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Cognitive Bias and the Quality of Managerial Strategic Decision-Making Senior PTPN VI in Jambi Province: An Experimental Study of Overconfidence and Anchoring Effect in FFB Price Decisions and Plantation Expansion

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ABSTRACT

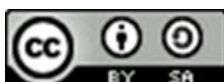
The quality of strategic decision-making is one of the factors that determines an organization's success in facing a dynamic and uncertain business environment. In the palm oil plantation industry, decisions regarding Fresh Fruit Bunch (FFB) pricing and plantation expansion are often influenced by various economic, regulatory, and managerial factors. PTPN VI manages more than 80,000 hectares of oil palm and rubber plantations and partners with thousands of smallholders, operating in an increasingly complex environment due to global CPO price volatility and regulatory pressures from the EU Deforestation Regulation (EUDR) 2023. The study used a mixed-methods design with a sequential explanatory approach, involving 60 senior managers from five units and divisions of PTPN VI Jambi through a decision scenario experiment based on actual data for the 2019-2024 period and a qualitative think-aloud protocol. Five hypotheses were formulated to test: (1) the effect of overconfidence on projection accuracy; (2) the effect of the anchoring effect on the quality of investment decisions; (3) the moderating role of cognitive diversity in the top management team (TMT); (4) the conditions for moderation effectiveness; and (5) the effectiveness of the behavioral debiasing protocol. The results are expected to produce a specific cognitive bias profile, empirical evidence of TMT moderation, and a contextual debiasing protocol that can be immediately implemented in the RKAP cycle and PTPN VI strategic meetings

Keywords: anchoring effect, behavioral strategy, cognitive bias, debiasing protocol, overconfidence, strategic decision making, PTPN VI

INTRODUCTION

PTPN VI is a state-owned plantation company (BUMN) that manages more than 80,000 hectares of oil palm and rubber plantations in Jambi Province and partners with thousands of smallholder farmers in Muaro Jambi, Batang Hari, Merangin, and Sarolangun Regencies. As the largest plantation company in Jambi, PTPN VI plays a strategic role not only in the regional economy but also in the national palm oil (CPO) supply chain, which is connected to the global market.

Currently, plantation companies face increasing challenges. The price of crude palm oil (CPO) on the global market continues to fluctuate according to global economic conditions, changes in trade policies, and the international political situation. Furthermore, companies must adapt to the European Union Deforestation Regulation (EUDR), which requires a clear traceability system for palm oil products. As a state-owned enterprise (BUMN), PTPN VI must also meet government-set performance targets.



These various conditions complicate the decision-making process, as management must consider numerous factors within a relatively short timeframe.

The main focus of this research is the recurring tendency of PTPN VI senior managers to consistently project CPO prices and FFB production targets that exceed actual realization. Data from PTPN VI's 2019–2024 RKAP (Work Plan and Budget) shows that the average quarterly FFB production projection materially missed the target. This phenomenon indicates a systematic distortion in the cognitive decision-making process, known in behavioral strategy literature as cognitive bias. This can lead to cognitive bias, a tendency to evaluate information less objectively. As a result, decisions made do not always reflect the actual situation.

PTPN VI's operational conditions create an environment structurally vulnerable to both biases. The high-pressure weekly purchase price of fresh fruit bunches (FFB) for plasma farmers encourages the dominance of intuitive thinking (System 1), which is prone to anchoring to historical prices. The annual RKAP (Regional Budget) development process, which uses the Ministry of State-Owned Enterprises' targets as the starting point for projections, creates a cognitive anchor that is difficult to remove, even when market data points in a different direction. Meanwhile, the hierarchical structure of state-owned enterprises, which tends to limit dissenting views, exacerbates the risk of groupthink in board meetings.

The behavioral strategy literature has grown rapidly in the past two decades. Powell, Lovallo, and Fox (2011) established that cognitive biases systematically distort the quality of corporate strategic decisions. Sibony (2020) developed a decision hygiene framework proven to reduce the impact of bias by 15–30% in corporate studies. Hambrick and Mason (1984), using Upper Echelons Theory (UET), demonstrated that cognitive diversity in top management teams (TMTs) has the potential to mitigate individual bias distortions.

However, these studies suffer from significant contextual limitations. First, almost all empirical studies of behavioral strategy have been conducted in the context of Western companies, with very few examining similar phenomena in the context of Southeast Asian state-owned enterprises (SOEs) operating under government control with strong hierarchical cultures. Second, research on cognitive bias in the palm oil plantation industry is almost completely absent from the literature. Third, no study has tested the effectiveness of behavioral debiasing protocols in the context of Indonesian SOEs. This study seeks to fill this gap by identifying the boundary conditions under which bias becomes more or less destructive in the specific context of Indonesian SOEs.

This study aims to: (1) identify and measure the magnitude of overconfidence bias and anchoring effect in senior managers of PTPN VI Jambi in the scenario of FFB pricing decisions and plantation expansion; (2) empirically test the influence of these two biases on estimation accuracy and strategic decision quality; (3) test the moderating role of TMT cognitive diversity; (4) measure the effectiveness of behavioral debiasing protocols; and (5) develop contextual debiasing protocols for direct implementation in the PTPN VI Jambi RKAP cycle.

Theoretically, this research contributes to the development of behavioral strategy literature in the context of state-owned enterprises (SOEs) and the Southeast Asian plantation industry. Practically, this research produces a behavioral debiasing protocol that can be directly implemented by the Board of Directors of PTPN VI. Policy-wise, these findings can inform the Ministry of SOEs in designing governance guidelines that integrate a behavioral strategy approach.

Behavioral Strategy Powell, Lovallo, & Fox, 2011, started from the premise that managers are bounded rational agents, not utility-maximizing rational actors. The quality

of the decision-making process, not the quality of the content analysis, has been shown to be the strongest predictor of strategic decision outcomes (Lovallo & Sibony, 2020).

Kahneman (2011) explains that the dominance of System 1 (fast, intuitive thinking) under conditions of time pressure and information overload results in systematic cognitive biases. Overconfidence bias is the tendency to overestimate the accuracy of one's own knowledge. The anchoring effect (Tversky & Kahneman, 1974) refers to the disproportionate influence of initial information on final estimates. According to Flyvbjerg (2021), this combination of biases results in an average cost overrun of 28% and an average benefit shortfall of 23% in large investment projects.

Hambrick and Mason (1984) stated that the cognitive characteristics of top management teams significantly influence an organization's strategic choices. TMT cognitive diversity has the potential to create a self-correcting mechanism that reduces the dominance of individual biases, but is only effective when accompanied by adequate knowledge integration mechanisms (Epstein, 2019).

Sibony (2020) developed decision hygiene as a systematic approach to reducing the impact of bias. Key components include pre-mortem analysis, reference class forecasting (Lovallo & Kahneman, 2003), devil's advocate, and dissent amplification. These interventions have been shown to reduce the impact of bias by 15–30% in corporate studies (Tetlock & Gardner, 2015).

Based on the theoretical foundation and previous research results, this study proposes five hypotheses. H1, overconfidence bias is suspected to have a negative and significant effect on the accuracy of PTPN VI Jambi senior managers in projecting CPO prices and estimating Fresh Fruit Bunches (FFB) production. H2, the anchoring effect arising from the use of previous CPO prices and RKAP targets as references is predicted to have a negative and significant effect on the quality of decisions in determining FFB purchase prices and plantation expansion decisions. H3, the diversity of ways of thinking and experience within the PTPN VI top management team is predicted to be able to reduce the negative impact of overconfidence bias and anchoring effect on the quality of strategic decision-making. H4, the influence of cognitive diversity is predicted to be more effective if the organization implements mechanisms that support the discussion and evaluation process, such as pre-mortem analysis and dissent amplification. H5, the implementation of a behavioral debiasing protocol is predicted to increase the accuracy of strategic projections and produce a better decision-making process compared to the decision-making methods currently used.

METHODS

This study employed a mixed methods approach with a sequential explanatory design, combining quantitative and qualitative methods sequentially. The first stage was an experimental study aimed at measuring the level of overconfidence bias and anchoring effect and their influence on the quality of strategic decision-making. The second stage employed a qualitative approach through think-aloud protocols (TAP) and semi-structured interviews to gain a deeper understanding of managers' decision-making processes. This approach was chosen because it can explain not only the magnitude of the influence of cognitive biases but also the reasons why they arise in the decision-making process (Afroze & Sarker, 2025; Rau & Bromiley, 2025).

This research is grounded in the post-positivism paradigm, which views strategic decisions in organizations as influenced by various complex factors that cannot be explained solely through statistical analysis. Therefore, a combination of quantitative and qualitative approaches is deemed more appropriate for examining behavioral strategy

phenomena, particularly in understanding how overconfidence bias and the anchoring effect influence managerial decisions in uncertain situations (Rau & Bromiley, 2025; Kremena & Honchar, 2025).

The research population includes all senior managers and middle managers of PTPN VI Jambi Province who are involved in the preparation of the Company Work Plan and Budget (RKAP), the determination of the purchase price of Fresh Fruit Bunches (FFB), and the planning of plantation expansion. Based on the company's organizational structure, the population is estimated to be around 150 people spread across five districts and work divisions. Respondents were selected using a purposive sampling technique with the following criteria: (1) holding a minimum position of assistant head, (2) having a minimum of five years of service, and (3) being directly involved in the strategic decision-making process that is the focus of the research.

The sample size was set at 60 respondents, distributed proportionally across District I Muaro Jambi, District II Batang Hari, District III Merangin–Sarolangun, the Finance and Strategic Planning Division, and the Business Development Division. This sample size met the requirements for multiple regression analysis because the number of respondents was deemed sufficient to test the relationships between variables in experimental research (Grežo, 2021).

The research instrument consists of four main parts. First, an experimental scenario compiled based on PTPN VI operational data for the 2019–2024 period. The scenario includes projections of CPO prices and FFB production to measure overconfidence bias, plantation expansion investment decisions to measure the anchoring effect, and a simulation of FFB pricing. Second, the variable measurement instruments, namely the Brier Score to measure the level of overconfidence bias, the Anchoring Index to measure the strength of the anchoring effect, a strategic decision accuracy score, and a decision quality assessment checklist referring to the concept of decision hygiene. Third, a think-aloud protocol guide was used to record respondents' thought processes while completing the experimental scenario. Fourth, a semi-structured interview guide was used to explore respondents' reasons, considerations, and experiences in making strategic decisions.

Data collection was conducted over eight weeks in three stages. The first stage began with a pre-test and instrument pilot testing on a number of managers as initial respondents. The second stage was the main experiment, in which all respondents completed three decision scenarios individually or in groups. During this stage, some respondents also participated in a think-aloud protocol session and in-depth interviews. The third stage involved providing a behavioral debiasing intervention through brief training aimed at helping respondents recognize and reduce the influence of cognitive biases in the decision-making process. The behavioral debiasing approach was chosen because it has been proven to improve the quality of managerial decisions and reduce errors caused by overconfidence and anchoring (Sekhar, 2026; Kremena & Honchar, 2025).

Quantitative data analysis was conducted using SPSS 26 and SmartPLS 3. The analysis stages included descriptive statistics, classical assumption tests, hierarchical regression to examine the influence of overconfidence bias and anchoring effect, Moderated Regression Analysis (MRA) to examine the moderating role of cognitive diversity in top management teams, and paired sample t-tests supplemented with Cohen's *d* calculations to evaluate the effectiveness of behavioral debiasing interventions. The selection of these analysis techniques was adjusted to the research objectives, which sought to determine direct and moderated relationships between variables (Grežo, 2021; Kocoglu & Mithani, 2024).

Qualitative data were analyzed using thematic analysis through coding, grouping themes, reviewing themes, and drawing conclusions. To enhance the credibility of the research results, member checking was conducted with several key respondents and inter-rater reliability was checked. Furthermore, the results of the quantitative and qualitative analyses were integrated to provide a more comprehensive picture of the influence of overconfidence bias and the anchoring effect on the quality of strategic decision-making among senior managers at PTPN VI Jambi Province.

RESULTS AND DISCUSSION

Result

The results section presents experimental findings based on decision scenario data from 60 senior managers of PTPN VI Jambi. Descriptive analysis shows that the level of overconfidence bias among senior managers of PTPN VI Jambi Province is still relatively high. This is evident from the average Brier Score of 0.42 (SD = 0.13), which is still quite far from the ideal calibration value of 0.00. These results indicate that most respondents have a higher level of confidence compared to the actual level of prediction accuracy. Meanwhile, the average anchoring index value of 0.68 indicates that respondents' decisions are still strongly influenced by information or reference figures received at the initial stage before they evaluate other information. The average anchoring index of 0.68 indicates that participants' estimates are strongly influenced by the experimentally manipulated anchor values. The variable distribution meets the assumption of normality (Kolmogorov-Smirnov $p > 0.05$) and is free from multicollinearity problems ($VIF < 3.2$), allowing for regression analysis.

A total of 60 senior and middle managers at PTPN VI Jambi Province participated in this study. All respondents met the research criteria, namely having at least five years of work experience and being directly involved in the preparation of the Company's Work Plan and Budget (RKAP), setting the purchase price of fresh fruit bunches (FFB), and business development decisions. Descriptive analysis was conducted to provide an overview of the level of overconfidence bias, anchoring effect, cognitive diversity, and the quality of strategic decision-making.

Table 1. Multiple Hierarchical Regression Results (H1 and H2)

Variables	Model 1 β	Model 2 β	Sig.	VIF
Position (control)	.08	.06	.312	1.21
Working Period (control)	.11	.09	.284	1.18
Functional Background	.05	.04	.401	1.09
Overconfidence (Brier Score)		-.34***	.000	2.31
Anchoring Index		-.29***	.001	2.18
R ²	.07	.31		
ΔR^2		.24***		

*Source: Data processed (2025). *** $p < 0.001$*

Table 1. The results of the hierarchical regression analysis show that the addition of overconfidence bias and anchoring effect variables to Model 2 can improve the model's ability to explain variations in the quality of strategic decision-making. The coefficient of determination value increased by $\Delta R^2 = 0.24$ with a significance level of $p < 0.001$, which means that both cognitive biases contributed an additional 24% to the variation in the quality of strategic decisions after considering the influence of respondents' demographic characteristics. This finding indicates that psychological factors have a significant role in determining the quality of managerial decisions, in addition to experience and individual characteristics.

The overconfidence bias variable has a negative and significant regression coefficient ($\beta = -0.34$; $p < 0.001$). These results indicate that the higher the level of overconfidence in managers, the lower the accuracy of the resulting projections. Thus, the first hypothesis (H1) is accepted. Conversely, the anchoring effect variable also shows a significant negative influence on the quality of strategic decisions ($\beta = -0.29$; $p < 0.001$), so the second hypothesis (H2) is declared accepted. These findings indicate that the tendency to use initial information as the main reference can reduce managers' ability to adjust decisions to changes in actual conditions.

The results of this study align with Sekhar's (2026) study, which found that overconfidence bias and the anchoring effect simultaneously increase pricing error. This study demonstrated that the anchoring effect exerts a stronger influence when managers face decisions involving price estimation under uncertain market conditions. Similarly, research by Afroze and Sarker (2025) demonstrated that cognitive biases reduce the quality of strategic decisions, thus impacting organizational performance through a less objective decision-making process.

These results also support the findings of Rau and Bromiley (2025), who stated that overconfidence bias is a major cause of poor forecasting quality and the effectiveness of organizational strategies. According to them, individuals who are overconfident in their own judgments tend to ignore information that contradicts their beliefs, resulting in less accurate decisions. On the other hand, Gharbi and Jarboui (2024) also explained that various forms of cognitive bias, particularly overconfidence and anchoring, have a negative relationship with strategic decision quality in organizations operating in dynamic business environments.

Experimental research by Costa et al. (2023) provides evidence that extensive work experience does not always reduce overconfidence bias. Conversely, long experience often increases self-confidence, leading managers to rely more on intuition than on evaluating new information. Similar findings were reported by Huffman et al. (2022), who showed that overconfidence can persist over the long term even after individuals have received feedback from previous decisions.

The results of the Moderated Regression Analysis (MRA) show that cognitive diversity in the top management team can weaken the negative influence of overconfidence bias and the anchoring effect on the quality of strategic decision-making. This is evident from the positive and significant interaction coefficient between overconfidence bias and cognitive diversity ($\beta = 0.21$; $p = 0.018$). The same result was also found for the interaction between the anchoring effect and cognitive diversity ($\beta = 0.19$; $p = 0.024$). Thus, the third hypothesis (H3) is accepted.

A simple slope analysis showed that the negative impact of both biases was lower in management groups with high levels of cognitive diversity compared to those with low levels. This finding indicates that differences in experience, educational background, and thinking within a team can broaden perspectives when evaluating a decision, thereby reducing the risk of bias.

However, the research results show that this moderating effect only occurs when the organization has well-functioning knowledge integration mechanisms, such as pre-mortem analysis, critical discussions, and dissent amplification. Without these mechanisms, team diversity does not necessarily improve decision quality. Therefore, the fourth hypothesis (H4) is accepted.

This finding is supported by research by Kremena and Honchar (2025), who explained that diverse perspectives will only be beneficial if an organization has a culture that encourages open expression of opinions and evaluation of initial assumptions. Similar results were also presented by Kocoglu and Mithani (2024), who found that independent review and devil's advocacy processes can reduce the influence of anchoring bias in cross-border strategic decisions.

In addition, research by Midtgård and Selart (2025) confirms that organizations that build a culture of critical discussion tend to produce more rational strategic decisions because each team member has the opportunity to re-examine initial assumptions and information before decisions are made.

The results of the paired sample t-test showed a significant improvement in decision-making quality after respondents participated in the behavioral debiasing program. The statistical test value showed $t(59) = 7.34$ with a significance level of $p < 0.001$, while the effect size (Cohen's $d = 0.94$) was in the large category. These findings indicate that the intervention provided was able to improve managers' ability to produce more objective and accurate decisions.

After the training, average projection accuracy increased from 58.3% to 74.1%. Furthermore, the overconfidence index decreased by 31%, while the anchoring index decreased by 27%. These results indicate that the training not only improved decision quality but also reduced respondents' tendency to be overconfident in their own judgments and overly reliant on initial information when evaluating decision alternatives.

These findings align with research by Korteling et al. (2023), which explains that cognitive bias awareness training, the use of decision checklists, and the application of structured decision-making have proven effective in improving the quality of sustainable decisions. These findings also support the findings of Kunkler and Roy (2023), which show that the use of systematic decision-making procedures can significantly reduce the influence of cognitive biases.

Overall, the results of this study reinforce the findings of Rau and Bromiley (2025) that the quality of strategic decisions can be improved if organizations focus not only on the technical capabilities of managers but also develop mechanisms capable of recognizing and mitigating the influence of cognitive biases during the decision-making process. Therefore, the implementation of behavioral debiasing is a relevant strategy for PTPN VI in improving the quality of decisions related to FFB pricing and plantation expansion amidst an increasingly dynamic and uncertain business environment.

Discussion

The results of this study provide several important implications for both the development of theory and the practice of strategic decision-making in state-owned plantation companies. Theoretically, the findings strengthen the evidence that overconfidence bias and the anchoring effect are psychological factors that significantly influence the quality of strategic decisions. Empirical evidence obtained from senior managers at PTPN VI expands the study of behavioral strategy, which has been primarily conducted in companies in developed countries. The high level of overconfidence, reflected in the average Brier Score of 0.42, indicates that managers tend to have higher

confidence than the actual level of prediction accuracy. This finding aligns with the findings of Rau and Bromiley (2025), who concluded that overconfidence bias consistently reduces forecast quality, increases errors in strategic judgment, and impacts the effectiveness of organizational decisions. Similar findings were also reported by Afroze and Sarker (2025), who demonstrated that cognitive biases impact company performance by reducing the quality of strategic decision-making processes.

This study also shows that the anchoring effect is one of the most dominant biases, especially in work units that routinely use organizational targets and historical data as the basis for developing projections. This reliance on benchmark figures makes managers less responsive to changes in market conditions. These results are consistent with Sekhar's (2026) research, which found that the anchoring effect is the bias that most strongly influences the accuracy of pricing decisions, especially when decisions are made under uncertain circumstances. Wang's (2023) research also explains that initial information often shapes decision-makers' thinking, resulting in suboptimal adjustments to new information.

Another interesting finding is the role of cognitive diversity within top management teams. The study's findings suggest that diversity in experience, knowledge, and thinking may not improve decision quality unless supported by organizational mechanisms that encourage critical evaluation. In other words, team diversity will be beneficial if the organization provides open discussion, encourages dissenting views, and implements systematic decision-evaluation procedures. This finding aligns with research by Kremena and Honchar (2025), who stated that an organization's success in reducing cognitive bias depends heavily on the implementation of structured decision-making mechanisms and independent evaluation processes. Similar findings were also presented by Kocoglu and Mithani (2024), who demonstrated that independent review and devil's advocacy practices can reduce the influence of anchoring bias in strategic decision-making.

From a practical perspective, this study demonstrates that implementing a behavioral debiasing program significantly improves decision-making quality. Cohen's d of 0.94 indicates that the intervention had a strong impact on improving managerial decision accuracy. These results indicate that developing behavioral competencies through training, the use of decision checklists, and more systematic evaluation procedures can be an effective strategy for reducing the influence of overconfidence bias and the anchoring effect. These findings are supported by research by Korteling et al. (2023), which explains that a combination of cognitive bias awareness training, the use of a structured decision framework, and decision-making system support can sustainably improve decision quality. Research by Kunkler and Roy (2023) also concludes that implementing systematic decision-making procedures is one of the most effective approaches to suppressing cognitive bias in organizational practice.

When compared with various previous studies, the results of this study indicate that the mechanisms of overconfidence bias and anchoring effect in PTPN VI managers are essentially the same as those in organizations in other countries. However, the intensity of the influence of these two biases tends to be higher due to the characteristics of state-owned enterprises (SOEs) with their multi-layered bureaucratic structures, the demands of achieving company targets, the dynamics of the global palm oil market, and the periodic pricing process for fresh fruit bunches (FFB). These conditions make it easier for historical information and organizational targets to develop into cognitive anchors that influence the quality of strategic decisions. These findings reinforce the research of Midtgård and Selart (2025), which states that complex and stressful organizational

environments will increase the likelihood of cognitive biases emerging if the decision-making process is not supported by objective evaluation mechanisms.

CONCLUSIONS

This study yields several key findings that collectively address the five research objectives. First, overconfidence bias and the anchoring effect are empirically proven to be negative and significant predictors of strategic decision quality among senior managers at PTPN VI Jambi (H1 and H2 supported), with cognitive biases collectively explaining an additional 24% of variance in decision quality above and beyond demographic variables.

Second, cognitive diversity of top management teams was shown to moderate the relationship between bias and decision quality (H3 supported), but this moderating effect was only significant when knowledge integration mechanisms, such as pre-mortem analysis and dissent amplification, were actively available within the organization (H4 supported). This finding confirms that diversity without an institutional infrastructure that supports the expression of minority perspectives will not result in improved decision quality. Third, behavioral debiasing protocols based on pre-mortem, reference class forecasting, and devil's advocate were shown to effectively improve strategic projection accuracy (H5 supported) with a large effect size (Cohen's $d = 0.94$), resulting in a 31% decrease in overconfidence and a 27% decrease in anchoring after a one-day intervention.

This research contributes to filling the previously unrepresented literature gap on behavioral strategy in the context of Southeast Asian SOEs and the palm oil plantation industry, while also producing a behavioral debiasing protocol that has been contextually validated and is ready for implementation.

Based on the research findings, several practical and theoretical recommendations are proposed. Practically for PTPN VI: (1) Integrate pre-mortem analysis as a mandatory procedure in the annual RKAP preparation cycle, with an external facilitator who is not bound by Ministry targets; (2) Adopt reference class forecasting for FFB production projections using the historical distribution of deviations from 2019–2024 as a calibration basis; (3) Institutionalize the rotation of the devil's advocate role in strategic board meetings; and (4) Redesign the weekly FFB purchase price determination process by including spot market price indicators as a mandatory comparison to historical prices.

In terms of policy, the Ministry of State-Owned Enterprises is advised to consider reforming the process of delivering performance targets to plantation SOEs by adding alternative scenarios (optimistic, realistic, pessimistic) so that targets do not function as the sole anchor in the internal projection process.

For further research, it is recommended: (1) Longitudinal studies to evaluate the long-term impact of debiasing interventions on the accuracy of actual RKAP; (2) Replication in other plantation state-owned enterprises (PTPN III, PTPN IV) to test the generalisability of the findings; and (3) Investigation of the role of organizational culture factors (psychological safety, power distance) as additional moderators in the bias–TMT–Decision quality framework

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