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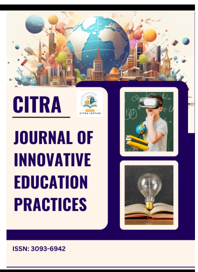

Sustainable Practices and Operational Performance in a Malaysian Higher Education Institution: A Resource-Based View Perspective

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ABSTRACT

The education sector is increasingly encouraged to implement sustainable practices to enhance environmental stewardship, social responsibility, and institutional effectiveness. Higher education institutions (HEIs), as major consumers of resources, play a critical role in reducing environmental impact while improving operational efficiency. This study aims to examine the influence of sustainable practices on the operational performance of the Management and Science University (MSU), Malaysia. Guided by the Resource-Based View (RBV), the research investigates three dimensions of sustainable development: advancement of technology, safety and health practices, and environmental practices. A quantitative survey involving 278 academic and support staff was conducted, and the data were analyzed using descriptive statistics, correlation analysis, and multiple regression. The findings reveal that advancement of technology and environmental practices significantly enhance operational performance, whereas safety and health practices show no direct statistical effect. These results indicate that sustainable practices function not only as ethical responsibilities but also as strategic resources that strengthen institutional efficiency, reduce operational costs, and improve reputation. The study contributes empirical evidence from a developing-country context and offers recommendations for policymakers and HEI leaders to strengthen digital transformation, environmental initiatives, and safety culture within higher education.

1. Introduction

Over the past two decades, sustainable development has shifted from a voluntary initiative to a global imperative, driven by accelerating climate change, resource depletion, and increasing societal expectations for responsible governance. Higher education institutions (HEIs) play a pivotal role in advancing sustainability, not only as knowledge hubs and talent incubators but also as large organizations with substantial operational footprints [1]. Their adoption of sustainable practices can influence environmental outcomes, institutional efficiency, and long-term strategic positioning.

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In Malaysia, the Twelfth Malaysian Plan (2021–2025) reinforces sustainable development as a national priority, emphasizing energy efficiency, waste reduction, green technology adoption, and the transition toward a low-carbon economy [11]. While these policy directives provide a strong foundation, there remains limited empirical evidence on how Malaysian HEIs operationalize sustainable development and the extent to which such practices translate into improved institutional performance. Most existing studies focus on policy analysis or environmental awareness, leaving a gap in understanding the operational and performance-level effects of sustainability initiatives within universities.

To address this gap, the present study investigates the relationship between sustainable practices and operational performance at Management and Science University (MSU) in Shah Alam, Malaysia. Guided by the Resource-Based View (RBV), which positions sustainability practices as strategic organizational resources that enhance efficiency, effectiveness, and resilience [4], the study examines three key dimensions: technological advancement, safety and health practices, and environmental practices.

This research fills an important gap by providing empirical evidence on how specific sustainability practices influence operational performance within a Malaysian HEI context. The main objective is to determine the extent to which technological advancement, safety and health practices, and environmental practices contribute to improved operational outcomes at MSU. The findings are significant as they offer actionable insights for policymakers and university leaders seeking to strengthen sustainability frameworks, optimize resource utilization, and enhance institutional competitiveness in the higher education sector.

2. Literature Review and Conceptual Framework

Universities are resource-intensive organizations, with significant electricity consumption for classrooms and laboratories, large volumes of paper and digital resources, and considerable waste production [3]. Unlike manufacturing industries, higher education institutions are primarily evaluated based on their academic performance, student achievement, and reputation. However, these outcomes depend on complex administrative systems and infrastructure that demand optimal operational efficiency.

In Malaysia, higher education institutions face the challenge of integrating sustainable development without compromising their academic mission. Institutions such as Management and Science University (MSU) must meet the growing expectations of stakeholders (students, parents, regulatory bodies, and ranking authorities) while dealing with limited budgets, low awareness, and inadequate assessment tools [7]. This study examines whether sustainable practices significantly improve operational performance and proposes avenues for more comprehensive strategies in similar contexts.

2.1 Operational Performance in HEIs

Operational performance refers to the efficiency and effectiveness of institutional processes, assessed by productivity, cost reduction, quality of services and resource use [9]. In higher education institutions, it encompasses administrative efficiency, teaching, staff productivity and institutional resilience.

2.2 Technological Advancement

Technological innovation is transforming higher education institutions by improving teaching, research, and administration. The integration of AI, big data analytics, and IoT systems enhances service delivery and cost-effectiveness [2]. The COVID-19 pandemic also highlighted the crucial role of technology in business continuity through the rapid adoption of digital platforms [2].
H1: Technological advancement positively impacts operational performance.

2.3 Safety and Health Practices

Safety and health practices (SH) are essential for business continuity and employee well-being. While sector studies demonstrate a strong link between safety measures and productivity [5,6], the findings in higher education are contradictory. SH is often perceived there as a compliance requirement rather than a strategic driver of operational efficiency.
H2: Safety and health practices positively impact operational performance.

2.4 Environmental Practices

Environmental initiatives, such as waste reduction, recycling, and energy management, are widely recognized for their ability to generate savings and improve the institution's image. Green practices also meet student expectations and the criteria of international rankings, thus reinforcing their strategic importance [8].
H3: Environmental practices positively impact operational performance.

2.5 Conceptual Framework

This study adopts the resource-based view (RBV) theory, which posits that valuable, rare, inimitable, and irreplaceable resources constitute a sustainable competitive advantage [4]. In higher education institutions, sustainable practices can be viewed as strategic resources that improve operational performance, reduce costs, and enhance the institution's reputation portrayed in Figure 1, conceptual framework.

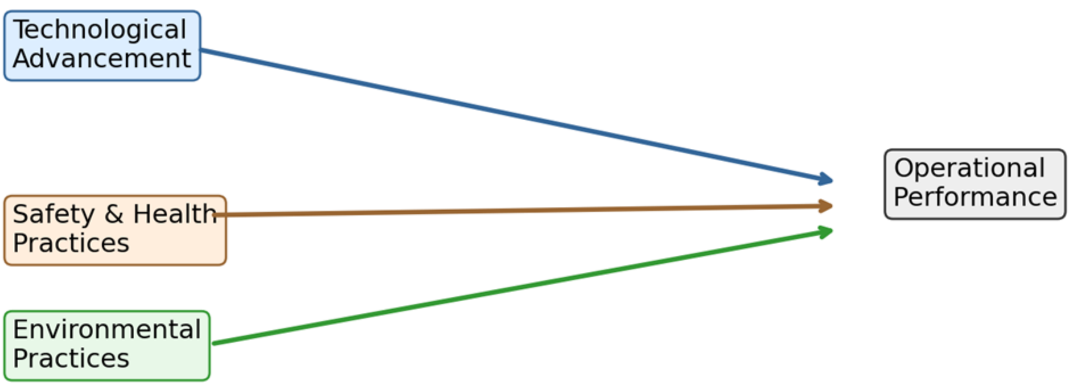

Fig. 1. Conceptual framework

3. Methodology

This quantitative cross-sectional study targeted academic and support staff at the Management and Science University (MSU). From a population of 1,061 employees, a sample of 278 respondents was drawn using simple random sampling, in accordance with the Krejcie and Morgan table [13].

Data were collected using a questionnaire structured in five sections: Demographics; Operational Performance (OP); Technological Advancement (TA); Safety and Health Practices (SH); and Environmental Practices (EP). Each construct was measured using five items on a 5-point Likert scale (1 = strongly disagree… 5 = strongly agree). These items were adapted from instruments validated in previous studies [5,17,18] to ensure their relevance. The OP items assessed process efficiency, service quality, and resource utilization; AT measured the maturity of the digital infrastructure; SH reflected OHS routines; and EP measured waste reduction, emissions control, and environmental improvements. Scores were calculated using composite means. The instrument is based on resource-based view (RBV) by operationalizing sustainable development practices as hypothetical internal capabilities aimed at improving operational performance [4].

Table 1
Instrument development process

Variable	Items	Likert	Sources
Operational Performance (OP)	5	1–5	Tze *et al.*, [17]; Salerina [18]; Hejazi [5]
Technological Advancement (TA)	5	1–5	Tze *et al.*, [17]
Safety & Health Practices (SH)	5	1–5	Salerina [18]
Environmental Practices (EP)	5	1–5	Hejazi [5]

Data collection was conducted online over a one-month period. SPSS software was used for analysis: descriptive statistics summarized the characteristics of the respondents; Cronbach's alpha coefficient assessed reliability; Pearson's correlation examined relationships between variables; and multiple regression tested hypotheses [14].

4. Results and Discussion

This section presents empirical results and their interpretation to avoid repetition. The analyses focus on the sample profile, descriptive statistics and reliability, then correlations and the multivariate model (ANOVA, coefficients), leading to the results of the hypotheses and their implications. The focal predictors are Technological Advancement (AT), Safety & Health (SH), and Environmental Practices (EP), tested against Operational Performance (OP) in line with RBV [4].

The study, presented in Table 2, analyzed data from 278 employees of MSU, with a balanced gender distribution (50.5% women and 49.1% men). Of these, 55.1% held support positions and 44.5% held faculty positions. This balanced distribution mitigates biases associated with a single group and improves the generalizability of the results across MSU. The staff had a high level of education (56.2% held graduate degrees), and approximately 82% had at least six years of service, reflecting the experience of this group. The predominance of graduate graduates suggests that respondents are familiar with institutional processes and are able to reliably assess sustainability practices. The proportion of long-serving employees (approximately 82% with at least six years of service at MSU) strengthens the reliability of perceptions regarding long-term operational routines (e.g., safety culture, environmental programs, digital systems). The representative sample encompassed the main faculties and administrative units, confirming the generalizability of the results to teaching and administrative activities. This diversity reinforces confidence in the respondents' ability to credibly assess operational and sustainability practices. The variety of faculties and administrative units covered allows for a better consideration of teaching and administrative operations, processes linked to operational performance in the research model. Descriptive statistics reveal a balanced gender distribution and a majority of respondents with postgraduate degrees, reflecting the diversity and educational level of MSU staff.

Table 2
Respondent demographics (N = 278)
A gender and role

Variable	Category	n	%
Gender	Male	139	49.1
	Female	143	50.5
Role at MSU	Academic Staff (Lecturer/Senior Lecturer/Professor)	126	44.5
	Support Staff (Admin/Technical/Library/IT/Maintenance)	156	55.1

B Highest educational qualification

Qualification	n	%
SPM	5	1.8
Foundation / Diploma / STPM	43	15.2
Bachelor’s Degree	75	26.5
Master’s Degree	108	38.2
Doctorate	51	18.0

C Tenure at MSU

Years in Service	n	%
< 1 year	0	0.0
1–5 years	49	17.3
6–10 years	167	59.0
11–15 years	64	22.6
> 15 years	2	0.7

D Department / faculty distribution

Unit	n	%	Unit	n	%
FBMP	26	9.2	Global Affairs	10	3.5
IMS	25	8.8	LRC	10	3.5
SCHA	23	8.1	MSU Academy	10	3.5
SESS	23	8.1	HR	10	3.5
FHLS	19	6.7	Procurement	10	3.5
FISE	11	3.9	SPH	10	3.5
Maintenance	11	3.9	Account Department	10	3.5
IT	10	3.5	Admission & Records	10	3.5
SCD	10	3.5	GSM	9	3.2
SGS	8	2.8	Media	4	1.4
Audit	5	1.8	CFS	5	1.8
RMC	5	1.8	SOD	3	1.1

Table 3 shows that, overall, the averages are around 19-20 on a 5-point, 5-item scale, indicating that respondents generally agree on the existence of sustainable development practices and the quality of operational performance. The conversion to an average per item (average ÷ 5) gives: OP ≈

3.84, TA ≈ 3.81, SH ≈ 4.06, and EP ≈ 3.97 (where 3 = neutral and 4 = agree). The highest average score is for health and safety (20.29), suggesting that OHS procedures are perceived as well integrated within the institution. Environmental practices (19.83) also receive a high score, consistent with visible initiatives in waste, energy, and recycling. Operational performance (19.21) is slightly lower than that of SH and EP, reflecting an overall positive perception of process efficiency and service quality. The lowest mean score for technological development (19.05) suggests greater room for improvement in digital infrastructure and data-driven processes compared to the areas of security and environment. There is moderate dispersion among the variables (standard deviation ≈ 2.45–2.84), which is desirable for subsequent correlation and regression analyses, as it indicates sufficient variability rather than a ceiling effect. The minimum values (OP = 13; TA = 11; SH = 12; EP = 12) reveal areas of less support (units or roles where these practices are not applied uniformly), while the maximum scores of 25 for OP, SH, and EP indicate that some respondents report a strong presence of these practices. An anomaly is the maximum TA score (35), which exceeds the expected score of 25 for five 5-point items. This likely reflects an inconsistency in the scoring (e.g., a different number of items or response scale, or a data entry error).

Table 3
Descriptive statistics of variables

Variable	Mean	SD	Min	Max
Operational Performance (OP)	19.21	2.45	13	25
Technological Advancement (TA)	19.05	2.79	11	35
Safety & Health Practices (SH)	20.29	2.68	12	25
Environmental Practices (EP)	19.83	2.84	12	25

The four scales exhibit acceptable to high internal consistency, justifying their use in subsequent correlation and regression analyses, as shown in Table 4. The "Environmental Practices" scale (α = 0.866) shows the highest reliability, indicating that its five items are closely linked to a single underlying construct. The "Safety and Health Practices" (α = 0.789) and "Technological Advancement" (α = 0.759) scales show good reliability, suggesting consistent responses across all items, with moderate dispersion. The "Operational Performance" scale (α = 0.723) is acceptable, meeting the generally accepted threshold of ≥ 0.70 for social science instruments. Taken together, these coefficients imply that the items of each construct measure the targeted dimensions with sufficient accuracy to allow inferences at the group level. If future improvement of the instrument is desired, the OP and the TA could be strengthened by (i) revising the weaker elements (e.g., clarifying the wording or improving the specific relevance of the HEI) and (ii) adding or rebalancing the indicators to capture important facets that are not yet fully represented.

Table 4
Reliability of constructs (Cronbach's α)

Construct	Items	Cronbach's α
Operational Performance (OP)	5	.723
Technological Advancement (TA)	5	.759
Safety & Health Practices (SH)	5	.789
Environmental Practices (EP)	5	.866

All reported associations are positive and statistically significant ($p < 0.01$, two-tailed test), indicating that higher levels of each practice tend to coexist with and with each other in operational performance (OP), as shown in Table 5. OP and technological progress (TA): $r = 0.726$ indicates a strong correlation. Units with more mature digital infrastructure, increased automation, and data-driven processes also report better operational performance (efficiency, quality of service, resource utilization). OP and environmental practices (EP): r = 0.696 indicates a strong correlation. Waste reduction, energy management, and more systematic environmental control are associated with better operational outcomes. OP and SH: r = 0.552 indicates a moderate to strong correlation. Better organized OHS routines (hazard identification, monitoring frequency, training, supportive work environment) are linked to improved performance, although less strongly than with TA and EP. Correlations between concepts show that practices are interdependent: TA–SH: r = 0.741 (strong correlation) and TA–EP: r = 0.675 (strong correlation) suggest that units with advanced technologies often also excel in OHS and environmental matters, which is consistent with integrated management systems and process standardization. Furthermore, SH–EP: r = 0.497 (moderate) indicates a significant, albeit comparatively weaker, link between safety culture and environmental initiatives.

This pattern confirms the article's hypothesis that capabilities related to sustainable development (TA, SH, EP) are associated with increased operational efficiency. Concurrently, the strong intercorrelations between the predictors (particularly TA–SH = 0.741) indicate shared variance. This explains why, in the multivariate regression, information technology (IT) and environmental practices (EP) remained significant predictors of operational performance (OP), unlike occupational health and safety (OHS): once IT and EP are included in the model, much of the bivariate contribution of OHS is absorbed by shared variance (in other words, OHS can function as a hygiene/compliance capability rather than a performance lever when more strategic capabilities such as IT and EP exist).

The bivariate data show that technology and environmental practices are most strongly associated with operational performance, while safety and health are positively associated, but in a more diffuse manner across units. This clearly justifies, empirically, prioritizing digital transformation and environmental management as performance-oriented capabilities, while integrating OHS to strengthen institutional resilience and continuity.

Table 5
Pearson correlations among constructs (n=278)

Variables	OP	AT	SH	EP
OP	1	.726**	.552**	.696**
TA	.726**	1	.741**	.675**
SH	.552**	.741**	1	.497**
EP	.696**	.675**	.497**	1

*Note: ** p < .01 (two-tailed). OP=Operational Performance; TA=Technological Advancement; SH=Safety & Health; EP=Environmental Practices*

The regression model in Table 6 shows a strong overall association between the set of predictors (Technological Advancement, Safety & Health Practices, Environmental Practices) and Operational Performance, with R = .778. The model explains 60.6% of the variance in operational performance (R^2 = .606), which is substantial for organizational research and indicates that sustainability related capabilities account for a large portion of performance differences across units. The Adjusted R^2 = .601 is only slightly lower than R^2, suggesting minimal shrinkage after correcting for the number of predictors and sample size. In practical terms, this small gap implies the model is parsimonious (few predictors, strong explanatory power) and likely to generalize well beyond the sample (N = 278). Together, these statistics support the conclusion that technology and environmental practices—along with safety culture to a lesser extent—form a meaningful explanatory set for operational performance in the HEI context.

Table 6
Regression model summary

Model	R	R Square	Adjusted R Square
1	.778	.606	.601

The ANOVA results in Table 7 indicate that the regression model is highly significant. The Regression Sum of Squares (SS = 1024.859, df = 3) captures the variation in Operational Performance explained jointly by Technological Advancement, Safety & Health Practices, and Environmental Practices. Dividing by its degrees of freedom yields a Mean Square = 341.620. The unexplained variation is given by the Residual SS = 667.170 (df = 277; MS = 2.409). The resulting F = 141.836 (i.e., 341.620 ÷ 2.409) with $p < .001$ rejects the null hypothesis that the model provides no improvement over a mean only specification—at least one predictor contributes significantly to explaining Operational Performance.

Two additional points help contextualize these values: (i) Effect magnitude: The ratio of explained to total variation (SS_regression / SS_total = 1024.859 / 1692.028 ≈ 0.606) mirrors $R^2 = .606$, confirming that the model accounts for about 60.6% of the variance in performance—substantial for organizational research. (ii) Degrees of freedom check: The total df = 280 implies N ≈ 281 (since total df = N − 1), while other tables report N = 278. For publication, it's good practice to reconcile N across tables (e.g., clarify casewise deletions or data cleaning) so that df and sample size are consistent throughout the manuscript.

Table 7
ANOVA for regression model

	Model	Sum of Squares	df	Mean Square	F (Sig.)
1	Regression	1024.859	3	341.620	141.836 (< .001)
	Residual	667.170	277	2.409	
	Total	1692.028	280		

The model indicates that Technological Advancement (AT) and Environmental Practices (EP) are the key drivers of Operational Performance (OP), while Safety & Health (SH) is not a significant predictor when the other variables are controlled as in Table 8.

The unstandardized coefficients (B) show expected changes in the OP composite score (sum of five items) per one unit increase in each predictor's composite: holding other variables constant, a +1 increase in AT is associated with +0.394 in OP, and a +1 increase in EP with +0.326 in OP; SH has a trivial effect (B = 0.030, p = .561). The standardized betas (β)—which make effects directly comparable—confirm that AT (β = .447, t = 6.769, $p < .001$) is the strongest predictor, followed by EP (β = .378, t = 7.398, $p < .001$); SH (β = .033, t = 0.582, p = .561) does not contribute net explanatory power beyond AT and EP. The constant (4.616, $p < .001$) represents the baseline OP level when all predictors are zero. Importantly, collinearity statistics indicate no serious overlap among predictors (Tolerance = .327–.545; VIF = 1.835–3.063—well below typical concern thresholds), so coefficient estimates are stable. Taken together, the results suggest that strengthening digital capability and environmental management is most directly associated with higher operational performance in the HEI context, whereas OSH appears to function more as a compliance/resilience hygiene factor rather than a performance lever when technology and environmental practices are accounted for.

Table 8
Regression coefficients and collinearity statistics

Predictor	B	SE	β	t	p	Tolerance	VIF
Constant	4.616	.786		5.871	< .001		
Technological Advancement	.394	.058	.447	6.769	< .001	.327	3.063
Safety & Health Practices	.030	.051	.033	.582	.561	.457	2.215
Environmental Practices	.326	.044	.378	7.398	< .001	.545	1.835

The results in Table 9 confirm that Technological Advancement (H1) and Environmental Practices (H3) have significant positive effects on Operational Performance, whereas Safety & Health Practices (H2) do not exert a direct, statistically significant impact when considered alongside the other predictors. Practically, this means investments in digital infrastructure, automation, data enabled processes and systematic environmental management (e.g., energy efficiency, waste minimization, emissions control) are the most reliable levers for improving process efficiency, service quality, and resource utilization. The non support for H2 is consistent with a pattern where OSH often functions as a compliance/resilience "hygiene" capability: it correlates positively with performance in bivariate analyses, but its unique contribution diminishes once stronger, performance oriented capabilities (technology and environment) are accounted for in the multivariate model. Methodologically, this aligns with the observed inter correlations among predictors, much of SH's variance overlaps with AT and EP, while collinearity diagnostics remain within acceptable bounds. Conceptually (RBV), the supported hypotheses indicate that HEIs gain performance advantages by developing valuable, hard to imitate digital and environmental capabilities; OSH may still be critical for risk management and continuity, but its performance impact likely operates indirectly (e.g., through staff engagement, absenteeism reduction, or service continuity) and may require better integration with productivity metrics to surface in regression models.

Table 9
Summary of hypothesis testing

Hypothesis	Result
H1: Technological advancement positively impacts operational performance.	Supported
H2: Safety & health practices positively impact operational performance.	Not Supported
H3: Environmental practices positively impact operational performance.	Supported

Taken together, the evidence shows that digital capability and environmental management are the most consequential levers for improving operational performance at MSU. The sample is broad and experienced, reliability is adequate ($\alpha > .70$), and relationships are consistent: Technological Advancement ($\beta = .447$, $p < .001$) and Environmental Practices ($\beta = .378$, $p < .001$) are strong, independent predictors of performance, while Safety & Health, though positively correlated, does not add unique explanatory power ($\beta = .033$, $p = .561$) once technology and environment are considered. The model's explanatory strength ($R^2 = .606$; Adjusted $R^2 = .601$) underscores that sustainability related capabilities account for a substantial share of institutional efficiency.

Practically, MSU (and similar HEIs) should prioritize digital transformation (standardized systems, automation, data governance) and institutionalize environmental policies (energy, waste, emissions targets embedded in dashboards and accountability cycles). To surface OSH's contribution, reframe safety as a resilience capability and link it to continuity and productivity metrics (e.g., absenteeism reduction, service uptime). This alignment will help convert compliance into measurable performance outcomes and complement the gains already delivered by technology and environmental initiatives.

5. Conclusion and Recommendations

This study confirms that technological advancement and environmental management are the most influential sustainability practices for improving operational performance in Malaysian HEIs. Framed by the Resource-Based View, these practices act as strategic internal resources that enhance efficiency, resilience, and institutional reputation [1,4,7,8]. In contrast, safety and health practices, while essential for compliance and continuity, do not show a significant direct effect unless they are explicitly linked to productivity and service-continuity metrics.

To translate these findings into practice, universities should prioritize investments in scalable digital infrastructure, including AI-enabled services, cloud-based systems, and robust data governance [2]. These initiatives will strengthen process efficiency and decision-making capabilities. Similarly, environmental policies such as energy management, waste reduction, and green procurement should be institutionalized with measurable targets and integrated into operational dashboards to ensure accountability and sustained impact [7,8].

Safety and health practices should be reframed as resilience capabilities rather than mere compliance measures. Linking OSH programs to service continuity, staff productivity, and absenteeism reduction can make their contribution to performance more visible and strategically relevant. This shift will help HEIs unlock the latent value of safety culture in operational outcomes.

At the policy level, national and state agencies can accelerate sustainability adoption through targeted grants, performance-linked funding, and recognition schemes. Harmonizing sustainability reporting frameworks across HEIs will enable benchmarking and support Malaysia's transition toward a low-carbon, knowledge-driven economy [10,11].

Finally, the generalizability of these findings is limited by the single-institution design. Future research should include multiple HEIs, employ mixed methods to capture behavioral and cultural dimensions of sustainability adoption, and consider longitudinal designs to clarify causal pathways [12,15]. Such studies could also explore how OSH evolves into a performance-relevant capability when integrated with productivity metrics.

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