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The Impact of Big Data Analytics Capabilities on Sustainable Performance: an Application to Culinary and Fashion SME's

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Abstract

Using the analytical capabilities of Big Data, this research investigates the mechanisms by which sustainable performance helps create sustainable value. The research also looks at how supply chain management capabilities (SCMC) and circular economy practices (CEP) act as mediators in influencing sustainable performance. The focus of this research is micro, small, and medium enterprises (MSMEs) operating in Central Java in the food and fashion industries. This study used purposive sampling method and took 100 samples from the respondent population. Data were collected through questionnaires and then processed through path analysis using SPSS version 25. The results of the path analysis conducted, it can be seen that the Big Data Analytic Capabilities variable has a direct influence on Sustainable Performance through the mediating variables of Supply Chain Management and Circular Economy Practices.

***Keywords*: Big Data Analytics Capabilities, Supply Chain Management Capabilities, Circular Economy Practices, Sustainable Performance**

1. INTRODUCTION

Current academic trends, regarding the impact of information technology (IT) on organizational performance, suggest that IT tools should be used in combination with other organizational capabilities to achieve superior performance (Rai et al., 2006). In this regard, our research proposes a model that explains the network of interdependent relationships through which BDAC contributes to value creation. This research is based on two mediating variables: (1) supply chain management capabilities (SCMC), which enable firms to identify,

utilize, and aggregate resources and information to support supply chain (SC) activities (Wu et al., 2006); and (2) circular economy practices (CEP), which are practices that transform traditional linear production into a cyclical model (Shafiq, 2020).

Supply chain (SC) researchers are calling for expanded research on how utilizing big data analytics (BDAC) capabilities can impact supply chain management (SCMC) capabilities. In addition, there is a need to better understand the relationship between data-driven supply chains and the circular economy (Del Giudice et al., 2021). A previous study of Spanish companies found that big data analytics capabilities do not directly influence sustainability performance, but through supply chain management capabilities and circular economy practices. Therefore, this research is expected to provide academic, technical and managerial insights into how different organizational capabilities, enabled by Big Data, can be the basis of new sustainable business models. Therefore, the application of big data analytics capabilities aims to support the sustainable performance of MSME businesses in the culinary and fashion sectors by paying attention to aspects of management capabilities and supply chain management practices. Developing, survive and excel in the context of increasingly fierce and intense business competition.

This research starts from two issues: business phenomena and research gaps to contribute to building an integrated conceptual model for each variable used. In addition, this research is also expected to have a positive impact on the business world, especially culinary and fashion MSMEs in Central Java, and become a solution for the government in providing stimulation and relief that can improve performance. MSMEs in Central Java.

2. LITERATURE REVIEW

2.1 Big Data Analytics Capabilities

Big Data Analytics Capability addresses an organization's ability to provide insights by using data management, infrastructure, and talent to transform businesses into competitive resources (Mikalef et al., 2018). Therefore, Big Data Analytics Capability is identified as a group of measurable and non-quantifiable capabilities (Al Nuaimi et al., 2021). In this study, the evaluation of Big Data Analytics Capability is conducted through several factors, such as the ability of parallel computing in managing large data volumes, real-time assessment of data and information, the ability to process semi-structured and unstructured data, data accuracy and correctness, data-driven intelligence, good infrastructure and facilities, the ability to exchange services, and personnel skilled in analyzing data.

2.2 Sustainable Performance

The "three pillars" concept of Sustainable Performance is a major focus in the literature, describing the triple bottom line performance dimensions of economic, environmental, and social aspects (Purvis et al., 2019). Finally, social performance refers to corporate actions that provide benefits to human resources and society, such as community welfare or employee health (Nursimloo et al., 2020).

Previously, in the literature, significant attention was found regarding the extent to which Big Data Analytics Capabilities affect a firm's Sustainable Performance (Raut et al., 2019). Some authors have developed this view regarding Big Data Analytics Capability, arguing that its application can improve overall performance (Akter et al., 2016).

In terms of environmental performance, Al Nuaimi and colleagues (2021) highlighted three fundamental forms of big data exploitation: (1) data processing to demonstrate regulatory compliance; (2) big data analysis to address environmental challenges; and (3) modeling and testing different production transformations and resource use to reduce environmental impacts. Finally, in the context of social performance, a data-skilled workforce can utilize advanced analytical tools with big data to manage social issues, such as human safety, well-being, and community development (Shafiq et al., 2020).In this study, Sustainable Performance is assessed through several indicators, including economic performance, social performance, and environmental performance.

2.3 Supply Chain Management Capabilities

Circle Economy practices aim to transform linear production and consumption models into circular patterns, implemented through specific actions and practices (Schroeder et al., 2019). They propose six groups of internal Circle Economy practices based on commonalities and context: (1) Management initiatives: By sharing big data, the development and monitoring of reliable Circle Economy indicators by all parties involved becomes possible, thus ensuring openness across organizational boundaries (Kristoffersen et al., 2021b). (2) Economic initiatives: This dimension considers profitable business opportunities from Circle Economy practices. (3) Cleaner production: Big data analytics enable real-time and predictive decision-making about clean practices, such as scheduled maintenance or optimization of material and energy use (Kristoffersen et al., 2020). (4) Product development: The closed-loop model, suggested by the Circle Economy Practices, entails sharing widely traceable and trustworthy data on the product lifecycle among all stakeholders (Chiappetta Jabbour et al., 2019). In this study, Circle Economy Practices were evaluated using several indicators, including Governance Initiatives, Economic Initiatives, Cleaner Production, Product Development, and Management Support.

2.4 Circuar Economy Practices

Circle Economy practices aim to transform linear production and consumption models into circular patterns, implemented through specific actions and practices (Schroeder et al., 2019). They propose six groups of internal Circle Economy practices based on commonalities and context: (1) Management initiatives: By sharing big data, the development and monitoring of reliable Circle Economy indicators by all parties involved becomes possible, thus ensuring openness across organizational boundaries (Kristoffersen et al., 2021b). (2) Economic initiatives: This dimension considers profitable business opportunities from Circle Economy practices. (3) Cleaner production: Big data analytics enable real-time and predictive decision-making about clean practices, such as scheduled maintenance or optimization of material and energy use (Kristoffersen et al., 2020). (4) Product development: The closed-loop model, suggested by the Circle Economy Practices, entails sharing widely traceable and trustworthy data on the product lifecycle among all stakeholders (Chiappetta Jabbour et al., 2019). In this study, Circle Economy Practices were evaluated using several indicators, including Governance Initiatives, Economic Initiatives, Cleaner Production, Product Development, and Management Support.

2.5 Theoritical Framework

The following is the framework used in this study:

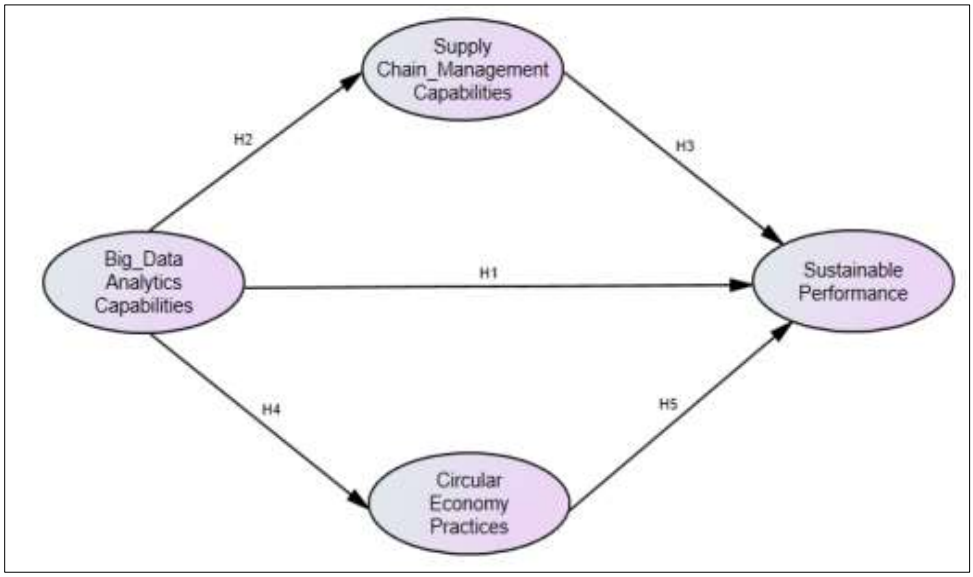

Figure 1. Theorotical Framework

Source: Processed Data

2.6 Hypothesis

The hypothesis formulation in this study is as follows:

H1 : Big Data Analytics Capabilities have a positive impact on Sustainable Performance.

H2 : Big Data Analytics Capabilities have a positive impact on Supply Chain Management Capabilities

H3 : Supply Chain Management Capabilities positively mediate the relationship between Big Data Analytics Capabilities and Sustainable Performance.

H4 : Big Data Analytics Capabilities have a positive impact on Circular Economy Practices.

H5 : Circular Economy Practices positively mediates the relationship between Big Data Analytics Capabilities and Sustainable Performance.

3. RESEARCH METHOD

The type of research conducted is quantitative descriptive research which takes the basis on the view that reality is something concrete, can be seen with the human senses, can be grouped by type, form, and behavior, does not change, and can be measured and verified (Sugiyono, 2020).

The population in this study consists of MSMEs in the culinary and fashion sectors operating in the Central Java region. As a sampling method, based on the guidelines provided by Hair (2022) which suggests using a minimum of 100 samples, this study chose to use 100 respondents who are owners or managers of MSMEs in a number of cities in Central Java. These cities include Pati, Rembang, Kudus, Semarang Regency, Boyolali, Salatiga, Semarang City, Demak, Kendal, Surakarta, Wonogiri, Karanganyar, Pemalang, Brebes, and Tegal.

The data collected in this study came from using a questionnaire as a tool, using both closed and open questions. The statements in this questionnaire are scored using a scale of 1-5 to produce data that has an interval nature and is given a score or value according to the guidelines provided by Hair et al. (2022). In this study, the collected data were analyzed using the path analysis method. Path analysis, as explained by Ghozali (2013), is used to test the effect of variables that act as intervening variables. This path analysis is an extension of multiple linear regression analysis and is used to evaluate the causal relationship between variables (causal models) that have been previously determined.

4. RESULT AND DISCUSSION

4.1 Validity Test

The testing technique for the validity test in this study is to use the Pearson Bivariate correlation (Pearson Moment Product). The research results are said to be valid if the

calculated r value is greater than the specified r table value (count> r table). In this study, the validity test results were obtained as follows:

Table 1. Validity Test

Variable	Question Item	r count	r table	Result
Big Data Analytic Capability	Item 1	0,778	0.1966	Valid
	Item 2	0,829		Valid
	Item 3	0,805		Valid
	Item 4	0,847		Valid
	Item 5	0,725		Valid
	Item 6	0,871		Valid
	Item 7	0,875		Valid
	Item 8	0,856		Valid

Source: processed data

Table 2. Validity Test of M2

Variable	Question Item	r count	r table	Result
Supply Chain Management	Item 1	0,833	0.1966	Valid
	Item 2	0,833		Valid
	Item 3	0,809		Valid
	Item 4	0,864		Valid

Source: processed data

Table 3. Validity Test of M2

Variable	Question Item	r count	r table	Result
Circular Economy Practices	Item 1	0,829	0.1966	Valid
	Item 2	0,795		Valid
	Item 3	0,829		Valid
	Item 4	0,849		Valid
	Item 5	0,844		Valid
	Item 6	0,820		Valid

Source: processed data

Table 4. Y Validity Test

Variable	Question Item	r count	r table	Result
Sustainable Performance	Item 1	0,836	0.1966	Valid
	Item 2	0,820		Valid
	Item 3	0,860		Valid

Source: processed data

Based on the validity test results, the question items for all variables are declared valid.

4.2 Reliability Test

A questionnaire is said to be reliable or reliable if someone's answer to a question is consistent or stable over time. The decision making for reliability testing is that a construct or variable is said to be reliable if it provides a Cronbach's Alpha value> 0.7. In this study, the reliability test results were obtained as follows:

Table 5. Reliability Test

No	Variable	Chronbach Alpha	Result.
1	*Big Data Analytic Capability*	0,729	Reliable
2	*Supply Chain Management*	0,825	Reliable
3	*Circular Economy Practices*	0,804	Reliable
4	*Sustainable Performance*	0,842	Reliable

Source: processed data

Based on the reliability test results, all variables can be declared reliable.

4.3 Normality Test

The normality test aims to test whether in the regression model, the dependent variable and the independent variable both have a normal distribution or not. The basis for decision making is seen from the value of Asyim. Sig on the results of the Kolmogoov-Smirnov calculation, where the value must be> 0.05 so that it can be said that the data is normally distributed. The following are the results of the Kolmogorov-Smirnov normality test:

Table 6. Normality Test

Test	Sig.	Alpha	Result
Kolmogorov-Smirnov	0,058	0,05	The data is normally distributed

Source: processed data

Based on the results of the normality test, it can be concluded that the data is normally distributed.

4.4 Multicolinearity Test

Multicollinearity test is intended to test whether the regression model finds a correlation between independent variables. The multicollinearity test results can be seen in the following table:

Table 7. Multicollinearity Test

No	Variable	Tolerance	VIF	Result
1	*Big Data Analytic Capability*	0,845	1,183	Multicollinearity does not occur
2	*Supply Chain Management*	0,884	1,132	
3	*Circular Economy Practices*	0,866	1,154	

Source: processed data

Judging from the test results above, the three variables have a tolerance value of more than 0.10 and a VIF value of less than 10, it can be concluded that the data does not occur multicollinearity.

4.5 Heterocedasticity Test

The test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. The results of the heteroscedasticity test can be seen in the following scatterplot graph:

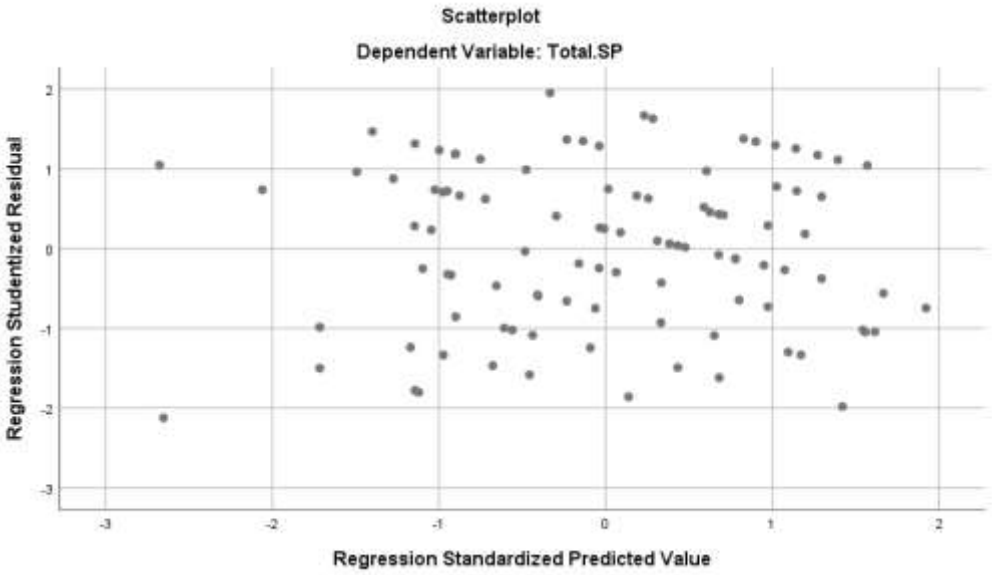

Figure 2. Heteroscedasticity Test Results

Source: processed data

Based on the picture above, it can be seen that the plots contained in the image spread randomly, so it can be concluded that the data does not occur heteroscedasticity.

4.6 Path Analysis Test

Path analysis is used to test the effect of intervening variables. Path analysis is an extension of multiple linear regression analysis, or path analysis is the use of regression analysis to estimate the causal relationship between variables (causal models) that have been previously determined. The following are the results of the path analysis in this study:

Table 8. Analysis Results

Hypothesis	Coefficient	Std. Error	t	Sig.
Big Data Analytics Capabilities have a positive impact on Sustainable Performance	0,3682	0,069	53,2483	0,000
Big Data Analytics Capabilities have a positive impact on Supply Chain Management Capabilities	0,5037	0,077	65,2049	0,000

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Hypothesis	Coefficient	Std. Error	t	Sig.
Supply Chain Management Capabilities positively mediate the relationship between Big Data Analytics Capabilities and Sustainable Performance.	0,2295	0,0829	2,7696	0,0067
Big Data Analytics Capabilities have a positive impact on Circular Economy Practices	0,7542	0,0141	53,6316	0,000
Circular Economy Practices positively mediates the relationship between Big Data Analytics Capabilities and Sustainable Performance	0,1884	0,0455	4,1391	0,001

Source: processed data

From the results of the path analysis above, the analysis model in the study is obtained as follows:

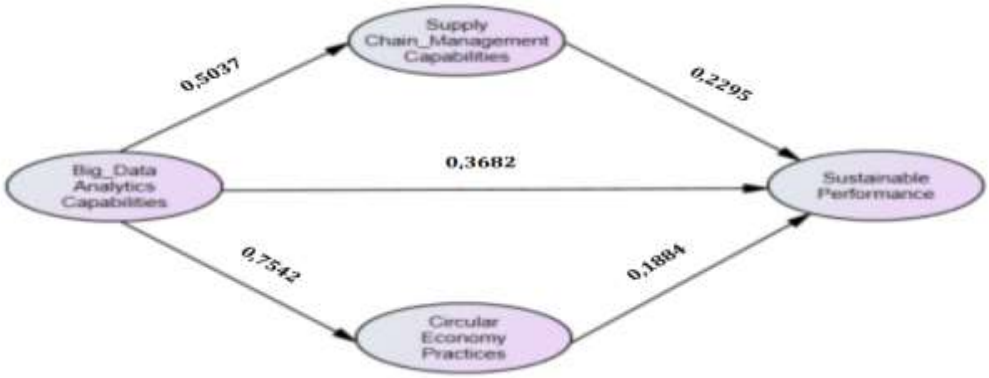

Figure 3. Analysis model

Source: data processed

To see the direct and indirect effects can be seen through the table below:

Table 9. Direct Effect

Variable	Coeff.	Se	T	p
BDAC-SP	0,1105	2,5160	53,2483	0,0135

Source: data processed

Table 10. Indirect Effect

Variabel	Data	Se	Result
SCMC, CEP	0,2577	0,0450	5,7266
SCMC	0,1156	0,0358	3,229
CEP	0,1421	0,0299	4,7525

Source: data processed

From the results of the path analysis conducted, it can be seen that the Big Data Analytic Capabilities variable has a direct influence on Sustainable Performance through the mediating variables of Supply Chain Management and Circular Economy Practices of 0.1105. Furthermore, Big Data Analytic Capabilities has an indirect influence on Sustainable Performance through the mediating variables of Supply Chain Management and Circular Economy Practices of 5.7266. Through the mediating variable of Supply Chain Management, Big Data Analytic Capabilities has an indirect effect on Sustainable Performance of 3.229 while through Circular Economy Practices, Big Data Analytic Capabilities has an indirect effect on Sustainable Performance of 4.7525.

The R-Square value is used to show the magnitude of the influence of the independent variables and mediating variables on the dependent variable.

Table 11. Model Summary

R-square	Adj R-square	P
0,9760	0,9753	0,000

Source: data processed

The R-Square value of 0.9760 which shows the magnitude of the role or contribution of the Big Data Analytic Capability, Supply Chain Management Capabilities and Circular Economy Practices variables is able to explain the Sustainable Performance variable by 97.6% and the remaining 2.4% is influenced by other variables not included in this study.

4.7 Hypothesis Test

a. From the test results above, it is known that the t value of the Big Data Analytic Capabilities variable is 53.2483 with a significance value <0.05, namely 0.000, it can be concluded that Big Data Analytic Capabilities affects Sustainable Performance or H1 is accepted. This is in line with research conducted by (Shafiq et al., 2020) where Big Data Analytic Capabilities can be used by the workforce to maximize company

management so that the company's performance increases.

b. From the test results above, it is known that the t value of the Big Data Analytic Capabilities variable is 65.2049 with a significance value <0.05, namely 0.000, it can be concluded that Big Data Analytic Capabilities affects Supply Chain Management or H2 is accepted. This is in line with research conducted by (Modgil et al., 2021) where the use of Big Data can support and facilitate the supply chain activities of logistics companies.
c. From the test results above, it can be seen that the t value of the Supply Chain Management Capabilities variable is 2.7696 with a significance value <0.05, namely 0.0067, it can be concluded that Supply Chain Management mediates the relationship between Big Data Analytic Capabilities and Sustainable Performance or H3 is accepted. The results obtained are supported by the results of research conducted by (Modgil et al., 2021) where Big Data supports supply chain activities which then also affects the company's performance which also increases (Shafiq et al., 2020).
d. From the test results above, it is known that the t value of the Big Data Analytic Capabilities variable is 53.6316 with a significance value <0.05, namely 0.000, it can be concluded that Big Data Analytic Capabilities affects Circular Economic Practices or H4 is accepted. This is in line with research conducted by (SHafiq et al., 2020) where the maximum utilization of Big Data will certainly affect company management and its impact to be more effective and efficient both in economic and social terms.
e. From the test results above, it can be seen that the t value of the Circular Economic Practices variable is 4.1391 with a significance value <0.05, namely 0.001, it can be concluded that Circular Economic Practices mediates the relationship between Big Data Analytic Capabilities and Sustainable Performance or H5 is accepted. This is in line with research conducted by (Munr et al., 2020) where Circular Economy Practices, in this case supported by the use of Big data, have an influence in reducing costs which have an impact on economic performance.

5 CONCLUSİON

5.1 Conclusion

Based on the results of the analysis and discussion in this study, several conclusions can be drawn, namely as follows:

a. Big Data Analytic Capabilties has a direct and significant influence on Sustainable Performance of Culinary and Fashion MSMEs in Central Java.
b. Big Data Analytic Capabilities has an influence on Supply Chain Management of Culinary and Fashion MSMEs in Central Java

c. Supply Chain Management Capabilities has an influence in mediating Big Data Analytic Capabilities on Sustainable Performance of Culinary and Fashion MSMEs in Central Java.
d. Big Data Analytic Capabilities has an influence on Circular Economic Practices at Culinary and Fashion MSMEs in Central Java
e. Circular Economic Practices has an influence in mediating Big Data Analytic Capabilities on Sustainable Performance of Culinary and Fashion MSMEs in Central Java.
f. The two mediating variables, namely Supply Chain Management Capabilities and Circular Economic Practices, have an indirect and significant influence in mediating Big Data Analytic Capabilities on Sustainable Performance in Culinary and Fashion MSMEs in Central Java both together and individually.

5.2 Suggestion

Based on the results of the analysis and discussion in this study, the following suggestions can be made:

a. It is recommended for MSMEs in the culinary and fashion fields in the Central Java region to expand their network and the application of big data in an effort to increase the effectiveness, efficiency, and operational reach of their companies.
b. MSMEs in the culinary and fashion sector in Central Java should organize training for human resources working in their companies, especially related to the use of big data, in order to better support company operations.

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