

The Role of ERP Systems in Driving Corporate Sustainability

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Abstract. *This paper explores how Enterprise Resource Planning contributes to sustainability through real-time monitoring, data-driven decision-making, and regulatory compliance. Through the analysis of case studies and industry reports, our study highlights the ways in which Artificial Intelligence (AI)-enhanced Enterprise Resource Planning solutions are transforming sustainability management. We demonstrate that Enterprise Resource Planning systems are not just operational tools but strategic enablers of corporate sustainability goals, ensuring that businesses meet regulatory requirements while enhancing their long-term resilience and efficiency. We adopted an exploratory research approach that combines literature review, case study analysis, and qualitative content analysis to gain comprehensive insights into the role of Enterprise Resource Planning systems in sustainability transformation. The analysis focuses on four dimensions: real-time monitoring and data-driven decision-making, sustainable supply chain management, regulatory compliance, and waste reduction through circular economy strategies. Through this we propose practical recommendations for businesses. These cover investment in AI, a transition to cloud-based solutions, the integration of Blockchain, a focus on the circular economy, and enhanced compliance monitoring.*

Keywords: Enterprise Resource Planning (ERP) Systems, Sustainability, Environmental, Social, and Governance (ESG), Digital Transformation (DT), Corporate Social Responsibility (CSR), Artificial Intelligence (AI).

Introduction

This paper examines how Enterprise Resource Planning (ERP) systems contribute to corporate sustainability through real-time monitoring, data-driven decision-making, and regulatory compliance. Through a structured exploration of academic and business literature, together with several case studies, we aim to develop practical proposals for businesses to adopt, to better benefit from ERP systems in the area of sustainability.

Corporate sustainability has become a fundamental priority for businesses striving to balance economic growth, environmental responsibility, and social well-being. Companies are increasingly pressured by stakeholders, regulatory bodies, and consumers to integrate sustainability practices into their operations. The emergence of Environmental, Social, and Governance (ESG) criteria as a key evaluation metric for investors and regulatory agencies highlights the need for businesses to adopt more transparent and sustainable operational frameworks. Organizations that fail to address sustainability concerns risk reputational damage, regulatory penalties, and declining competitiveness in a global market that favors responsible corporate practices.

Digital transformation is at the core of corporate sustainability strategies, enabling organizations to optimize resource use, improve efficiency, and enhance decision-making processes. Technologies such as Artificial Intelligence (AI), the Internet of Things (IoT),

Blockchain, and cloud computing provide businesses with the necessary tools to collect, analyze, and report sustainability-related data with unprecedented accuracy. By leveraging these innovations, companies can track carbon emissions, monitor supply chain ethics, and automate sustainability compliance reporting.

As organizations navigate the challenges of corporate sustainability, they are increasingly recognizing the need to integrate digital transformation with sustainability objectives. This dual shift, referred to as Twin Transformation, represents the interconnected advancement of both digitalization and sustainability strategies, ensuring that technology not only enhances efficiency but also supports long-term environmental and social responsibility (Christmann et al., 2024).

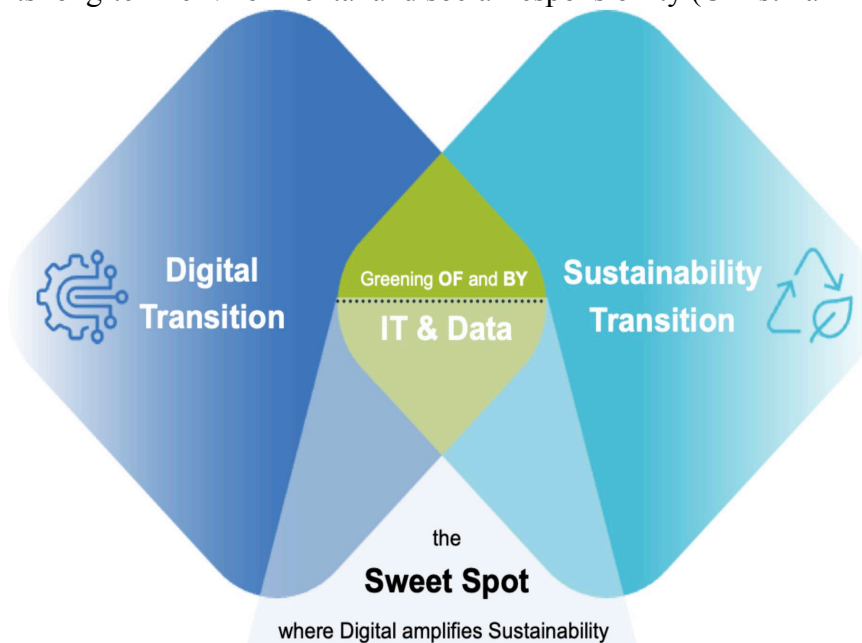


Figure 1. The sweet spot in Twin Transition where Digital amplifies Sustainability

Source: World Economic Forum, 2022.

Rather than treating digitalization and sustainability as separate strategic initiatives, Twin Transformation underlines the necessity of a synergetic approach, where both transformations mutually reinforce each other to unlock new sources of value. Digital transformation plays a pivotal role in enabling sustainability by providing real-time data analytics, predictive modelling, and automation, which facilitate better resource management and ESG compliance. Simultaneously, sustainability transformation can reshape digital strategies, guiding the development of technology-driven solutions that prioritize environmental and social goals (World Economic Forum, 2022).

Enterprise Resource Planning (ERP) systems stand at the core of this transformation, offering a comprehensive digital infrastructure that integrates both sustainability and operational objectives. These systems have evolved beyond traditional operational management tools to become key drivers of sustainability initiatives. By consolidating financial, operational, and sustainability-related data, ERP platforms enable businesses to:

- Monitor and reduce their environmental footprint by tracking energy consumption, carbon emissions, and waste generation.
- Ensure responsible supply chain management by enforcing ethical sourcing and procurement policies.

- Enhance regulatory compliance by automating ESG reporting and audit trails.
- Improve decision-making through data analytics and AI-driven insights, allowing organizations to adopt proactive sustainability measures.

With the rise of cloud-based ERP solutions, companies can also reduce their carbon footprint by eliminating the need for energy-intensive on-premises IT infrastructure. The ability to integrate machine learning within ERP systems further strengthens sustainability strategies by providing predictive analytics, real-time monitoring, and process optimization.

By analyzing case studies and industry reports, the study highlights the ways in which AI-enhanced ERP solutions are currently transforming sustainability management. We demonstrate that ERP systems are not just operational tools but strategic enablers of corporate sustainability goals, ensuring that businesses meet regulatory requirements while enhancing their long-term resilience and efficiency.

Following this introduction we first review academic and business literature to understand current trends and identify common themes. We then move on findings based on a structured analysis of case studies. The paper ends with our conclusions, including practical recommendations for businesses that may wish to adopt.

Literature review

The integration of AI into ERP systems has come out as a transformative element in the organizational management system, as can be identified in a significant number of academic papers published over the last decade. Academic literature points out how AI-enhanced ERP systems support the twin transformation framework by integrating digitalization and sustainability, while addressing Environmental, Social, and Governance (ESG) standards. The following literature review emphasizes key findings from recent academic papers and targeted business materials to explore this crossing.

Early research concluded more than a decade ago, such as papers of Adams and Garcia (2010) and Lee et al. (2009), set the foundation by exploring AI's potential to link technology and operations, forecasting trends like enhanced decision-making and operational efficiency. Subsequent studies, including Smith (2021) and Johnson and Patel (2020), contribute to providing extensive overviews and empirical evidence of AI's role in developing ERP functionalities, pointing out benefits such as operational efficiency and predictive insights through technologies like machine learning and natural language processing.

The concept of "twin transformation" was defined by Christmann et al. (2024) as the interplay between digital and sustainability efforts, improving organizations through this integration. Twin transformation came as a grip in recent years as businesses and societies face simultaneous challenges of digitalization and decarbonization, necessitating a cohesive strategy to address both. Based on two key sources: a practical guide from the World Economic Forum (WEF, 2022) and the academic study by Christmann et al. (2024) an integrated view is provided for the concept, its implementation, and the organizational capabilities required. According to "The Twin Transformation Butterfly" written by Christmann et al. (2024) twin transformation is presented as leverage for digital technologies to enhance sustainability, identifying 16 dynamic capabilities that organizations must develop. AI-enhanced ERP systems are central to this process, enabling data-driven sustainability insights and operational efficiency. The manuscript written by Christmann et al. (2024) emphasizes capabilities such as deploying sustainable digital technologies and leveraging digitalization for ESG reporting, which aligns with broader corporate goals. On the other hand, the World Economic Forum (WEF, 2022) offered in its study a conceptual description

rather than a concise definition, aligning with its focus on implementation and broader industry discourse presenting a framework which underscores ERP systems as a central element for integrating twin transformation principles, providing a structured approach to meeting ESG demands.

Burinskiene, A. & Nalivaike, J. (2024) underline that twin transformation is implicitly defined as the simultaneous adoption of digital technologies and sustainable practices by SMEs to meet EU policy targets. This is a pragmatic approach that focused on measurable indicators and factors like resource productivity and technology adoption considering that their study examines twin transformation in the context of SMEs across the EU-27, aligning with the EU's Digital Decade 2030 and Green Deal goals.

In addition, Mhaskey (2025) demonstrates in its paper that AI-driven ERP solutions improve operational outcomes, with over 30% increases in user satisfaction and 25% boosts in productivity. Based on the study these systems use predictive analytics and machine learning to optimize processes in this way being capable of reducing in this day-to-day world resource waste and supporting sustainability objectives. On the same pattern, Godbole (2023) reported a 27% reduction in task processing times and an 18% decrease in maintenance costs across 300 enterprises using AI-infused ERP systems.

The study of Zhang & Huang (2024) highlights how digital transformation enhances ESG performance in Chinese A-share listed companies from 2009 to 2022, with supply chain resilience-specifically reduced supplier and customer concentration-as a key mediator. Based on the spread of innovation, resource view and stakeholder theories, the study emphasizes that digital tools improve transparency, risk diversification, and operational efficiency, boosting ESG scores, with stronger effects in non-heavy polluting, high-tech, and eastern-region firms.

Achieving and improving transparency and compliance through real-time data processing is the result of integrating AI to address ESG issues, positioning ERP as a critical infrastructure for digital transformation. The paper of Mhaskey (2024) makes the connection of AI integration in ERP systems to real-time data processing and compliance, which are critical for ESG, more closely on governance aspect.

From another perspective, Bhagat (2025) emphasizes transparency and accountability using explainable AI, solid governance frameworks and real-time processing capabilities aligning with ESG's governance and social aspects, positioning ERP as a tool able to make transformation and answer to different social objectives from public sector operations, even though it does not concentrate on the explicit ESG concept or does not explore the private-sector digital transformation.

Zawad & Balázs (2024) explore how machine learning within ERP environments enables dynamic adaptation to real-time insights. This adaptability enhances operational efficiency and supports sustainability by minimizing environmental footprints through optimized resource use.

Wang et al. (2023) provide in its study the empirical evidence of AI adoption in ERP systems from Chinese firms, showing how significantly this enhances ESG performance by fostering green innovation. AI tools embedded in ERP platforms improving governance through better monitoring and reporting serving as a comprehensive digital infrastructure, bridging operational and sustainability goals and showing how digital transformation boosts these effects.

Improvements brought by AI adoption in ERP infrastructure for digital support aligned with organizational goals enhance sustainability by reducing energy consumption and operational inefficiencies of different companies, aligning with ESG standards and focusing on AI's role in

improving the decision-making process, in predictive maintenance and personalized user experiences, enhancing both operational and environmental outcomes.

The papers presented in this literature review emphasize that AI-enhanced ERP systems are at the core of digital transformation, offering a digital infrastructure that integrates sustainability and operational objectives. With the help of twin transformation and tools like predictive analytics, organizations are enabled to respond effectively to ESG standards, balancing efficiency with environmental and social responsibility. Further research could explore more the impact of digital technologies over corporate sustainability, scalability and long-term ESG impacts across diverse industries and countries.

Methodology

This study adopts an exploratory research approach to investigate how ERP systems facilitate corporate sustainability. Given the evolving nature of ERP-driven sustainability initiatives, an exploratory approach allows for the identification of emerging trends, challenges, and best practices. We combine literature review, with case study analysis and qualitative content analysis, to develop comprehensive insights into the current role played by ERP systems in sustainability transformation.

A structured review of academic research, industry reports, and regulatory guidelines was conducted to establish a theoretical foundation for the role of ERP in corporate sustainability. Sources included peer-reviewed journal articles, white papers from leading ERP vendors, and reports from organizations such as the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB), and the European Corporate Sustainability Reporting Directive (CSRD). The review focused on identifying key sustainability metrics, ERP functionalities, and digital transformation strategies.

To assess real-world applications, we analyze a number of case studies of organizations that have integrated sustainability features into their ERP systems. The selected cases span different industries, including manufacturing, retail, logistics, and financial services, providing a diverse perspective on ERP's impact. Each case study examines:

- ERP implementation strategies for sustainability
- Sustainability reporting improvements achieved through ERP automation
- Measured reductions in carbon footprint, waste, and resource consumption
- Challenges faced and key lessons learned from ERP adoption

To further understand industry trends, qualitative content analysis was applied to sustainability reports and white papers from major ERP providers such as SAP, Oracle, and Microsoft, with the aim of identifying common themes relating to ERP solutions and their design that address ESG compliance, sustainability reporting, and operational efficiency. Additionally, this method helps to highlight industry-specific best practices and technological advancements that drive ERP innovation in sustainability management.

By combining literature review, case study analysis, and qualitative content analysis, we aim to provide a comprehensive understanding of ERP's role in sustainability transformation, highlighting its potential as a strategic enabler of corporate ESG initiatives.

Results and discussions

In this section we present the key findings of this study, highlighting the ways in which ERP systems are currently contributing to corporate sustainability. Through the analysis of real-world

implementations and leveraging insights from the literature and case studies, we explore how ERP-driven technologies enhance sustainability practices. The analysis focuses on four main dimensions: (1) real-time monitoring and data-driven decision-making; (2) sustainable supply chain management; (3) regulatory compliance; and (4) waste reduction through circular economy strategies. These four dimensions reflect the most significant areas where ERP adoption is driving measurable improvements in environmental, social, and governance (ESG) performance.

1. Real-time Monitoring and Data-Driven Decision Making

ERP systems enable organizations to track, measure, and analyze sustainability metrics in real time. Integrated sustainability dashboards allow businesses to monitor carbon emissions, energy consumption, and waste production, providing actionable insights for reducing environmental impact. AI-driven analytics enhance decision-making by identifying patterns and forecasting sustainability trends, helping companies set and achieve reduction targets proactively.

In addition, IoT sensors embedded in production facilities and supply chains feed real-time data into ERP platforms, enabling automated environmental monitoring. Organizations can leverage predictive analytics to optimize energy efficiency, prevent excessive waste, and improve operational sustainability.

GridPoint (2025), BrainBox AI's ARIA presented in (Times, 2024), and Verdigris Technologies (2025) represent case studies showing real-time monitoring and data-driven decision-making solutions with solid potential but mixed impact. GridPoint's platform optimizes energy use in commercial buildings with granular data, cutting costs and supporting grid stability elements considered practical but not radical from the point of view of changes. ARIA's AI components boost HVAC (heating, ventilation, air con) systems and building data for efficiency (up to 25% energy savings) and emissions cuts (up to 40%), though its real-world scale is still unfolding. Verdigris systems track equipment-level energy patterns, offering actionable insights for efficiency, but lacks transformative depth. All three leverage real-time data effectively, acting as enhancing tools for existing systems, rather than completely overhauling them considered valuable advancements but not revolutionary changes.

2. Sustainable Supply Chain Management

ERP systems play a crucial role in ensuring sustainable procurement and ethical supply chain management. By integrating supplier ESG scoring, organizations can assess vendor sustainability performance and make informed procurement decisions that align with corporate responsibility goals.

AI-powered ERP solutions analyze vast datasets to predict supply chain inefficiencies, reducing overproduction, minimizing transportation-related emissions, and identifying optimal routing strategies. Blockchain-integrated ERP further enhances supply chain transparency, ensuring ethical sourcing and preventing fraudulent sustainability claims.

The AI integration into supply chain management for true sustainability can be showcased using the examples from case studies provided by Estes (2024) through Virtasant's examples (DHL, Walmart, Unilever), Reuters (2024) with FedEx's investment in Nimble robotics, and Shein's AI-driven fashion model. Virtasant (2024) points out that DHL's sorting robots cut emissions by improving efficiency (over 40% sorting capacity). Furthermore, Walmart's AI driven forecasting helps to minimize inventory waste, and Unilever is addressing its 70% supply chain emissions footprint with smarter logistics. FedEx's with its \$106 million investment in Nimble's autonomous aimed to reduce last-mile delivery costs and emissions through automation processes.

Meanwhile, Shein's use of AI, as mentioned by Time (2024), helps predict trends to reduce overproduction, although the fast fashion model still grapples with significant emissions and waste. Together these cases illustrate how digital transformation can streamline inventory, lower fuel consumption, and improve transparency, considered key factors for achieving success in Sustainable Supply Chain Management (SSCM). However, the improvements are more gradual than revolutionary. For example, while Shein leverages AI, its approach risks greenwashing within a fundamentally unsustainable business model. Likewise, while FedEx and Virtasant focus on efficiency, this often comes at the expense of a more comprehensive sustainability strategy. Although AI plays a valuable role in advancing SSCM by reducing carbon emissions and waste, it is essential to rethink supply chains fundamentally to achieve deeper sustainability and have in mind challenges like data privacy, high initial investments, and the continued need for human oversight.

3. Regulatory Compliance and ESG Reporting

With increasing global ESG regulations (e.g., EU CSRD, GRI, SASB), organizations face growing pressure to ensure accurate sustainability reporting. ERP systems automate ESG data collection, validation, and reporting, reducing administrative burdens and ensuring compliance with regulatory frameworks.

AI-driven ERP platforms can identify discrepancies in sustainability reports, mitigating greenwashing risks. These systems streamline carbon accounting, water usage tracking, and waste disposal documentation, making ESG reporting more reliable and auditable.

In 2024 Thomson Reuters published the report "How EnerSys uses GenAI to drive efficiency, ensure accuracy, and safeguard sustainability & ESG data" showcasing EnerSys leveraging GenAI (e.g., ChatGPT Enterprise) to streamline ESG reporting and compliance, decreasing questionnaire time by 50% while emphasizing human oversight for accuracy. In addition, RepRisk (2025) uses AI to analyze massive quantities of ESG risk data daily, using rules-based approaches to enhance compliance due diligence. In February 2025 FintechTalk highlights in Business Reporter an interview with Head of ESG Reporting from AIA Group mentioning the AI's role in automating ESG data processes in finance, enhancing regulatory compliance but warning of potential risks like bias. Collectively, these three cases studies highlight that AI increases efficiency in ESG reporting and compliance, though human review and data integrity remain critical.

4. Waste Reduction and Circular Economy Strategies

ERP systems support organizations in implementing circular economy principles, ensuring resource optimization, waste reduction, and lifecycle management. By tracking product lifecycle data, ERP platforms help businesses design recycling programs, reverse logistics, and sustainable production processes.

AI-enhanced ERP solutions provide material efficiency models, helping manufacturers minimize raw material waste, optimize inventory levels, and promote product remanufacturing. Cloud-based ERP further reduces environmental impact by eliminating energy-intensive on-premise IT infrastructure.

Based on the case studies from Winman (2025), Pangrow (2024) related to Starbucks, and Recykal (2024) & Recykal (2023), waste reduction and circular economy strategies in the food and waste management sectors demonstrate significant potential when supported by robust ERP systems and innovative business models. On one side, Winman company examined ERP systems

in the food industry in 2025 highlighting how integrated software can optimize production, reduce excess waste, and enhance resource efficiency by streamlining supply chains and minimizing overproduction. On the other side, Starbucks' ERP case study, though focused on operational efficiency, implies indirect waste reduction through better inventory management and demand forecasting, aligning with circular principles by curbing unnecessary resource use, even if sustainability is not the main important focus. The model proposed by Recykal directly integrates circularity by digitizing waste management in India, connecting stakeholders to recycle materials like plastic and e-waste, hence closing the loop and decreasing the dependence of landfill. All together, these cases suggest that ERP systems technology-driven solutions can effectively support waste reduction and circularity by improving process visibility and resource tracking. However, these companies' success in waste reduction and circular economy strategies (Atasu et. all, 2021) vary through the final purpose. Winman and Recykal aim for sustainability, while Starbucks's advantages are more incidental meaning that the circular goals indicate intentional design toward maximizing impact. Therefore, these strategies are efficient when technology and objectives are aligned, but systemic change, scalability in various markets and the need for broader adoption are still big challenges.

As organizations continue their digital transformation journeys, the role of ERP systems in sustainability is expected to evolve significantly. Emerging technologies such as Artificial Intelligence (AI), blockchain, and cloud computing are set to redefine the sustainability landscape by making ERP systems more intelligent, automated, and efficient.

- Machine learning algorithms enable ERP systems to process vast amounts of sustainability data in real time, identifying trends and providing predictive insights. These capabilities allow businesses to optimize resource consumption, detect inefficiencies, and automate carbon accounting processes. AI-driven ERP platforms can also recommend sustainability best practices, alerting companies to potential compliance risks and helping them align with ESG goals.
- The transition from on-premise ERP systems to cloud-based solutions has reduced energy consumption and carbon footprints associated with maintaining large-scale IT infrastructures. Cloud ERP enables remote access, real-time collaboration, and lower hardware dependency, leading to more sustainable operations. Moreover, many cloud service providers prioritize green energy sourcing, further enhancing the environmental benefits of cloud-based ERP adoption.
- Blockchain technology has the potential to revolutionize sustainability reporting and supply chain transparency. By integrating blockchain with ERP systems, businesses can ensure immutable ESG data records, traceable product life cycles, and verifiable ethical sourcing claims. This eliminates risks associated with greenwashing and improves trust among stakeholders, regulators, and consumers.

As ERP systems become more advanced, businesses must proactively integrate sustainability metrics into their core operations. Future ERP models will likely emphasize circular economy strategies, automated ESG compliance, and AI-powered sustainability audits. Companies investing in next-generation ERP solutions will not only enhance their sustainability performance but also gain a competitive advantage in an increasingly ESG-driven business environment.

Conclusion

Our investigations highlight the critical role that ERP systems play in driving corporate sustainability by enabling real-time monitoring, data-driven decision-making, sustainable supply chain management, regulatory compliance, and circular economy strategies. Modern ERP platforms, enhanced by AI, IoT, and blockchain, are allowing businesses to optimize resource consumption, track ESG performance, and enhance transparency in sustainability initiatives. The case studies we presented clearly demonstrate that ERP adoption significantly can reduce carbon footprint, improve ethical sourcing, and ensure adherence to evolving ESG regulations.

As a result of these analyses, we can, therefore, propose several practical recommendations and strategic actions that businesses might adopt to fully leverage ERP systems with an aim on sustainability.

1. *Invest in AI-Enhanced ERP Solutions:* AI-driven ERP platforms provide predictive analytics and automation that enhance sustainability decision-making and regulatory compliance.
2. *Transition to Cloud-Based ERP:* Cloud solutions offer energy-efficient alternatives to on-premises infrastructure, reducing overall carbon emissions.
3. *Integrate Blockchain for ESG Transparency:* Blockchain-powered ERP ensures tamper-proof sustainability records, fostering greater trust among stakeholders.
4. *Adopt a Circular Economy Framework:* ERP-enabled product lifecycle tracking and reverse logistics help minimize waste and promote sustainable production practices.
5. *Enhance Supplier ESG Compliance Monitoring:* ERP-driven supplier scoring mechanisms improve ethical sourcing and sustainability accountability across the supply chain.

As digital transformation accelerates, AI-powered, cloud-based, and blockchain-integrated ERP systems will play an increasingly pivotal role in sustainability strategies. Businesses that proactively integrate sustainability metrics into their ERP frameworks will not only improve their ESG performance but also strengthen long-term resilience and competitive advantage. The future of ERP lies in its ability to seamlessly align corporate objectives with global sustainability imperatives, ensuring that businesses remain agile, transparent, and environmentally responsible in an ever-evolving regulatory landscape.

While this study provides valuable insights, it is subject to several limitations. First, reliance on publicly available case studies may introduce selection bias, as organizations that have successfully implemented ERP for sustainability are more likely to document their results. Second, the lack of primary data collection limits deeper insights into decision-making processes and implementation challenges.

Our future research will incorporate empirical data collection through surveys and expert interviews, as this will further enhance our understanding of ERP adoption for sustainability, leading to refined proposals for its implementation in future.

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