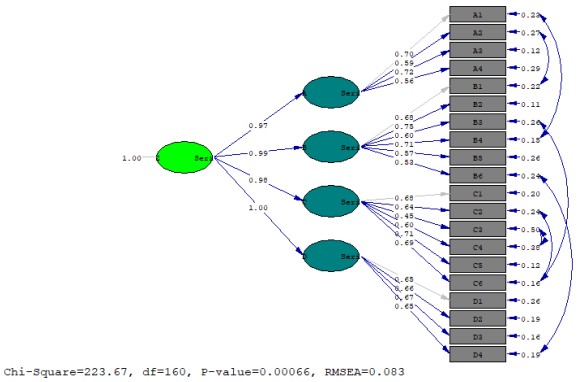

Figure 2. Semantic Scale Estimates Model

Table 4. Goodness of Fit

Indicator	Criteria	Likert's Lisrel Output	Decision	Semantic's Lisrel Output	Decision
Chi-square	< 2df	228,20 < 2f (157)	Good fit	223,67 < 2f (160)	Good fit
p-values	≥ 0,05	0,00018	Bad fit	0,00066	Bad fit
RSMEA	≤ 0,08	0,088	Marginal fit	0,083	Marginal fit
GFI	≥ 0,90	0.72	Bad fit	0.72	Bad fit
AGFI	≥ 0,90	0.62	Bad fit	0.63	Bad fit

NFI	≥ 0,90	0.72	Bad fit	0.82	Bad fit
CFI	≥ 0,95	0.84	Bad fit	0.93	Marginal fit
IFI	≥ 0,95	0.84	Bad fit	0.93	Marginal fit

Based on the analysis results, it can be concluded that the Semantic Differential Scale demonstrates advantages in terms of higher validity and reliability compared to the Likert Scale. This is particularly found in the context of measuring technology-based applications such as Mendeley. Both scaling models yield the same dimensions. Despite that, the Semantic Differential Scale contributes more substantially to the total variance, making it more effective in measuring complex constructs.

Discussions

This study compares two scaling models—the Likert Scale and the Semantic Differential Scale—in measuring the use of the Mendeley application. Based on the results of the analysis, using both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA), it is found that the Semantic Differential Scale demonstrates higher levels of reliability and validity compared to the Likert Scale. These findings indicate that the Semantic Differential Scale is more effective in capturing variance and provides more consistent results in measuring the construct of the Mendeley application.

Based on the data that have been obtained, the difference in reliability between the two scales is reflected in the higher reliability coefficient for the Semantic Differential Scale (0.9706) compared to the Likert Scale (0.9464). This indicates that the semantic instrument is more consistent in measuring the intended variable. In addition, the Standard Error of Measurement (SEM) analysis reveals that the Semantic Differential Scale has a lower SEM value (2.210), which indicates greater measurement accuracy. In terms of factor analysis, the Semantic Differential Scale also demonstrates a higher Kaiser–Meyer–Olkin (KMO) value (0.924) compared to the Likert Scale (0.774). This suggests better sampling adequacy and greater suitability for factor analysis. These findings thus reinforce the argument that the semantic differential scale provides more optimal measurement.

The Semantic Differential Scale has been proven to yield superior results in terms of reliability and validity. This is consistent with findings from previous studies that highlight the advantages of semantic instruments in measuring more complex constructs (Bagozzi et al., 2017; Pelsmacker et al., 2007). In the context of technology applications such as Mendeley, which encompass multiple interrelated dimensions and variables, the Semantic Differential Scale is better able to capture variations in user experience, including understandability, operability, learnability, and attractiveness.

These findings further reinforce previous research indicating that the Semantic Differential Scale tends to be more sensitive to variations in data, thereby enabling more accurate identification of changes in user perceptions (Larsen et al., 2008). The significant differences in variance contribution between the two scales in this study, both in the original and scaled data, suggest that the semantic differential scale is more effective in capturing deeper nuances related to the quality and user experience of technology-based applications.

Despite the advantages demonstrated by the Semantic Differential Scale, comparison with the Likert Scale remains important. Both scales yield the same four factors, indicating that each can be used to measure key aspects of application use, although the semantic differential scale shows advantages in several areas. The use of the Likert Scale remains relevant, particularly for more straightforward and contextual analyses that do not require highly complex variable examination.

One potential counterargument to these findings is that, although the Semantic Differential Scale demonstrates superior reliability and validity, the CFA results indicate that both scaling models do not fully meet the desired model fit criteria, particularly for indices such as GFI and NFI. On the contrary, despite the fact these indices falling below the ideal threshold, the CFA results suggest that both scales remain acceptable within the category of marginal fit. This indicates that, although some degree of misfit exists, both scaling models can still be employed for the purposes of this study with minor refinements.

These findings contribute to the advancement of measurement theory in the context of technology-based applications. By demonstrating that the semantic differential scale is more effective in measuring complex constructs, this study extends our understanding of how to select and develop more accurate and valid measurement instruments in technology application research. From a practical perspective, these findings can be utilized by application developers and researchers to select more appropriate scaling models for assessing user experience and application features.

Based on the main findings of this study, it can be concluded that the Semantic Differential Scale provides a more substantial contribution in terms of reliability and validity compared to the Likert Scale in measuring the use of the *Mendeley* application. These findings affirm that the Semantic Differential

Scale is more effective in capturing the complex dimensions of technology-based applications and holds significant potential for use in the development of measurement instruments for other technology applications.

Conclusions

Based on the findings of this study, the instrument developed to measure the use of the Mendeley application using two scaling models (Likert and Semantic Differential) yields four main factors: understandability, operability, learnability, and attractiveness. The measurement results indicate that the Semantic Differential Scale demonstrates superior validity and reliability compared to the Likert Scale. These findings contribute to the development of measurement instruments for technology-based applications, which can be utilized for further evaluation in the context of other application uses.

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