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Statistical Application Using Visual Basic For Application (VBA) Excel

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ABSTRACT

BandiStats, a statistical application, was developed with the aim of being a simple and easy-to-use statistical analysis tool thanks to its base on Microsoft Excel, a well-known platform. The development method used the Visual Basic for Application (VBA) programming language. The application test results showed the success of all implemented menus. This research produced an application that can facilitate users in analyzing statistical data. It is hoped that this application can be a useful tool for those who need statistical analysis in their daily work without having to have in-depth knowledge of statistics or computer programming. With its easy-to-use interface and comprehensive features, BandiStats provides an efficient and effective solution for statistical data analysis.

Keywords: Statistical applications, Bandistats, Visual basic for applications (VBA), Microsoft Excel

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INTRODUCTION

Statistics is a science related to collecting, processing, and analyzing data, as well as drawing conclusions and making decisions based on data that has been collected and analyzed. This discipline has a very important role in various fields, such as economics, business management, accounting, marketing, and research (Watrianthos, 2014). Statistical data can be processed either manually or by using specialized software. Data processing using software is much more accurate and efficient than manual data processing (Andriani & Lestari, 2021). With the help of statistical software, such as applications that use Visual Basic for Application (VBA) in Microsoft Excel, users can easily perform data analysis, represent the results of the analysis in the form of tables and graphs, and make more accurate conclusions based on strong data. Thus, the use of statistical software is very important in supporting appropriate and effective decision making in various fields.

According to (Santoso, 2011) statistical software is a computer program that plays a very important role in statistical data processing activities. Statistical software consists of software that calculates invoices based on processed statistical data (Agusyana & Islandscript, 2011). With the rapid development of technology, many statistical programs are used in data processing today, for example. SPSS, Minitab, Stata, Eview, AMOS, Lisrel, SmartPLS, R, Microsoft Excel, etc. Microsoft Excel is a spreadsheet application used to process data automatically through basic calculations, numerical manipulation, table and graph processing, data management and mathematical calculations (Susandra, 2008). Microsoft Excel is easy to use because many ready-made facilities and auxiliary programs (Add-in) are provided (Wicaksono, 2007). For advanced data analysis

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Microsoft Excel provides facilities in the form of a visual programming language, namely Visual Basic for Application (VBA).

Visual Basic for Application (VBA) is a derivative of the Visual Basic programming language specially developed by Microsoft Excel (Pangaribuan, 2005). Object-oriented (Alexander & Kusleika, 2016), VBA is used to control objects in Microsoft Excel. With VBA, users can control spreadsheets, tables, formulas, columns, rows, and other components to form an integrated system (Wahyono, 2013). The use of Visual Basic for Application (VBA) in Microsoft Excel makes it possible to create custom programs automatically (Wang & Hu, 2012), which can improve the ability of software development to process data. Thus, VBA becomes a very useful tool in accelerating data processing tasks in Microsoft Excel. By using VBA, users can automate routine tasks, improve efficiency, and expand data analysis capabilities, thus allowing users to focus on the core of data analysis and decision-making.

Previous research has shown the successful use of Visual Basic for Application (VBA) in various contexts, such as in a study entitled "Optimization of material delivery time analysis by using Visual Basic for applications in Excel" (Kalwar., et al, 2023), "Developing An Interactive Learning Model Using Visual Basic Applications With Ethnomathematical Contents To Improve Primary School Students' mathematical Reasoning" (Rohaeti., et al,, 2020), "Analysis of the Effect of Visual Basic Application Use on Elementary Students' Mathematics Learning Interest in Prime Numbers Material" (Nurhayati & Chotimah, 2020), and "Designing a Visual Basic Application Excel-based Data Collection Information System for Residents (Case Study of Sentral Baru Village, Rejang Lebong Regency)" (Ternando, 2023). These studies provide interesting examples of the potential of Visual Basic for Application (VBA) in improving efficiency and effectiveness in various fields, ranging from data analysis to the development of interactive learning models.

Based on the above description, the author intends to design an application for statistical data analysis using Visual Basic for Application (VBA) in Microsoft Excel. This application is designed to allow users to analyze statistical data easily and efficiently. In addition, this software is also capable of representing data output in the form of tables (lists) and diagrams (graphs), making it easier for users to understand and visualize the results of the analysis. It is expected that with this application, the data analysis process will become more effective and efficient, and can help users in making decisions based on information obtained from data analysis. This application is expected to be used by various groups, ranging from academics, researchers, to practitioners who need tools for statistical data analysis quickly and accurately.

METHOD

The system development method used in this research is the Waterfall Method, which consists of four main stages: System Analysis, Design, Coding, and Testing (Mauluddin & Jaidar, 2022).

1. System Analysis:
   At this stage, the author conducts an in-depth analysis of various existing statistical software. This analysis aims to understand user needs and evaluate the features needed in the statistical application to be created. From the results of this analysis, the author designs a statistical application that pays attention to user needs and has an easy-to-use interface.
2. Design:
   The statistical application design stage is carried out by considering various statistical analysis techniques that are often used. At this stage, the author planned the overall structure of the application, including the main features it would have as well as an intuitive user interface. In addition, the author also conducted data modeling to determine the right data structure for the app.
3. Coding:
   The implementation or coding stage was done after the application design was completed. Coding was done using the Visual Basic for Application (VBA) programming language, which is an integral part of Microsoft Excel. The author implements the features that have been designed in

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the previous stage into program code. This coding process includes creating various modules, functions, and procedures needed to run the statistics application.

4. Testing:
   The testing stage is carried out to ensure that the application that has been created meets the established quality standards. Testing includes functionality testing, reliability testing, performance testing, and integration testing. The results of this test are used to ensure that the statistical application created is in accordance with user needs, error-free, and ready for widespread use. If problems or shortcomings are found during the testing phase, the author will make the necessary repairs and improvements before the application is officially launched.

RESULTS AND DISCUSSION

1.1 Application View

The application that the researchers have developed is called BandiStats. The development process of this application begins with the creation of a Ribbon menu tab that will house various statistical analysis techniques. The Ribbon menu tab is designed to make it easier for users to access the various features and statistical analysis techniques provided by the BandiStats application. The Ribbon menu tab is designed with an intuitive and easy-to-use interface. Users can easily navigate through the various statistical analysis techniques available by clicking on the appropriate tabs. The following is an overview of the Ribbon menu tabs that have been designed:

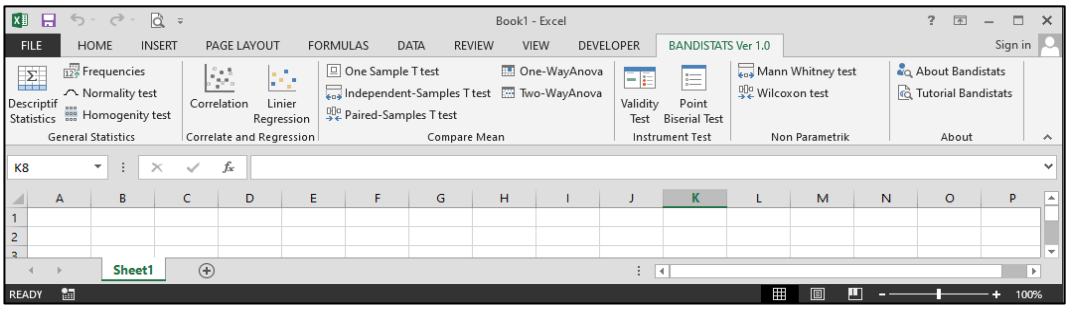

Figure 1. Bandistats Application Ribbon menu tab
Source : Research Result

The Bandistats Application Ribbon menu tab is divided into four menu tabs and each menu tab has several menus. The menu tabs are:

1. General Statistics tab
   This menu tab consists of descriptive statistics to analyze descriptive statistics (mean, medium, mode, standard deviation, etc.). The second statistical technique is Frequencies to calculate the frequency of data, then the Normality test to conduct a normality test and finally the Homogeneity test to test the homogeneity of variances,
2. Correlation and Regression
   This menu tab consists of Correlation to perform a correlation test and Regression to perform a regression test.
3. Compare Mean
   This menu tab consists of one sample T test for one sample test, Independent sample T test for two independent samples test, Paired sample T test for two paired samples test, One way Anova for one-way variance analysis and Two way Anova for two-way variance analysis.
4. Intrument Test
   This menu tab consists of Validity test to test validity and reliability. Point Biserial Test for biserial validity test.
5. Non Parametric
   This tab is used for non-parametric tests consisting of the Mann Whitney and Wilcoxon tests.
6. About, this menu explains about the application and tutorial on how to use it.

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With this Ribbon menu tab, users can quickly access the various features and statistical analysis techniques provided by the BandiStats application. This is expected to increase user efficiency and productivity in conducting statistical data analysis.

1.2 Dialog Box and Application Output

To facilitate users in analyzing data, a user interface (UI) is created for each analysis. With the user interface, users can see and interact with the application so that the user experience is easier and more intuitive.

1. Descriptive Statistics Menu

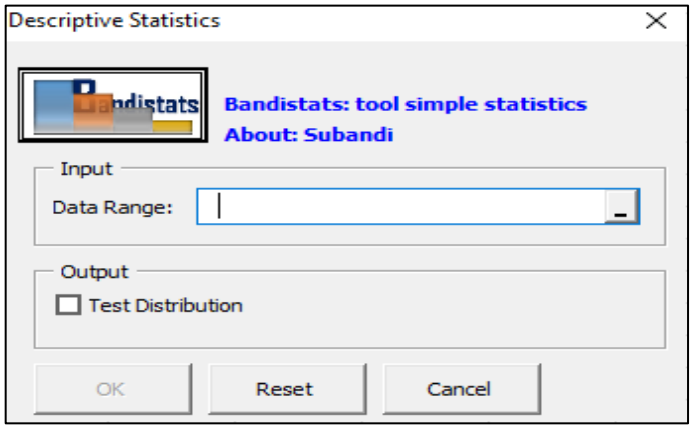

Figure 2. Desciptive Statistics dialog box
Source : Research Result

	A	B	C	D
1	**Descriptive Statistic**			
2				
3	Summary Statistics	Kepuasan Konsumen	Citra Merek	Harga
4	N	30	30	30
5	Mean	20.933	21.767	19.800
6	Modus	25	25	18
7	Median	20.5	22.5	20
8	Skewness	0.298	-0.804	0.242
9	Kurtosis	-0.057	-0.350	-1.082
10	Variance	13.030	14.737	10.234
11	Std. Deviation	3.610	3.839	3.199
12	Std. Error Mean	0.659	0.701	0.584
13	Std.Error Skewness	0.427	0.427	0.427
14	Std. Error Kurtosis	0.833	0.833	0.833
15	Min	15	13	15
16	Max	30	27	25
17	Sum	628	653	594
18	Range	15	14	10
19				
20				
21	Distribution test	Kepuasan Konsumen	Citra Merek	Harga
22	Coefficient of variation	17,24%	17,64%	16,16%
23	Skewness ratio	0.698	-1.884	0.567
24	Kurtosis ratio	-0.068	-0.421	-1.299
25	Jarque-Bera test	0.449	3.387	1.754
26	P-value	0.799	0.184	0.416

Figure 3. Output Desciptive Statistics
Source : Research Result

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2. Frequencies Menu

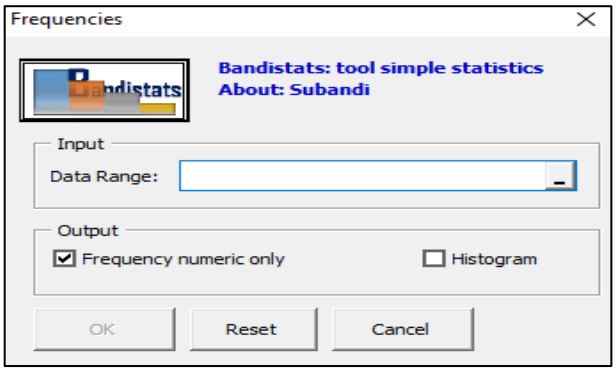

Figure 4. Frequencies Dialog Box
Source : Research Result

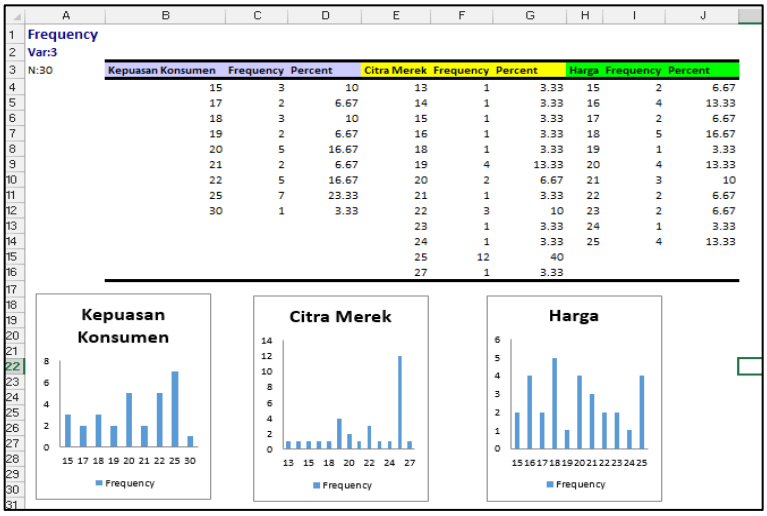

Figure 5. Output Frequency
Source : Research Result

3. Normality Test Menu

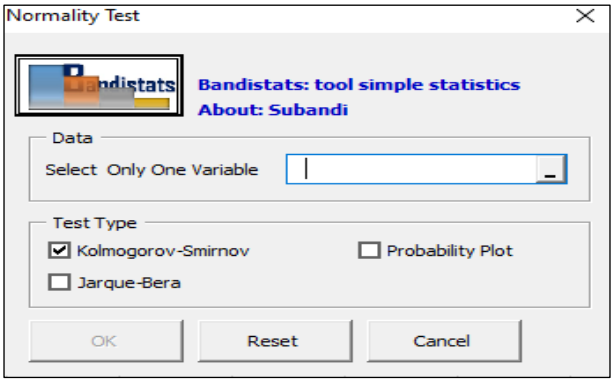

Figure 6. Normality Test dialog box
Source : Research Result

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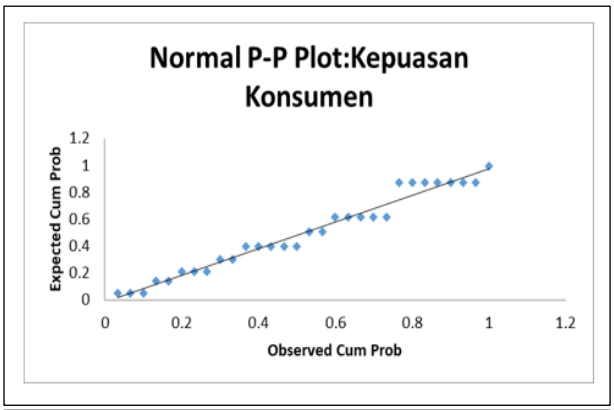

	A	B	C
1	**Test Normality**		
2			Kepuasan Konsumen
3	N		30
4	Normal Parameters	Mean	20.93
5		Std.Deviation	3.61
6	Most Extreme Differences	Positive	0.116796069
7		Negative	-0.136885001
8		Absolute	0.136885001
9	Kolmogorov-Smirnov-Z		0.749750028
10	p-value (2-tailed)		0.627588225
11	Jarque-Bera test		0,451
12	p-value		0,798
13			

Figure 7. Normality Test Output
Source : Research Result

4. Homogenity Test Menu

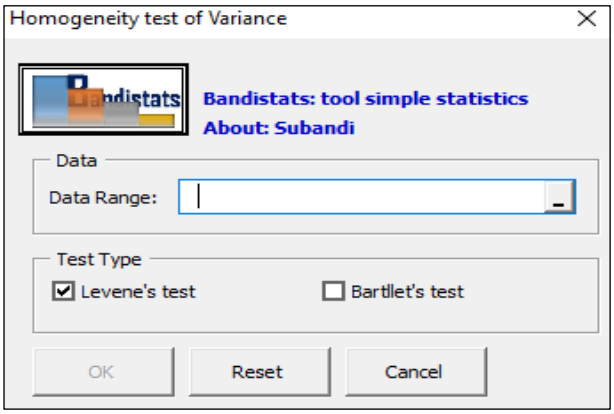

Figure 8. Homogeneity Test dialog box
Source : Research Result

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	A	B
1	Test of Homogeneity	
2		
3		Levene's Statistic
4	F	0.578
5	Ftable (0.05)	3.101
6	df 1	2
7	df 2	87
8	p-value	0.563
9		
10		
11		Bartllet's Statistic
12	df	2
13	Bartllet's test	0.987287689
14	p-value	0.610398141
15	Chi-table (0.05)	5.991464547

Figure 9. Homogeneity Test Output
Source : Research Result

5. Correlation Menu

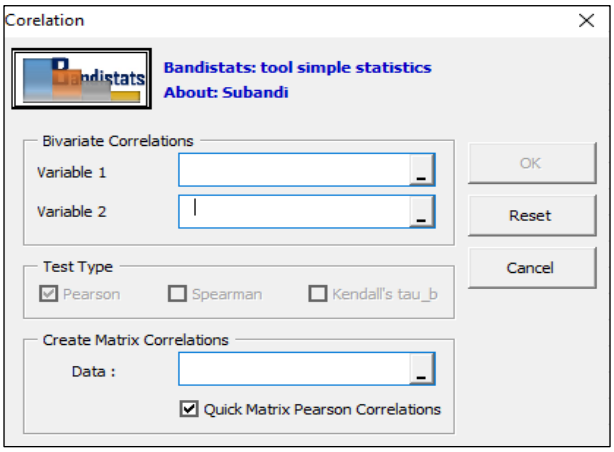

Figure 10. Correlation dialog box
Source : Research Result

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	A	B	C
1	**Bivariate Correlations**		
2			
3	Parametric Correlations	Kinerja Karyawan :	Motivasi Kerja
4	Pearson		0.621
5	Sig (2-tailed)		0
6	r-Crit		0.213
7	N		85
8			
9	Nonparametric Correlations	Kinerja Karyawan :	Motivasi Kerja
10	Spearman's rho		0.592
11	Sig (2-tailed)		0
12	r-Crit		0.18
13	N		85
14			
15	Nonparametric Correlations	Kinerja Karyawan :	Motivasi Kerja
16	Kendall's tau_b		0.454
17	Sig (2-tailed)		0
18	z		6.135
19	z-crit		1.96
20	N		85

	A	B	C	D	E
1	**Matrix Correlations**				
2					
3	**N of Variable:**	4			
4	**N:**	85			
5	**r-Crit(0.05):**	0.213			
6					
7		Kinerja Karyawan	Motivasi Kerja	Disiplin Kerja	Lingkungan Kerja
8	Kinerja Karyawan	1.000	0.621	0.627	0.515
9	Motivasi Kerja	0.621	1.000	0.597	0.564
10	Disiplin Kerja	0.627	0.597	1.000	0.427
11	Lingkungan Kerja	0.515	0.564	0.427	1.000
12					

Figure 9. Correlation Test Output
Source : Research Result

6. Linear Regresion Menu

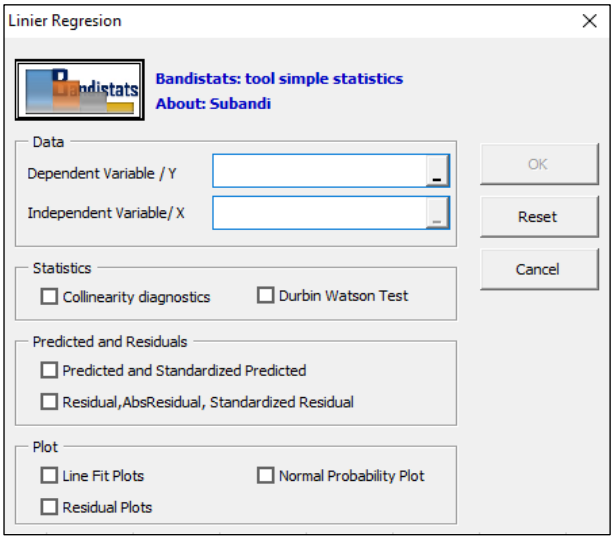

Figure 10. Linear Regresion
Source : Research Result

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	A	B	C	D	E	F	G	H
1	**Linier Regression**							
2	**Model Summary**							
3	R	0.72832818						
4	R Square	0.530461938						
5	Adjusted R Square	0.505486509						
6	Std.Error Estimate	1.796044664						
7	N	100						
8	Durbin Watson Test	1,835						
9								
10	**ANOVA**							
11	**Model**	**Sum of Square**	**df**	**Mean Square**	**F**	**Fcrit(0,05)**	**Sig**	
12	Regression	342.5670151	5	68.51340302	21.2393526	2.31127019	0,000	
13	Residual	303.2229849	94	3.225776435				
14	Total	645.79	99					
15								
16	**Coef.Regression**							
17	**Model**	**Coefficients**	**Std.Error**	**Beta**	**t**	**tcrit(0,05)**	**Sig**	**VIF**
18	Constants	-1.343256982	1.36428541		-0.98458649	1.98552344	0,327	
19	Tangible	0.335928282	0.09159677	0.299417048	3.66746845	1.98552344	0,000	1,334
20	Reliability	0.179657737	0.07037354	0.195934979	2.55291608	1.98552344	0,012	1,179
21	Responsiveness	0.162142929	0.08106428	0.174386418	2.00017719	1.98552344	0,048	1,522
22	Assurance	0.203042568	0.08008996	0.206410263	2.53518123	1.98552344	0,013	1,327
23	Emphaty	0.183553442	0.0700661	0.2132568	2.61971833	1.98552344	0,010	1,327
24	Dependent Variable:	Kepuasan Konsumen						

Figure 11. Linear Regresion Output
Source : Research Result

7. One Sample T-test Menu

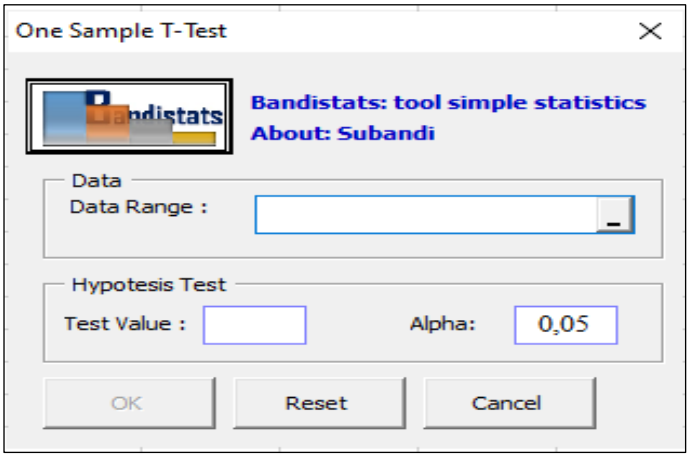

Figure 12. One Sample T test dialog box
Source : Research Result

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	A	B	C	D	E	F
1	**ONE SAMPLE T-Test**					
2			**Descriptive Statistics**			
3	**Variable**	**Mean**	**N**	**Std Deviation**	**Std Error Mean**	
4	Berat Badan	55.66	50	6,110	0.864	
5						
6						
7			**One Samples Test**			
8	**Variable**	**t**	**df**	**Sig**	**Mean Difference**	**t-crit:0,05**
9	Berat Badan	0.763889	49	0.44859625	0.66	2.009575
10	Test Value:55					

Figure 13. One Sample T test Output
Source : Research Result

8. Independent Sample T-test Menu

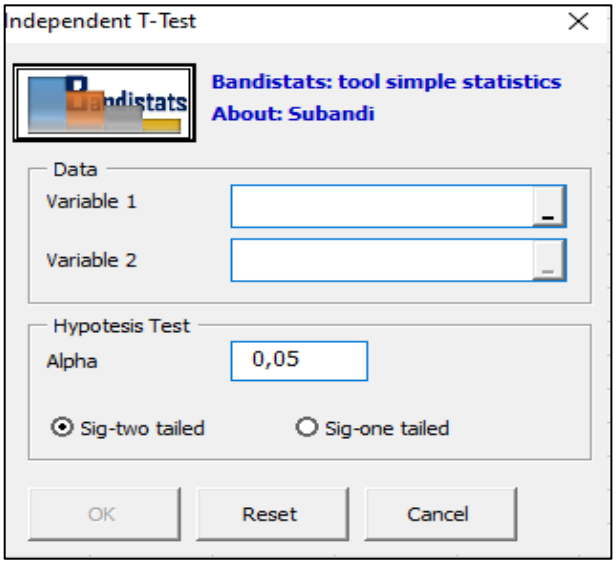

Figure 14. Independent Sample T test Dialog Box
Source : Research Result

	A	B	C	D	E	F
1	**INDEPENDENT T-Test**					
2			**Group Statistics**			
3	**Variable**	**Mean**	**N**	**Std Deviation**	**Std Error Mean**	
4	Metode I	19,700	20	2,736	0,612	
5	Metode II	19,950	20	3,364	0,752	
6						
7			**Independent Samples Test**			
8	**Variable**	**t**	**df**	**Sig two-tail**	**t-crit:0,05**	**Mean Difference**
9	Metode I	-0,258	38	0,798	2.024	0.25
10	Metode II					

Figure 14. Independent Sample T test Output
Source : Research Result

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9. Paired Sample T-test Menu

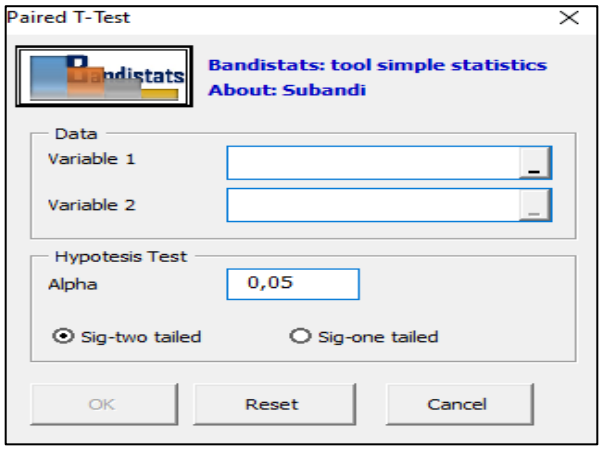

Figure 15. Paired Sample T test Dialog Box
Source : Research Result

	A	B	C	D	E	F
1	PAIRED T-Test					
2			Group Statistics			
3	Variable	Mean	N	Std Deviation	Std Error Mean	
4	Sebelum Pelatihan	64,950	20	5,463	1,221	
5	Sesudah Pelatihan	83,000	20	6,009	1,344	
6						
7			Paired Samples Correlations			
8	Pair	N	Correlation	Sig	r-crit 0.05	
9	Sebelum Pelatihan	20	0.629	0.003	0.444	
10	Sesudah Pelatihan					
11						
12			Paired Samples Test			
13	Pair	t	df	Sig two-tail	t-crit:0,05	Mean Difference
14	Sebelum Pelatihan	-16,25	19	0	2.093	18.05
15	Sesudah Pelatihan					

Figure 16. Paired Sample T test Output
Source : Research Result

10. One Way Anova Menu

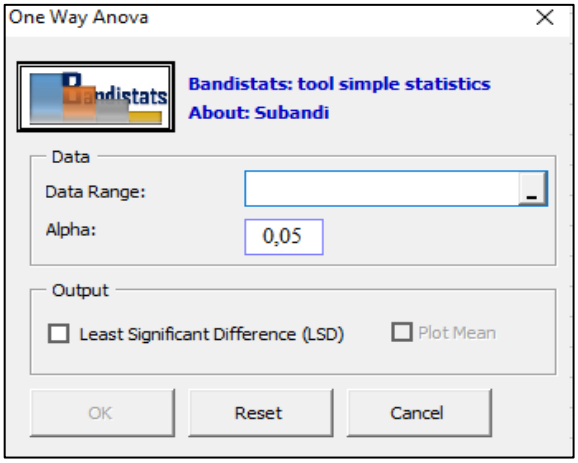

Figure 17. One Way Anova Dialog Box
Source : Research Result

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	A	B	C	D	E	F	G
1	**One Way Anova**						
2							
3	**Summary**	**Metode 1**	**Metode 2**	**Metode 3**			
4	Mean	12.467	15.733333	17.5333333			
5	Variance	3.124	4.9238095	4.55238095			
6	Standard Deviation	1.767	2.2189659	2.13363093			
7	Count	15	15	15			
8	Sum	187	236	263			
9							
10	**Source**	**Sum of Square**	**df**	**Mean Square**	**F**	**Sig**	**Fcrit**
11	Between Groups	197.91	2	98.955	23.561	0	3.2
12	Within Groups	176.4	42	4.2			
13	Total	374.31	44				
14							
15	Coefficient of variation	13,44%					
16	R Square	0.529					
17	Adj. R Square	0.506					
18	LSD	1.51					
19							
20	Mean difference		Metode 1	Metode 2	Metode 3		
21	Metode 1	12.46666667	0				
22	Metode 2	15.73333333	3.2666667	0			
23	Metode 3	17.53333333	5.0666667	1.8	0		

Figure 18. One Way Anova Output
Source : Research Result

11. Two Way Anova Menu

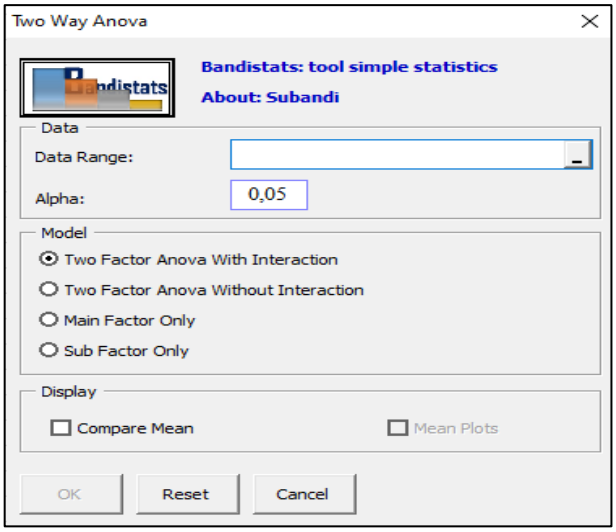

Figure 19. Two Way Anova Dialog Box
Source : Research Result

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	A	B	C	D	E	F	G
1	**Two Factor Anova**						
2	**With Interaction**						
3							
4	**Tests of Between-Subjects Effects**						
5	**Source**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig**	**Fcrit**
6	Corrected Model	18726.57	11	1702.4155	3.907	0.0005	1.995
7	Metode	8782.9	2	4391.45	10.079	0.0002	3.191
8	Lama	3411.65	3	1137.2167	2.61	0.0622	2.798
9	Metode*Lama	6532.02	6	1088.67	2.499	0.0348	2.295
10	Error	20914.28	48	435.7142			
11	Total	1527071	60				
12	Corrected Total	39640.85	59				
13	Dependent Variable:	Skor					
14	R-Squared:	0.472					
15	Adjusted R-Squared:	0.351					
16	Coefficient of Variation:	13.26%					

Figure 20. Two Way Anova Output
Source : Research Result

12. Validity and Reliability Menu

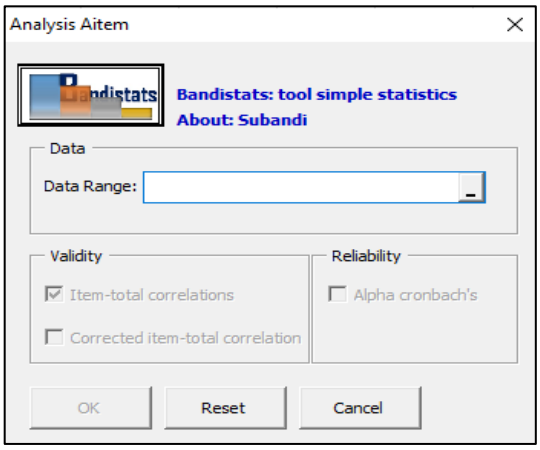

Figure 21. Validity Test Dialog Box
Source : Research Result

	A	B	C	D
1	**Item Analysis**			
2				
3	**N of Item:**	10		
4	**N:**	30		
5	**r-crit:**	0.361		
6	**Cronbach's Alpha:**	0.841		
7				
8	**Item**	**Item-Total Correlations**	**p-Value**	**Corrected Item-Total Correlations**
9	Item 1	0.785	0.000	0.695
10	Item 2	0.824	0.000	0.763
11	Item 3	0.392	0.032	0.251
12	Item 4	0.127	0.504	0.002
13	Item 5	0.679	0.000	0.584
14	Item 6	0.620	0.000	0.514
15	Item 7	0.824	0.000	0.763
16	Item 8	0.735	0.000	0.646
17	Item 9	0.536	0.002	0.438
18	Item 10	0.759	0.000	0.665

Figure 22. Validity and Reliability Output
Source : Research Result

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13. Biserial Test Menu

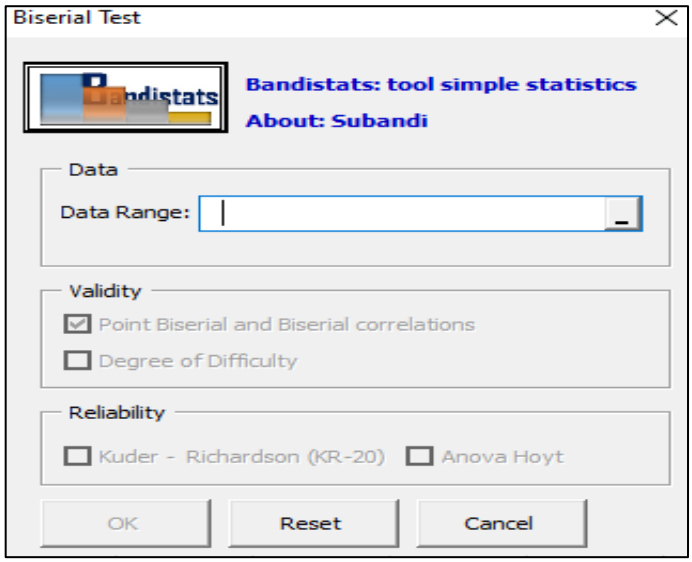

Figure 23. Biserial Test Dialog Box
Source : Research Result

	A	B	C	D
1	**Analysis Test**			
2				
3	**N of Item:**	10		
4	**N:**	9		
5	**KR-20:**	0.58		
6	**Anova Hoyt:**	0.58		
7				
8	**Item**	**Point Biserial**	**Biserial**	**Degree of difficulty**
9	Soal 1	0.518	0.162	0.778
10	Soal 2	0.633	0.484	0.444
11	Soal 3	0.279	0.087	0.778
12	Soal 4	0.527	0.439	0.333
13	Soal 5	0.433	0.331	0.444
14	Soal 6	0.527	0.439	0.333
15	Soal 7	0.316	0.156	0.667
16	Soal 8	0.316	0.263	0.333
17	Soal 9	0.797	0.662	0.222
18	Soal 10	0.000	0.000	0.333

Figure 24. Biserial Test Output
Source : Research Result

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14. Mann-Whitney Test Menu

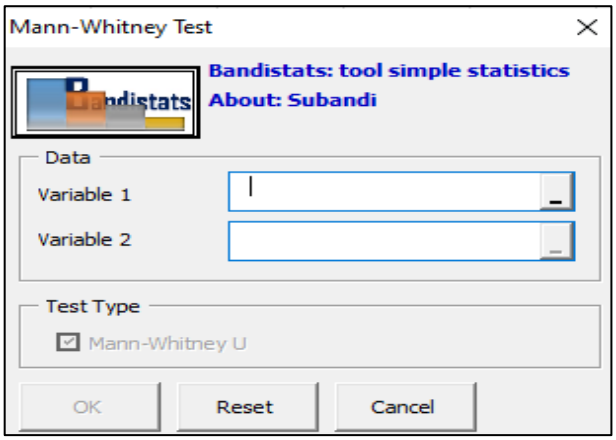

Figure 25. Mann- Whitney Test Dialog Box
Source : Research Result

	A	B	C	D
1	**Mann-Whitney Test**			
2				
3		**Ranks**		
4	**Variable**	**N**	**Mean Rank**	**Sum of Ranks**
5	Traning A	10	6.25	62,5
6	Traning B	10	14.75	147,5
7	Total	20		
8				
9		**Test Statistics**		
10			**Statistics**	
11	Mann-Whitney U		7.5	
12	Z		-3.2127	
13	Asymp.Sig		0.001315	

Figure 26. Mann- Whitney Test Output
Source : Research Result

15. Wilcoxon Test Menu

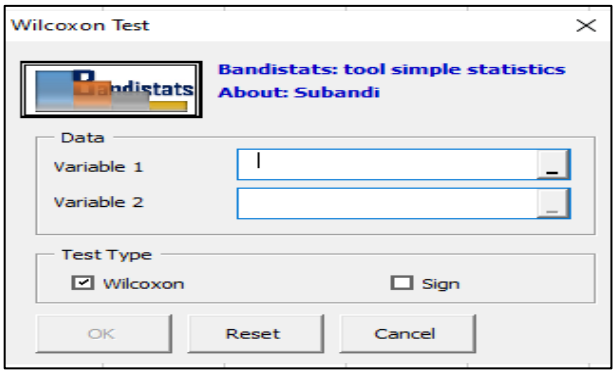

Figure 27. Wilcoxon Test Dialog Box
Source : Research Result

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Wilcoxon Signed Ranks Test

Ranks

Variable		N	Mean Rank	Sum of Ranks
Setelah Traning-Sebelum Traning	Negative Ranks	0	0	0
	Positive Ranks	10	5.5	55
	Ties	0		
	Total	10		

Test Statistics

	Statistics
Wilcoxon	0
Z	-2,803
Asymp.Sig (2-tailed)	0.005

Figure 28. Wilcoxon Test Output
Source : Research Result

CONCLUSION

Based on the results of the BandiStats application, it can be concluded that this application makes a significant contribution in simplifying the statistical analysis process. With the BandiStats application, users can easily perform various statistical analysis techniques without having in-depth knowledge of programming or statistics. The BandiStats application has been designed with an intuitive and easy-to-use interface, so users can quickly learn how to use the application. The features provided by the BandiStats application, such as the Ribbon menu tabs that house various statistical analysis techniques, allow users to easily access and use these features without having to search around. Thus, the BandiStats application not only simplifies the statistical analysis process, but also increases the efficiency and productivity of users in conducting data analysis. This application is expected to be a useful tool for those who need statistical analysis in their daily work, be it in academia, business, or research.

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