



Strengths-based leadership and bootleg innovation: The roles of growth need strength and work centrality

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Abstract: Bootleg innovation serves as a vital supplement to routine innovation, yet strengths-based leadership mechanisms driving such informal behavior remain underexplored. This study examined the mediation mechanism of growth need strength, as well as the boundary condition set by work centrality, in the association between strengths-based leadership and bootleg innovation. We employed a time-lagged design across two waves to gather data from 375 employees within the technology sector (Wave 1, $n = 583$; Wave 2, $n = 425$). The final sample consisted of 47.5% males, with 67.7% aged between 30 and 40. Hierarchical regression results found that strengths-based leadership serves as a predictive factor of employee bootleg innovation. Furthermore, growth need strength was found to fully mediate this association, suggesting that such leadership fuels employees' developmental desires, which in turn prompts them to undertake bootleg innovation. Moreover, it was found that work centrality attenuates the positive association between strengths-based leadership and bootleg innovation. Based on these findings, we suggest that organizations focus their strengths-based leadership efforts on employees with lower work centrality, as high work centrality naturally substitutes for the need for external leadership support.

Keywords: strengths-based leadership; work centrality; growth need strength; bootleg innovation

Introduction

In the current volatile business environment, enterprises primarily rely on their innovation capabilities to maintain sustainable market competitiveness (Rehman, 2023). However, resource scarcity is a recurrent feature of organizational innovation projects, with the result that only a small fraction of creative ideas obtains the formal support necessary for further development (Li & Ye, 2021). To circumvent these resource constraints and other restrictive conditions, employees increasingly engage in “bootleg innovation” (Criscuolo et al., 2014). Bootleg innovation occurs in the absence of explicit prohibition; it is characterized by its “hidden” nature rather than open defiance (Criscuolo et al., 2014). Unlike creative deviance, in which employees disregard or violate orders from management in order to continue innovative thoughts (Mainemelis, 2010), bootleg innovation is uniquely positioned as a proactive, informal, and bottom-up behavior where employees covertly utilize organizational resources to come up new ideas (Criscuolo et al., 2014), bridging the gap between rigid formal planning and flexible emergent opportunities. In this context, we posit that strengths-based leadership, which values productive innovation and employee growth, acts as a crucial driver. Moreover, work centrality determines whether and how strengths-based leadership explains higher bootleg innovation. Our aim was to clarify these relationships within the context of a high-technology industry.

Strengths-based leadership and bootleg innovation

According to strengths-based leadership, individuals realize their greatest potential for growth and development in

the domains where their strengths reside (Ding & Quan, 2021; Breevaart et al., 2025). Unlike traditional leadership approaches that typically adopt a top-down focus on remediation and standardized performance (Welch et al., 2014), strengths-based leadership emphasizes a bottom-up approach by identifying and cultivating unique individual strengths (Van Woerkom et al., 2016). This distinction is particularly relevant for bootleg innovation, which is inherently a self-determined and spontaneous behavior rather than a response to top-down directives (Criscuolo et al., 2014). Consequently, strengths-based leadership's individualized focus provides the essential autonomy and resource support required for such discretionary innovative efforts. By leveraging strengths identification methods, this leadership enables employees to precisely recognize their own strengths and provides support to maximize their application, thereby enhancing their self-confidence in implementing innovative ideas (Ding & Chu, 2020). Accordingly, employees are more likely to put in extra effort with regard to innovation activities; even when their ideas diverge from leadership opinions, they tend to persist in advancing their creative initiatives, such as engaging in bootleg innovation (Huang et al., 2024). Furthermore, when strengths-based leaders facilitate the recognition, development, and full utilization of subordinates' strengths, employees experience higher-quality leader-member exchange (Ding & Yu, 2020). In turn, reciprocating this relational benefit, they typically expend additional effort to attain elevated performance goals (Ding & Yu, 2020), such as bootleg innovation. Thus, we speculate that strengths-based leadership exerts a positive impact on employees' bootleg innovation.



The mediating mechanism of growth need strength

According to Hackman and Oldham (1980), growth need strength represents a person's inherent drive to achieve, learn, and grow within their professional environment. Employees possessing high levels of this trait emphasize opportunities for career development and learning within their work, making them more likely to derive satisfaction and a sense of achievement from their professional activities (Bottger & Chew, 1986). Strengths-based leadership, which concentrates on discovering and cultivating the unique talents of subordinates, serves as a crucial job resource linked to subordinate growth, development, and job satisfaction (Ding et al., 2024). By emphasizing personal development and providing learning opportunities, strengths-based leadership signals organizational support for employee growth, thereby stimulating and enhancing employees' growth need strength (Van Woerkom et al., 2016). Consequently, exposure to such leadership behaviors is likely to heighten employees' growth need strength.

Furthermore, drawing on the premise that characteristics transmit leadership influence (Dionne et al., 2002), elevated growth need strength serves as a proximal driver of bootleg innovation. Individuals exhibiting elevated growth need strength are more engaged in stimulating and challenging tasks (Bottger & Chew, 1986). Rather than passively awaiting favorable opportunities, these individuals proactively pursue avenues that satisfy their intense aspirations to grow and advance personally (Huselid & Day, 1991). Bootleg innovation represents one such proactive avenue. As noted by Shalley et al. (2009), individuals who are strongly aspiring to achieve, learn and develop are inherently more inclined to participate in activities that promote creative outcomes to fulfill their intrinsic needs. Therefore, growth need strength acts as the underlying mechanism through which strengths-based leadership fosters bootleg innovation.

The moderating function of work centrality

The degree to which work is considered a central pillar of an individual's life is reflected in work centrality (Paullay et al., 1994). It indicates a stable attitude towards work values and show how much employees derive their self-identity and sense of purpose primarily from their occupational roles (Jiang & Johnson, 2018).

Drawing on the substitutes for leadership framework (Kerr & Jermier, 1978), we posit that work centrality functions as a "substitute" that reduces the effectiveness of strengths-based leadership in fostering bootleg innovation. Strengths-based leadership primarily fosters innovation by identifying employees' strengths and fulfilling their growth needs (Ding & Quan, 2021). However, for employees with high work centrality, this external motivational boost is less critical. Because they are inherently self-driven and committed to their work goals (Hirschfeld & Feild, 2000), they are prone to undertaking proactive initiatives, such as bootleg innovation, to benefit the organization regardless of the leader's intervention. This perspective is corroborated by prior research indicating that employees with strong work centrality have a solid work identity, which naturally fuels their creativity and drive to implement innovative solutions (Volery & Tarabashkina, 2021).

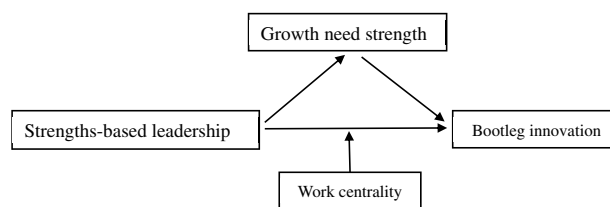


Figure 1. Theoretical model and hypotheses

In this context, the intense intrinsic motivation stemming from work centrality "substitutes" for the motivational effect of strengths-based leadership. As a result, the positive link between strengths-based leadership and bootleg innovation will be weaker for these employees, as the leader's influence adds little to their already high motivation. Conversely, for employees with low work centrality who lack such intrinsic drive, the external support and validation provided by strengths-based leadership are essential for stimulating their innovative efforts. In this study, we identify work centrality as a critical individual characteristic that substitutes the function of strengths-based leadership.

Goal of the Study

The main aim of this research was to examine the association connecting strengths-based leadership and bootleg innovation. Furthermore, we scrutinized the mediating mechanism of growth need strength and the boundary condition set by work centrality. Based on the theoretical framework (Figure 1), we proposed:

- **Hypothesis 1:** Strengths-based leadership is positively associated with employee bootleg innovation.
- **Hypothesis 2:** Growth need strength plays a mediating role in the relationship between strengths-based leadership and employee bootleg innovation, for higher employee bootleg innovation.
- **Hypothesis 3:** Work centrality functions as a substitute for strengths-based leadership; specifically, the positive impact of leadership on bootleg innovation is attenuated when employees possess high levels of work centrality.

Method

Participants setting

The study recruited 375 employees from five technology firms based in China. The sample's demographic composition is as follows: Regarding gender, the distribution was fairly even, with females accounting for 52.5% and males for 47.5%. In terms of age distribution, the largest group comprised individuals aged 30 to 40 (67.7%), followed by the 41–50 age group (14.9%), those under 30 (13.3%), and those over 51 (4.1%). With respect to education, 59.2% were graduates with a bachelor's degree, 32.5% held a master's degree, 3.5% possessed a doctorate, and 4.8% had a junior college education or lower. Finally, regarding organizational tenure, the sample consisted largely of experienced employees, with 75.5% having more than 10 years of work experience, followed by groups with 7–9 years (10.1%), 4–6 years (8.3%), and 1–3 years (6.1%).

Measures

Standard translation and back-translation procedures (Brislin, 1970) were followed to convert English scales into Chinese. All items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Strengths-based leadership

We measured this construct using the 8-item instrument from Ding et al. (2020). A sample item includes, "My supervisor gives me the chance to understand my strengths." The Cronbach's α was 0.927.

Work centrality

Work centrality was evaluated using a 3-item scale adopted from Erdogan et al. (2018). A representative item includes, "My personal success depends largely on my career achievement." The Cronbach's α was 0.715.

Growth need strength

To assess growth need strength, we used the 7-item scale by Hackman and Oldham (1980). Items include, "I place great importance on developing my ability to independently complete tasks." The Cronbach's α was 0.884.

Bootleg innovation

Bootleg innovation was assessed via the 5-item scale by Criscuolo et al. (2014). An example item is, "I have the flexibility to work my way around my official work plan, digging into new potentially valuable business opportunities." The Cronbach's α was 0.744.

Control variables

Consistent with previous studies (Ding & Chu, 2020), we controlled for demographic characteristics including gender, age, education level, and tenure.

Procedure

The research protocol was approved by the Research Ethics Committee of the Beijing Institute of Petrochemical Technology, and permission was granted by corporate managers (No. LL202503). All participants provided informed consent, with assurances of anonymity and confidentiality. Data were gathered via WeChat, a popular social media platform commonly employed in academic studies (Chu et al., 2022b).

To effectively mitigate common method bias and enhance the rigor of causal inference, we implemented a two-wave time-lagged design. Following established norms in strengths-based leadership research (Wang et al., 2023), data collection was separated by a one-month gap. In Time 1, participants were asked to report their demographic information, strengths-based leadership, work centrality, and growth need strength. A total of 583 surveys were collected. In Time 2, the same participants were invited to assess their bootleg innovation behavior, resulting in 425 responses. After matching the questionnaires from both waves using unique identification codes and excluding incomplete or invalid responses, we obtained a final dataset of 375 valid responses (effective response rate = 64.3%).

Data analysis

Hypotheses were evaluated in SPSS using Hayes' PROCESS (Hayes, 2017). We applied Model 4 to test mediation and Model 1 to test moderation. While Structural Equation Modeling (SEM) software such as AMOS or PLS is widely used for latent variable modeling, the PROCESS macro was selected for this study because it is specifically designed to robustly estimate conditional indirect effects and probe interactions (moderation) using the Johnson-Neyman technique, which provides a more granular analysis of boundary conditions (Hayes, 2017).

The analytical process involved multiple steps. We first ran CFA to check whether the four constructs could be empirically distinguished, and whether the measurement structure fitted the data. Next, we conducted Harman's one-factor test to diagnose potential common-method bias. Next, we summarized the sample by reporting the means and standard deviations of the variables, as well as their bivariate Pearson correlations. Finally, prior to estimating interaction terms, the predictors were mean-centered to reduce multicollinearity, and then ran the path models for hypothesis testing.

Confirmatory factor analysis

A confirmatory factor analysis (CFA) was performed to examine whether the four focal constructs represent separable latent factors. Table 1 reports the fit statistics. The proposed four-factor model showed good fit ($\chi^2 = 198.55$, $df = 98$, $\chi^2/df = 2.03$, $RMSEA = 0.06$, $CFI = 0.96$, $TLI = 0.95$, $SRMR = 0.04$). Furthermore, this model significantly outperformed all alternative models in terms of fit indices.

Common method variance

The unrotated factor solution showed that a single factor accounted for only 31.43% of the total variance, remaining well within the critical 40% limit. Moreover, CFA results indicated that the four-factor structure was statistically superior to the single-factor model ($\Delta\chi^2 = 1113.77$, $p < 0.001$). Consequently, common method bias does not appear to be a pervasive issue in our dataset.

Results

Descriptive statistics and correlation analysis

Descriptive statistics and Pearson correlations are summarized in Table 2. Notably, significant positive relationships were observed between strength-based leadership, work centrality, growth need strength, and bootleg innovation. These initial findings offer foundational support for further analytical procedures.

Strengths-based leadership and bootleg innovation

Table 3 (Model 4) showed that strengths-based leadership positively predicts employee bootleg innovation ($\beta = 0.18$, $p < 0.001$), providing evidence in favor of Hypothesis 1. This statistical evidence supports the notion that when leaders actively identify and support employees' strengths, it creates a psychological safety net that emboldens employees to engage in bootleg innovation.

Table 1. Confirmatory factor analysis ($N = 375$)

Models	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Four-factor model	198.55	98	2.03	0.06	0.96	0.95	0.04
Three-factor model	802.04	101	7.94	0.15	0.71	0.65	0.14
Two-factor model	986.03	103	9.57	0.16	0.63	0.57	0.15
One-factor model	1312.32	104	12.62	0.19	0.49	0.42	0.13

Note. Four-factor model was viewed as baseline models. Three-factor model: Strength-based leadership + growth need strength, work centrality, bootleg innovation. Two-factor model: Strength-based leadership + growth need strength + work centrality, bootleg innovation. One-factor model: Strength-based leadership + growth need strength + work centrality + bootleg innovation.

Table 2. Descriptive statistics and correlations ($N = 375$)

Variables	Mean	SD	1	2	3	4	5	6	7
1 Age	2.11	0.70	–						
2 Gender	1.53	0.50	0.08	–					
3 Education	2.35	0.63	–0.26**	–0.05	–				
4 Organizational tenure	3.99	1.20	0.62**	0.09	0.16**	–			
5 Strengths-based leadership	3.50	0.84	–0.03	0.01	0.10*	0.04	–		
6 Work centrality	3.41	0.76	0.09	–0.10	0.04	0.09	0.31**	–	
7 Growth need strength	4.04	0.60	–0.07	0.21**	0.13*	0.07	0.32**	0.35**	–
8 Bootleg innovation	3.15	0.73	–0.02	–0.23**	0.06	0.09	0.18**	0.27**	0.57**

Notes. * $p < 0.05$, ** $p < 0.01$.

Table 3. Results of regression analysis ($N = 375$)

Variables	Growth need strength		Bootleg innovation			
	Model 1	Model 2	Model 3	Model 4	Model5	Model6
Age	–0.12	–0.10	–0.04	–0.03	0.02	–0.06
Gender	–0.18**	–0.19***	–0.26***	–0.27***	–0.17***	–0.25***
Education	0.11*	0.08	0.05	0.03	–0.01	0.02
Organizational tenure	0.15*	0.12	0.10	0.08	0.02	0.08
Strengths-based leadership		0.30***		0.18***	0.02	0.14**
Growth need strength					0.53***	
Work centrality						0.19***
SBL × WC						–0.13**
R^2	0.07	0.16	0.09	0.12	0.35	0.17
F	7.04***	14.16***	8.59***	9.70***	33.00***	10.643***

Notes. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. SBL × WC = interaction of strengths-based leadership and work centrality.

The mediating effect of growth need strength

Referring to Models 2 and 5 in Table 3, strengths-based leadership positively predicted employee growth need strength ($\beta = 0.30, p < 0.001$). Growth need strength, in turn, was linked to more bootleg innovation ($\beta = 0.53, p < 0.001$). Additionally, when the mediator was included, the direct link between strengths-based leadership and bootleg innovation became no longer statistically distinguishable ($\beta = 0.02, p > 0.05$), suggesting that the indirect pathway accounts for much of the relationship. Bootstrapping with PROCESS Model 4 produced a nonzero indirect effect (effect = 0.14, 95% CI = [0.08, 0.21]).

The corresponding direct effect estimate was small and its confidence interval included zero (effect = 0.02, 95% CI [–0.06, 0.09]), supporting Hypothesis 2. Analytically, this indicates that strengths-based leadership may foster bootleg innovation largely by stimulating employees’ growth-oriented motives.

The moderating effect of work centrality

Before testing Hypothesis 3, we mean-centered the variables to mitigate multicollinearity. As indicated in Model 6 (Table 3), strengths-based leadership ($\beta = 0.14, p < 0.01$) and work centrality ($\beta = 0.19, p < 0.001$) were both

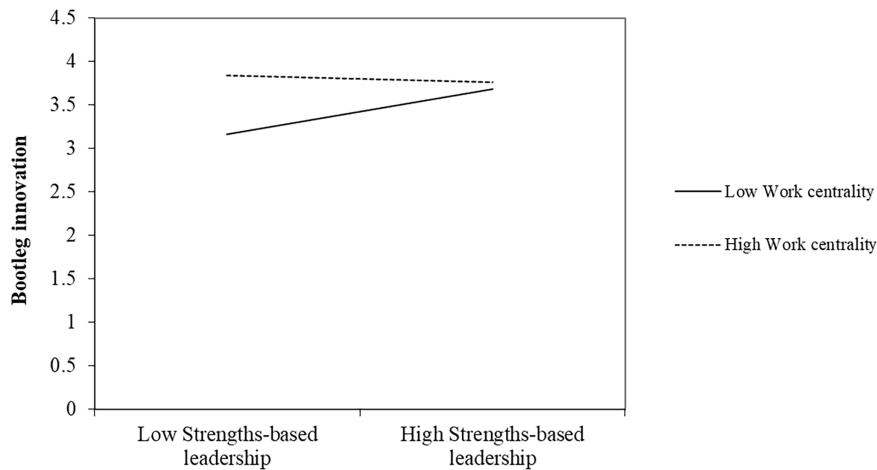


Figure 2. Moderating effect of work centrality on the relationship between strengths-based leadership and bootleg innovation

positively associated with bootleg innovation. Crucially, the strengths-based leadership \times work centrality interaction was negative ($\beta = -0.13, p < 0.01$), indicating that the positive association between strengths-based leadership and bootleg innovation weakens as work centrality increases. This pattern implies that work centrality meets the criteria for a leadership substitute (Howell et al., 1986), supporting Hypothesis 3. Simple-slope estimates (Figure 2) show that when work centrality is high ($M + 1$ SD), the link between strengths-based leadership and bootleg innovation is close to zero and not statistically significant ($\beta = -0.00, 95\% \text{ CI} = [-0.11, 0.12]$). When work centrality is low ($M - 1$ SD), the effect is positive and the confidence interval excludes zero ($\beta = 0.22, 95\% \text{ CI} = [0.10, 0.35]$). These results confirm the theoretical proposition that high work centrality functions as a self-sustaining motivational mechanism, thereby attenuating the efficacy of strengths-based leadership, whereas external leadership remains vital for employees lacking this innate drive.

Discussion

This research investigated how strengths-based leadership affects employee bootleg innovation, as well as the impact of growth need strength and work centrality on this process. First, the results indicate that strengths-based leadership positively predicts bootleg innovation, which aligns with earlier findings demonstrating that a strengths-based leadership approach can boost individual innovation (Ding & Yu, 2020). Supportive leadership is crucial in fostering employees' creative motivation, encouraging them to undertake bootleg innovation as a way to reciprocate leaders' support (Wu et al., 2020; Wang et al., 2024). Furthermore, strengths-based leaders create an emotionally supportive and understanding work environment, which reduces employees' perceived costs associated with potential mistakes. As a result, employees who enjoy high-quality supervisor-subordinate relationships are more willing to assume the possible negative consequences of innovation failures and are thus more likely to engage in bootleg innovation (Wang & Zou, 2019).

Second, our findings indicate that growth need strength mediates the link connecting strengths-based leadership

and employee bootleg innovation. This result can be interpreted through the lens that individuals leverage their strengths to generate energy, vitality, and enthusiasm, which in turn drives intentional growth and development (Meyers et al., 2015). Since strengths-based leaders excel at assisting employees in recognizing and cultivating their own strengths (Ding & Yu, 2021), employees under such leadership are likely to experience heightened growth need strength. Previous research has demonstrated that employees with a strong need for growth are more likely to engage in behaviors that promote creative performance (Shalley et al., 2009), such as bootleg innovation. Hence, these results contribute to clarifying possible mediating processes that connect strengths-based leadership with bootleg innovation.

Third, the findings indicate that work centrality moderates the link between strengths-based leadership and bootleg innovation. Specifically, the positive impact of strengths-based leadership is amplified when employees possess low work centrality; conversely, this effect diminishes when work centrality is high. This pattern corroborates previous research indicating that situational factors, such as job control, can substitute for strengths-based leadership by influencing felt obligation (Chu et al., 2022a). Our results suggest that high work centrality strengthens employees' identification with their work roles, independently stimulating the creativity needed for innovative solutions (Volery & Tarabashkina, 2021). Collectively, this highlights the contingent nature of strengths-based leadership. It empirically validates the core tenet of the substitutes for leadership theory within an innovation context, demonstrating that specific follower characteristics (i.e., work centrality) can effectively offset the need for positive leadership behaviors.

Implications for managerial practice

The evidence reported here provides concrete guidance for managerial action. First, these findings advance our theoretical understanding by elucidating the significant role strengths-based leadership plays in promoting employee bootleg innovation. Related work has shown that supportive leader behaviors (e.g., humor) can make bootlegging more likely (Zhang et al., 2023). Our study extends this

by pinpointing “strengths focus” as a specific behavioral driver. Practically, organizations should encourage strengths-based leadership practices, as such leadership can effectively foster employee bootleg innovation by cultivating a supportive and low-risk work environment.

Second, organization leaders should to implement targeted interventions (e.g., strengths coaching or job crafting programs) to amplify employees’ growth need strength, given its mediating role in translating strengths-based leadership practices into innovative behaviors. Moreover, organizations need to adopt differentiated leadership strategies contingent upon employees’ work centrality levels. Specifically, leaders should allocate strengths-based leadership resources more strategically toward individuals with lower work centrality to maximize innovation outcomes, while recognizing its diminished utility for employees with more salient work centrality.

Third, from an organizational policy perspective, human resource policymakers should embed strengths-based assessments into recruitment and leadership training frameworks. Rather than applying a “one-size-fits-all” leadership approach, policies should encourage leaders to tailor their involvement based on the work centrality profiles of their teams to optimize resource allocation. These findings collectively support the development framework of strength-based leadership, which integrates individual differences into a strengths-based management system.

Study limitations and directions for future research

Several limitations should be acknowledged. First, although we separated measurement points to mitigate short-term response effects, the data were not collected in a way that allows strong causal inference. Future work could move beyond correlational evidence by tracking employees across more waves or by experimentally varying leader behaviors to observe downstream bootleg innovation. Second, because key variables were obtained via self-reports, shared measurement context may have inflated some associations. While self-reports are theoretically suitable for assessing internal states (e.g., growth need strength, work centrality) and hidden behaviors (bootleg innovation), future work is encouraged to collect multi-source data, such as supervisor evaluations, to strengthen validity. Third, as the data were obtained from specific industries in China, the results may not be generalizable. Scholars should replicate this model in diverse cultural contexts and explore additional leadership substitutes to broaden its theoretical applicability.

Conclusion

This study aimed to investigate how strengths-based leadership relates to employees’ bootleg innovation and whether this link operates through growth need strength and varies with work centrality. Analyses indicate a positive association between strengths-based leadership and bootleg innovation. Growth need strength mediated the strengths-based leadership-bootleg innovation relationship. Moreover, the pattern is contingent on work centrality: When work is more central to employees’ self-concept, the leadership effect on bootleg innovation becomes stronger. This research offers new insights from

the perspective of strengths management on how to promote employee bootleg innovation.

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Availability of Data and Materials: The data supporting the conclusions of this study are available from the corresponding author upon reasonable request.

Ethics Approval: The research protocol was approved by the Research Ethics Committee of the Beijing Institute of Petrochemical Technology, and permission was granted by corporate managers (No. LL202503). All participants provided informed consent, with assurances of anonymity and confidentiality.

Conflicts of Interest: The authors declare no conflicts of interest.

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