

Green Process Innovation on Msmes Performance Moderate Perceived Environmental Volatility: Study on Food and Beverage MSMEs in Solo City



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ABSTRACT: Based on Stakeholder Theory and Social Cognitive Theory. This research aims to determine the influence of the relationship between green process innovation on the performance of MSMEs and moderating perceived environmental volatility. This research uses a survey. Research population of MSME owners in Solo City, Indonesia. Convenience sampling was used with a sample size of 120 respondents. Data analysis used PLS-SEM version 3.0. The research results show that green transformational leadership has a significant effect on the performance of MSMEs. Green process innovation has a significant effect on the performance of MSMEs. Moderation of perceived environmental volatility in the relationship between green process innovation has a significant effect on the performance of MSMEs and has a positive but not significant effect. The current research provides useful insights into green process innovation and perceived environmental volatility that can improve MSME performance.

KEYWORDS: Green Process Innovation, MSMEs Performance, Perceived Environmental Volatility.

I. INTRODUCTION

According to Medanbisnis (2016) MSMEs are now increasingly growing, such as in the culinary, printing, crafts, and clothing sectors. The role of MSMEs in the Indonesian economy is very large, especially as they can absorb 97.22% of the total number of productive workers. It was recorded that the gross domestic product (GDP) of MSMEs reached 60.34%. The role and contribution of MSMEs in the Indonesian economy is huge. Therefore, this shows that Indonesia is still very dependent on the growth of the MSME sector and this sector is a key factor in national economic development.

Even though the MSME sector is very important for economic growth, previous research findings show that the sustainability of MSMEs remains at risk (Cicea *et al.*, 2019; Kiyabo & Isaga, 2020; Mahmudova & Kovács, 2018; Ramdan *et al.*, 2022). This study illustrates the case of small and medium enterprises in Europe and Asia facing obstacles to performance growth due to a lack of mastery of technology, human resources, and, government policies that do not favor small entrepreneurs and a lack of participation from stakeholders or companies interested in the growth of the MSME sector through providing solutions. , as well as the formation of a green economy, namely an economic and business strategy that focuses on reducing environmental risks. These factors influence the performance of MSMEs, thereby impacting the sustainability of small and medium businesses (Achi *et al.*, 2022; Tjahjadi *et al.*, 2020).

One of the things that MSME actors need to pay attention to to improve MSME performance is environmentally friendly process innovation (Achi *et al.*, 2022). Innovation is expanding to environmentally friendly process innovation in line with the increasing responsibility of companies or business actors to meet stakeholder expectations. Environmentally friendly process innovation is an innovation that allows business actors to reduce negative impacts on the environment and respond to environmentally friendly markets. In an environmentally friendly market, a company or business actor competes with environmentally friendly competitors to meet the needs of environmentally friendly customers who are aware of environmentally friendly products. The first step that companies or business actors must take in implementing environmental friendliness is implementing environmentally friendly innovation (Anggadwita *et al.*, 2014). Environmentally friendly innovations are adopted by business actors to reduce waste which has an impact on environmental damage. Green innovation emphasizes

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the creation of environmentally friendly products or processes that can meet environmental protection requirements (Valdez-Juárez et al., 2021). Through environmentally friendly innovation, business actors can develop innovations such as green managerial innovation (Wang *et al.*, 2022), green organizational innovation (Le, 2022), environmentally friendly product innovation (Tjahjadi *et al.*, 2020), and environmentally friendly process innovation (Zhang *et al.*, 2023).

Business performance is influenced by the way a company balances social, economic, and environmental interests (Hooi *et al.*, 2022). A business or business must do this because it provides benefits in environmental, social, and economic dimensions (Zhang *et al.*, 2023). In an era of continuous competition, business actors are required to continue to innovate to meet market needs (Rehman & Alsolamy, 2023). Thus, this is in line with social cognitive theory which emphasizes the importance of innovation for long-term growth (Somwethee *et al.*, 2023). Through innovation, entrepreneurs can contribute to economic growth in developing countries (Valdez-Juárez et al., 2021). Therefore, there are ongoing efforts from academics and practitioners to explain how environmentally friendly process innovations influence MSME performance (Sánchez-Infante Hernández et al., 2020; Achi et al., 2022; Ahmad et al., 2023; Hansen et al., 2023; Simmou et al., 2023).

In the era of green business, the business world must pay attention to environmentally friendly competitors. MSME owners/managers are progressively orienting themselves towards environmentally friendly markets to meet environmentally friendly consumer demands to improve MSME performance (Chen *et al.*, 2023). MSME performance is the final result of business actors' efforts in managing resources (Wang *et al.*, 2022). Environmentally friendly innovation practices enable business actors to develop capabilities that lead to improved performance (Zheng & Zhang, 2023). Environmentally friendly innovation will improve performance consisting of financial and non-financial performance (Achi *et al.*, 2022). Improved environmental performance is the result of environmentally friendly process innovation implemented by a company (Opazo-Basáez *et al.*, 2024). Environmentally friendly practices implemented by companies or business actors will increase competitiveness thereby making business better (Mariyamah et al., 2020). Thus, this is in line with social cognitive theory which emphasizes the importance of innovation for long-term growth (Le, 2022). Through innovation, the performance of MSMEs can contribute to economic growth in developing countries.

This research was conducted on MSME owners in the city of Solo in the culinary food and beverage sector which is a source of economic growth in the city area. The potential for culinary MSMEs in the city of Solo is estimated to grow by around 15% in 2023 (Solo-Pos, 2023). There are currently many platforms that bridge MSMEs in the City of Solo, including the Solo Creative Hub, Solo Techno, Hetero Space, and Lokananta Records, which are collaborations between MSME players, government, communities, and educational institutions, thereby creating an ecosystem for the growth of MSMEs in the City of Solo. The phenomenon of this research being carried out cannot be separated from the phenomenon that the gross regional domestic product (GRDP) in Solo City has increased with growth of around 6.25% since 2020-2023, which is dominated by MSME players in the food and beverage industry. According to Bank Indonesia (2023), Solo City's economic growth in 2023 is estimated to be higher than Central Java, following the large number of performances held in the area. Every weekend in the city of Solo, activities never stop involving hundreds of MSMEs in various regions, as well as the participation of MSMEs from various Ministries/Institutions.

This research uses a stakeholder theory and social cognitive theory approach. The environmentally friendly process innovation variable is a capability utilized by business actors to balance and harmonize perceived changes in the environment to improve business performance. Therefore, this research makes three contributions to the field of management. First, responding to the ongoing call for additional research on green process innovation in developing country contexts (Sánchez-Infante Hernández et al., 2020; Achi et al., 2022; Ahmad et al., 2023; Hansen et al., 2023). Second, the mechanism of the effect of perceived environmental volatility on MSME performance (Ramdan et al., 2022). There are still inconsistent research results on green process innovation on MSME performance (Achi *et al.*, 2022; Ahmad *et al.*, 2023). Third, the contingency role of perceived environmental volatility in the relationship between environmentally friendly innovation processes and MSME performance, thereby presenting a more balanced perspective that has so far been limited to developing countries such as Indonesia.

II. LITERATURE REVIEW

Stakeholder Theory and Social Cognitive Theory

Stakeholder theory is one of the theories most frequently exploited in the field of sustainability-oriented management (Le, 2023). According to Freeman's stakeholder theory, (1984) the relationship between business and stakeholders is two-way and closely related to achieving common goals. Therefore, a company's output affects several of its stakeholders. In this context, stakeholder-oriented management practices deliberately pay attention to stakeholders regarding sustainability aspects

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(economic, social, and environmental). Therefore, this has a positive and active impact on cooperation and collaboration between stakeholders and the green business world (Achi *et al.*, 2022; Chen *et al.*, 2023). Social cognitive theory emphasizes the dynamic interaction between people (personal factors), their behavior, and their environment. In this case, the social cognitive theory is the most relevant to the current research context which shows that this theoretical perspective is adopted to investigate different aspects of green market orientation, and environmentally friendly process innovation. Social cognitive theory is a theory that combines mental, personal, and environmental behavioral influences to explain human behavior. During the COVID-19 pandemic, social cognitive theory provides a perspective on the relationship between perceived fear and environmentally friendly practices carried out by various companies, explaining how the pandemic situation encourages small and medium businesses to comply. Environmentally friendly practices and green market orientation guarantee the safety of the world of small and medium businesses (Wahyono *et al.*, 2021).

Hypothesis

Green innovation refers to product and process innovation that involves energy savings, pollution prevention, waste recycling, and environmentally friendly product design (Aftab *et al.*, 2023). A company produces environmentally friendly product innovations to comply with environmental regulations and increase competitiveness (Cicea *et al.*, 2019). A company adopts green innovation to reduce waste generated by the production process. Environmental action which is part of a sustainable program has a very important role in improving environmental, social, and economic performance (Tjahjadi *et al.*, 2020). A company will generate higher profits by developing, producing, and selling environmentally friendly products that provide environmental and social benefits (Simmou *et al.*, 2023). Valdez-Juárez & Castillo-Vergara, (2021) research on manufacturing and service companies empirically proves that environmentally friendly innovation practices improve environmental performance and company performance. Research by Achi *et al.*, (2022) in the manufacturing industry revealed that environmentally friendly product innovation drives cost efficiency and company profitability. Environmentally friendly process innovation has a direct and positive effect on organizational and environmental performance (Hsu *et al.*, 2023). Environmentally friendly innovation should be implemented because it provides strategic opportunities for companies. In short, the better the higher the green innovation, the higher the business performance. Based on the discussion above, it is hypothesized as follows:

H1: green process innovation has a positive effect on the performance of MSMEs.

Environmental volatility conditions the deployment of capabilities aimed at environmental strategies and improving firm performance (Li *et al.*, 2021; Zheng *et al.*, 2021). Companies are limited by the possibility of environmental volatility which ultimately influences strategic actions (Kiyabo *et al.*, 2020). Environmental volatility refers to the rate and amount of rapid change in a company's external environment (Ruzita, 2010; Aftab *et al.*, 2023). These changes can occur in aggregate market demand and supply, customer preferences, and/or technology, thereby creating anxiety, anxiety, and risk for companies operating in such environments (Joshi *et al.*, 2013; Cicea *et al.*, 2019). This rapid change makes it difficult for companies to make accurate projections regarding results (Achi *et al.*, 2022). Previous research argues that the higher level of damage in the environmental economy is inversely proportional to performance outcomes (Zheng *et al.*, 2021). This is because a turbulent environment makes it a challenge for businesses to initiate change, develop appropriate responses to counter its effects, and adapt practices (Chen *et al.*, 2023). Many companies in volatile environments become sluggish, making it difficult to identify market opportunities and implement sustainable environmental practices that may not directly determine short-term business success (Sánchez-Infante Hernández *et al.*, 2020; Le, 2022).

Therefore, this study argues that environmental volatility is highly volatile. Companies in developing countries have limited access to market information to support decision-making regarding environmental practices (Hsu & Chen, 2023; Xu & Liu, 2023). So predicting that this will occur in fluctuating environmental conditions, limited access to resources, and dispersion of capabilities will reduce the assumed benefits of CSR on performance results, through environmentally friendly process innovation (Achi *et al.*, 2022). This shows that environmental volatility will conditionally moderate the mechanism mediated by environmentally friendly process innovation on the relationship between MSME performance so that there is a stronger mediated effect when perceived environmental volatility is low. Based on the discussion above, it is hypothesized as follows:

H2: perceived environmental volatility negatively moderates the relationship between environmentally friendly process innovation and MSME performance

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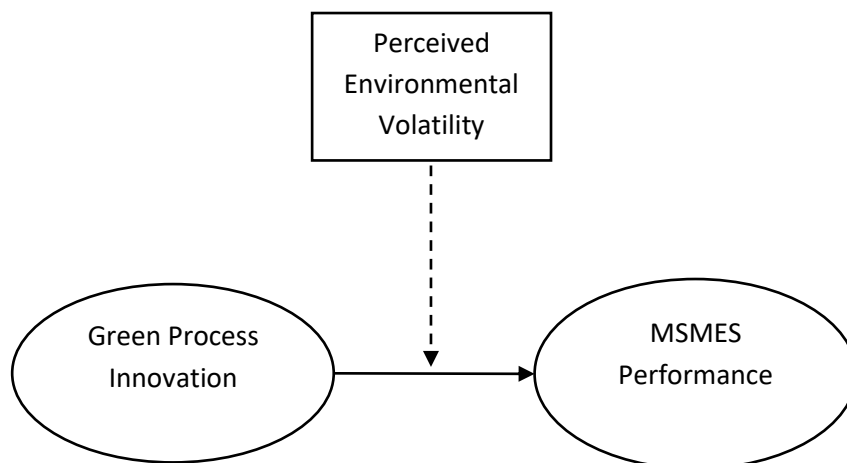


Figure 1. Research Model

III. RESEARCH METHODS

This research was designed as quantitative research with a survey method. The research population is the owners of MSMEs in Solo City, Indonesia. The research sampling method is non-probability with a convenience sampling technique. The reason for using this technique is to obtain available samples quickly and via google form. The total research sample was 120 respondents.

The questionnaire is divided into two parts. The first section includes the user's personal information about socio-demographics such as age, gender, education and income. The second part consists of data about the main variables in this research such as green process innovation, perceived environmental volatility and, MSMEs performance. Green process innovation was measured using 5 question items adapted from Thanh Tiep Le (2022). Gre perceived environmental volatility was measured using 3 question items adapted from Achi et al., (2022). MSMEs performance was measured using 4 question items adapted from Achi et al., (2022). Responses to each question item were obtained using a 5 point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

Data were analyzed through descriptive statistical analysis using the statistical software SmartPLS 3.0. We used structural equation modeling to test the seven hypotheses of this study collectively and provide the path coefficients.

IV. RESULTS

The research was conducted using a survey distributed to a target of 120 respondents. Based on gender, it can be seen that the number of male respondents was 48 people and the number of female respondents was 72 people or 60%. Based on education level, it can be seen that there were 54 respondents with a junior high school education level, 20 respondents with a senior high school education level, and 46 respondents with a bachelor's education level. It can be seen that there were 36 respondents aged 17-25 years, respondents aged 26-35 years there were 48 people, 36 respondents aged over 36 years, 70 respondents with incomes below 50 million, 41 respondents with incomes of 50-200 million, 9 respondents with incomes above 350 million.

Table 1. Demographics of Respondent

Description	Description	Amount	Percentage
Gender	Man	48	40%
Gender	Woman	72	60%
Education	Junior High School	54	45%
Education	Senior High School	20	16.7%
Education	Bachelor	46	38,3%
Income	<50 Million	70	58,3%
Income	50>200 Million	41	34,2%
Income	>350 Million	9	7,5%
Age	17-25 Years	36	30%
Age	26-35 Years	48	40%

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Age	>36 Years	36	30%
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Evaluation of the Measurement Model (Outer Model)

Data analysis was carried out using PLS-SEM via SMART PLS Version 3.0 software. The testing process was carried out in 3 stages including internal consistency reliability, convergent validity and discriminant validity. The results of internal consistency reliability testing were carried out using Cronbach Alpha. The test results in the table above show a reliability value above 0.7. Hair et al., (2017) stated that a Cronbach alpha score above 0.7 is in the very good category. Thus, overall it can be concluded that all variables passed the internal consistency reliability test. Convergent validity testing is carried out by looking at the Reliability Indicator (Outer Loading) value and the AVE (Average Variance Extracted) value. Hair et al., (2017) states that the standard outer loading value is very good if it has a score above 0.7 and the standard AVE value above 0.5 has very good criteria. The results of convergent validity testing can be seen in the following table:

Table 2. Internal Consistency Reliability Testing

Variable	Cronbach Alpha	Description
Green Process Innovation	0.746	Very good
MSMEs Performance	0.740	Very good
Perceived Environmental Volatility	0.824	Very good

Based on the table above, it is known that the loading factor value produced by each indicator is > 0.7 . Four measurement items do not meet the minimum criteria for the convergent validity test, namely GPI1, GPI4, GPI5, and P2, but are still retained for use because the AVE value in the validity test results meets the criteria > 0.5 . Hair et al., (2017) stated that indicators with loadings between 0.40 and 0.70 should be considered for removal or not from the scale by looking at the composite reliability results or the average variance extracted (AVE) above the recommended cut-off value, namely > 0.5 . In this way, these indicators are declared valid as measures of latent variables. Furthermore, the discriminant validity test using the Fornell-Larcker criteria (Hair et al., 2017) showed the highest cross-loading correlation value. Test results can be seen in the following table:

Table 3. Convergent Validity Test

Variable	Indicator	Loading Factor	Composite Reliability	AVE
Green Process Innovation	GPI1	0.472	0.831	0.507
	GPI2	0.844		
	GPI3	0.869		
	GPI4	0.634		
	GPI5	0.663		
MSMEs Performance	P1	0.748	0.834	0.558
	P2	0.637		
	P3	0.742		
	P4	0.847		
Perceived Environmental Volatility	PEV1	0.831	0.894	0.738
	PEV2	0.835		
	PEV3	0.909		

Table 4. Discriminant Validity

Variable	Green Process Innovation	MSMEs Performance	Perceived Environmental Volatility
Green Process Innovation	0.712		
MSMEs Performance	0.639	0.747	
Perceived Environmental Volatility	0.653	0.650	0.859

Inner Model Evaluation

After estimating the model meets the validity of convergent and also the criteria of discriminant validity, the step to do after is to get the structural model tested. Evaluation of this model are able to be applied by seeing at the determination coefficient

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or R-square. The higher the value of R-square, the better the proposed research model of prediction model. The results of the R-square value is visualized in table 6.

Table 6. R-square

Variable	R Square
MSMEs Performance	0.514

The good thing of the fit model in the analysis of PLS is seen from the R-square. Each endogenous variable with a value such as the MSMEs Performance variable is 0.514 or (51.4%). MSMEs Performance is influenced by the green process innovation, and perceived environmental volatility.

Hypothesis Testing

The next step after evaluating the measurement model is evaluating the structural model to test the previously proposed hypothesis. This analysis was carried out by testing the direct and indirect influence between the hypothesized variables. The following are the results of the PLS-SEM analysis:

Table 8. Hypothesis Results

Hypothesis	Original Sample	T Statistics	P Values	Decision
Green Process Innovation -> MSMEs Performance	0.433	4.454	0.000	Rejected
Moderating Effect 1 -> MSMEs Performance	0.098	1.512	0.131	Accepted
Perceived Environmental Volatility -> MSMEs Performance	0.452	4.309	0.000	Accepted

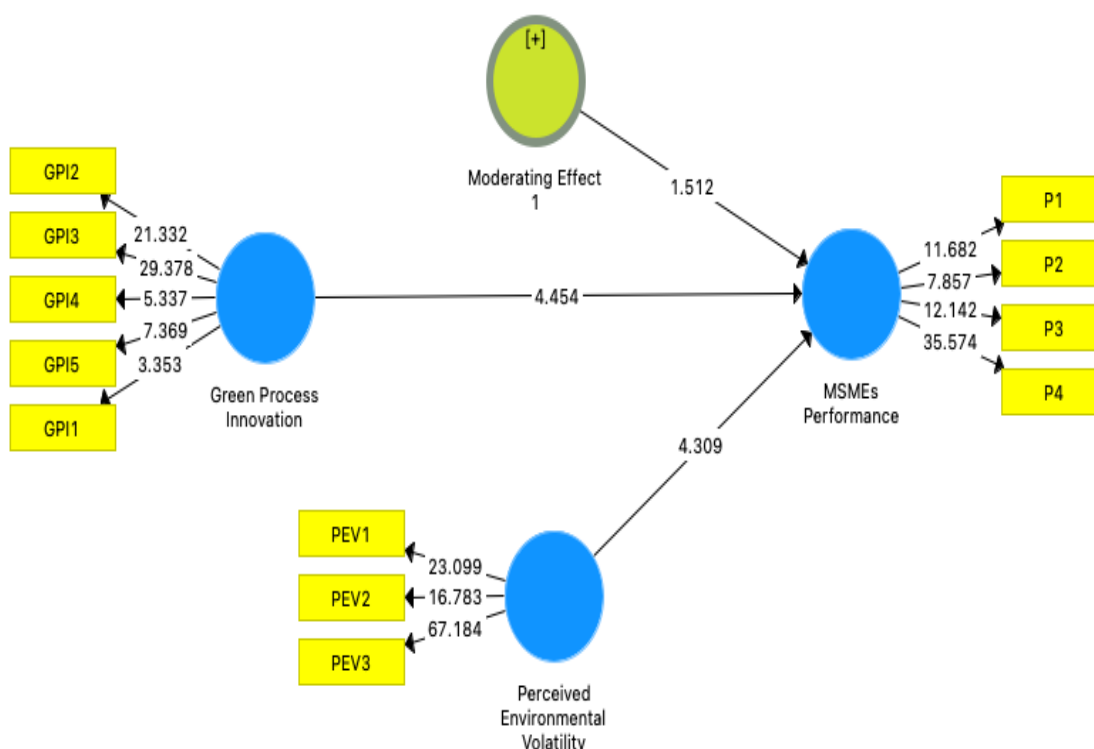


Figure 2. Smart PLS Output

The results of hypothesis testing use a confidence level of 95%, so the standard used for the calculated t-value is 1.96. The t-test value is greater than 1.96 and the p-value is below 0.05, so it can be concluded that the hypothesis is accepted. Hypothesis 1 proposed in the research has a t-test value greater than 1.96 and a p-value below 0.05, so it can be concluded that all hypothesis 1 can be accepted. Hypothesis 2 shows that the moderation results have a t-test value below 1.96 and a p-value above 0.05, so it can be concluded that hypothesis 2 is rejected or the influence of green process innovation on MSMEs performance which is moderated by perceived environmental volatility is not accepted.

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V. DISCUSSION AND CONCLUSIONS

This research investigates the green process innovation model for MSMEs' performance moderated by perceived environmental volatility. The total effects model supports the proposed hypothesis 1 except for the moderation effect. This study shows that green process innovation can improve MSME's performance. In taking a dynamic capabilities approach, research findings show that MSME capabilities must be used to develop green process innovation to encourage MSME performance (Tjahjadi et al., 2020; Valdez-Juárez et al., 2021; Hsu et al., 2023). This can be achieved by utilizing the capabilities obtained from the development and implementation of effective and efficient green process innovation. Furthermore, to the best of our knowledge, this is the first study to introduce green process innovation as an independent way to determine MSMEs performance in Indonesia. Furthermore, research findings also increase the number of studies that explore the need for perceived environmental volatility in MSMEs environments (Ruzita, 2010; Zheng et al., 2021). This research is new in showing that perceived environmental volatility acts as a moderator between the relationship between green process innovation and MSMEs performance. Specifically, the findings of this research reveal that perceived environmental volatility has a positive effect on the indirect relationship between green process innovation and MSME's performance (Achi et al., 2022). The research results show that this indirect relationship is stronger with low perceived environmental volatility. This shows that the gradual improvements needed to improve MSMEs' performance and overcome volatile environmental demands can be implemented through green process innovation at low costs. This can be attributed to the nature of other developing countries, where MSMEs are much more comfortable when operating in an environment with little volatility.

VI. LIMITATIONS AND FUTURE RESEARCH

This research has several limitations that could be opportunities for further research. This research adopted a previous research questionnaire given to MSME owners. Therefore, these findings cannot be generalized to different contexts and countries. Researchers can take other countries and contexts in the future, and the results can be compared. This study was cross-sectional, and data were collected at the same time. Apart from that, the volatility concept is a new idea that has been applied to MSMEs (Tjahjadi et al., 2020; Ahmad et al., 2023; Hsu et al., 2023), and it is hoped that long-term results can be obtained so that longitudinal studies can be carried out. This research considers the quantitative side of collecting respondent data. In the future, researchers can triangulate data sources by using qualitative insights to conduct interviews with respondents regarding the reasons for their responses. This study did not consider gender, age, or experience as moderating variables. Apart from that, future research could examine the role of considering green knowledge management variables and green market orientation (Tjahjadi et al., 2020; Khan et al., 2024).

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