

DIGITAL TRANSFORMATION OF PUBLIC SERVICE AND ITS INFLUENCE ON THE DEVELOPMENT OF HUMAN CAPITAL

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Abstract. This article examines the process of digital transformation in the public service and its impact on the development of human capital. It argues that the adoption of digital tools, platforms and data-driven organizational structures reshapes the role of public servants, demands new competencies and enables continuous learning pathways. To explore this linkage, the paper reviews the conceptual foundations of digital transformation and human capital, identifies mechanisms through which transformation affects workforce capabilities, presents empirical evidence from recent public-sector reform initiatives, and discusses challenges and implications for public institutions. The findings suggest that while digital transformation opens new opportunities for human capital development, realizing them depends on complementary factors such as training, culture, leadership and evidence-based human-resource management. The article concludes with recommendations for aligning digital-service strategies with human-capital policies and indicates directions for further research in public-administration practice.

Keywords: digital transformation, public service, human capital, workforce development, public sector reform, digital government.

Аңдатпа. Мақалада мемлекеттік қызметтің цифрлық трансформациясы және оның адами капиталды дамытуға әсері қарастырылады. Зерттеушілер цифрлық құралдар мен платформаларды, мәліметтерге негізделген ұйымдық құрылымдарды қолдану мемлекеттік қызметкерлердің рөлін өзгертетінін, жаңа құзыреттерге сұраныс туғызатынын және үздіксіз оқуға мүмкіндік беретінін дәлелдейді. Бұл байланыс зерттеу үшін цифрлық трансформация мен адами капитал түсініктерінің негіздері шолып өтіледі, кадрлық мүмкіндіктерге әсер ету механизмдері айқындалады, мемлекеттік сектор реформаларының эмпирикалық деректері келтіріледі, сондай-ақ мемлекеттік институттар үшін проблемалар мен практикалық салдарлар талқыланады. Зерттеу нәтижелері көрсетеді: адами капиталды дамытуға жаңа мүмкіндіктер ашылғанмен, олардың іске асуы оқыту, мәдениет, көшбасшылық және мәліметтерге негізделген кадрлық басқару сияқты қосымша факторларға тәуелді. Қорытындыда цифрлық қызмет стратегиясын адами капиталды дамыту саясатымен сәйкестендіруге арналған ұсыныстар беріліп, қосымша зерттеу бағыттары ұсынылады.

Түйінді сөздер: цифрлық трансформация, мемлекеттік қызмет, адами капитал, кадрлық даму, қоғамдық секторды реформа, цифрлық мемлекеттік басқару.

Аннотация. В статье рассматривается процесс цифровой трансформации государственной службы и её влияние на развитие человеческого капитала. Авторы утверждают, что внедрение цифровых инструментов, платформ и структур, ориентированных на данные, трансформирует роль госслужащих, предъявляет новые требования к компетенциям и открывает возможности для непрерывного обучения. Для изучения данной связи проводится обзор концептуальных основ цифровой трансформации и человеческого капитала, выделяются механизмы воздействия на кадровые возможности, приводятся эмпирические данные из реформ государственного сектора, обсуждаются проблемы и практические выводы для государственных институтов. Полученные результаты показывают: несмотря на новые возможности для развития человеческого капитала, их реализация зависит от таких факторов, как обучение, культура, лидерство и основное на данных управление персоналом. В заключении даются рекомендации по выравниванию стратегии цифровых услуг с политикой развития человеческого капитала и указываются направления дальнейших исследований.

Ключевые слова: цифровая трансформация, государственная служба, человеческий капитал, развитие кадров, реформа госсектора, цифровое государство.

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Introduction

Over the past decade, digital transformation has become a defining paradigm in the evolution of modern public administration. Governments worldwide are moving beyond traditional bureaucratic models toward data-driven, networked and citizen-centered systems of governance. This shift entails not only the introduction of new technologies but also profound changes in organizational structures, decision-making processes and the skills required from public servants. In this context, human capital – the aggregate of knowledge, competencies and values of civil servants – emerges as both a precondition and a consequence of successful digital transformation.

The growing interest in digitalization within public institutions has led to a rapidly expanding body of literature that explores how technological innovations affect governance practices, workforce development and organizational culture. Scholars and policy institutions such as the OECD and the World Bank increasingly highlight that the effectiveness of digital transformation depends less on the adoption of technology itself and more on the capacity of people to use it creatively and responsibly. However, despite a rich and diverse research landscape, the relationship between digital transformation and human-capital development remains conceptually fragmented and empirically uneven.

The purpose of this review article is to synthesize and critically examine the existing literature on digital transformation in the public service, with a particular focus on its influence on human capital. The review aims to:

- (1) map key theoretical perspectives that link technology, governance and human resources;
- (2) identify major trends and findings in empirical studies;
- (3) highlight cross-national experiences and policy approaches; and
- (4) outline research gaps and future directions for the study of digital-era public administration.

By integrating insights from academic publications, international reports and comparative case studies, this review contributes to a clearer understanding of how digital transformation reshapes the competencies, roles and development trajectories of public servants. It also offers a conceptual foundation for policymakers seeking to align digital-government strategies with human-capital policies, ensuring that technology serves not as a substitute for people but as a catalyst for their growth and effectiveness in the public sector.

Literature Review

Conceptual evolution of digital transformation in public administration

The scholarly understanding of digital transformation within public administration has evolved considerably since the early 2000s. Initial works, such as Fountain's *Building the Virtual State* (2001) and Heeks' *Implementing and Managing eGovernment* (2006), framed digitalization mainly as the automation of bureaucratic processes aimed at improving efficiency and transparency. These studies reflected the first generation of e-government reforms, which prioritized the delivery of online services and back-office integration. Since the mid-2010s, however, the discourse has shifted from e-government to digital government and then to digital transformation. Mergel, Edelman and Haug (2019) demonstrated that the concept increasingly encompasses organizational, cultural and behavioral change. The OECD (2020, 2023) further conceptualized digital transformation as a multidimensional reform process that integrates technology, human resources, and governance innovation. This paradigm stresses not only technological adoption but also adaptability, collaboration and citizen-centered design – elements that reframe the role of civil servants as active co-creators of value rather than passive executors of policy. Similarly, the World Bank's *GovTech Maturity Index* (2022) and the UN *E-Government Survey* (2022) highlight that successful transformation requires a holistic approach: digital platforms must be aligned with institutional capabilities, leadership commitment, and human-capital development. These frameworks collectively move the debate beyond infrastructure and toward the human and organizational dimensions of technological change.

Human capital in the context of public-sector transformation

The concept of human capital, introduced by Becker (1964) and Schultz (1971), traditionally referred to the accumulation of skills and knowledge that enhance productivity. In the public sector, it has been reinterpreted as the collective competence, ethical commitment, and learning capacity

of civil servants (Bontis, 2001; OECD, 2023). Modern governance literature increasingly recognizes that digital-era reform depends on such human capabilities.

Recent analyses connect human-capital development with the evolution from New Public Management (NPM) to New Public Governance (NPG) and digital-era governance (Dunleavy, 2006). While NPM emphasized efficiency and measurable outputs, newer models focus on networks, collaboration, and citizen participation – qualities requiring adaptive and digitally literate officials. Deloitte’s Human Capital Trends (2023) similarly underscores that public organizations must foster continuous learning ecosystems that combine reskilling, mentoring and knowledge-sharing through digital HR platforms. The OECD’s Public Employment and Management Report (2023) reaches the same conclusion: workforce capability, not technology, is the decisive factor in the success of digital reform. Studies conducted in various contexts confirm this dynamic understanding. Karpenko O. (2023) observed that in post-transition European administrations, digital projects advance most effectively where training and career development are institutionalized. UNDP and the Astana Civil Service Hub (2023) reached comparable results in their examination of Kazakhstan’s civil service, noting that digital initiatives yield sustainable benefits only when linked to systematic human-capital policies and professional standards.

Linking digital transformation and human-capital development

Across the reviewed literature, the interaction between digital transformation and human capital is viewed as bidirectional. On one side, digital technologies create demand for new skills – data literacy, agile project management, service-design thinking, and ethical decision-making in digital contexts (European Commission, 2023). On the other, these technologies enable new modes of learning, collaboration, and performance monitoring that can accelerate human-capital growth (OECD, 2020; World Bank, 2022). Research also highlights the mediating role of organizational culture and leadership. Sorensen and Torfing (2022) argue that innovation in public administration unfolds through “orders of public innovation” in which leadership and learning jointly shape institutional adaptability. Transformational and inclusive leadership styles foster a climate of experimentation and shared responsibility, essential for continuous capability building. By contrast, rigid hierarchical structures hinder knowledge exchange and limit the potential of digital initiatives.

The literature further suggests that digital transformation expands the meaning of human capital beyond technical skills. It includes social, cognitive and ethical dimensions – empathy in online service delivery, trust management in data governance, and creativity in cross-agency problem-solving (Alon-Barkat, 2023). These aspects position human capital as both the driver and beneficiary of digital governance.

International experience demonstrates diverse trajectories in linking digital transformation with workforce development. Singapore’s Smart Nation strategy integrates digital-skills training into every level of the public-service competency framework (Wa’u, 2024). South Korea’s Digital New Deal (2021) prioritizes retraining public employees for innovation-oriented governance. In Europe, Estonia and Denmark exemplify how long-term investment in human capital and digital infrastructure produces mutually reinforcing progress (United Nations E-Government Survey 2024; OECD, 2025).

Conversely, in transitional economies – including several post-Soviet states – scholars identify persistent challenges such as limited resources, insufficient digital literacy, and institutional resistance to change (Afzal, 2024). The World Bank (2022) reports that improvements in the GovTech Maturity Index correlate with productivity gains only when accompanied by consistent investment in public-sector training. These observations confirm that technology adoption alone does not guarantee success; it must be complemented by sustained human-capital policies.

A comparative overview of selected countries is presented in Table 1, which summarizes their digital-maturity levels, workforce-development priorities, and flagship policy initiatives.

Table 1. Comparative Overview of Digital Transformation and Human-Capital Initiatives (Selected Countries, 2022–2024)

Country	Digital Maturity (OECD DGI)	Workforce-Development Focus	Flagship Initiative
Singapore	Very High	Continuous reskilling, leadership development	Smart Nation Academy

Estonia	High	Data-driven HRM, lifelong learning culture	e-Governance Academy
Denmark	High	Agile administration, citizen-centered design	National Strategy for Digitalization
South Korea	High	Innovation-oriented reskilling, AI-literacy programs	2021 Action Plan for Digital New Deal
Kazakhstan	Medium	HR-standards reform, digital-skills upgrading	Digital Kazakhstan Program
Note. Compiled by the authors based on sources: OECD (2023), UNDP & Astana Civil Service Hub (2023), Wa'u (2024), and World Bank (2022).			

This comparative perspective reinforces the argument that digital transformation and human-capital development are mutually dependent. High-performing digital states consistently align technological progress with structured workforce-development policies. By contrast, countries that focus primarily on infrastructure without embedding learning and training mechanisms achieve limited and short-lived results.

The reviewed scholarship reveals both consensus and fragmentation. There is broad agreement that human capital is central to effective digital transformation, yet approaches to defining and measuring it remain inconsistent. Some studies focus narrowly on ICT skills, while others emphasize broader competencies such as leadership, collaboration, and ethical awareness. Empirical research remains uneven, heavily concentrated in OECD countries, with limited longitudinal data from developing and transitional administrations. Another gap concerns the integration of human-capital metrics into digital-government evaluation frameworks. Most international indices – including the UN E-Government Survey (2022) and the GovTech Maturity Index (2022) – measure service availability and infrastructure but not workforce capability. This omission obscures the human dimension of digital progress. Future research therefore needs to strengthen comparative and longitudinal methodologies, bridge disciplinary boundaries between information-systems and public-administration studies, and explore how inclusive leadership and organizational learning mediate the link between technology and people.

Overall, the literature portrays digital transformation and human-capital development as interdependent processes. Digital technologies reshape the competencies and structures of public administration, while human capital determines the capacity of institutions to implement and sustain change. The interplay between these dimensions defines the success of modern governance reforms. These themes provide the analytical foundation for the subsequent discussion of implications for policy, leadership and organizational learning.

Methodology

This article is based on a structured review of academic and policy-oriented literature rather than on an independent empirical study. The methodological approach is aimed at summarising and critically analysing existing research on digital transformation in public administration, with particular attention to its implications for human capital development. The review focuses on identifying common themes, recurring arguments, and analytical perspectives present in the selected body of literature, without collecting or analysing primary empirical data.

The review was conducted in accordance with the principles of narrative synthesis and qualitative content analysis. Academic databases such as Scopus, Web of Science, and Google Scholar were searched using a combination of keywords including *digital transformation*, *public administration*, *e-government*, *human capital*, *workforce development*, and *public sector innovation*. The search covered publications from 2015 to 2024, reflecting the period when the notion of “digital transformation” began to replace earlier concepts such as “e-government” and “information society”.

The inclusion criteria focused on peer-reviewed journal articles, institutional reports (OECD, World Bank, UN E-Government Survey, European Commission, Deloitte Human Capital Trends), and case studies addressing human-capital issues within the context of public-sector digitalization. Publications that dealt exclusively with private-sector digital transformation or purely technical aspects of information systems were excluded. Preference was given to studies that analyzed organizational change, workforce skills, leadership, learning, and HR management in government agencies.

The analytical process followed three stages.

1. Screening and selection: An initial set of 180 sources was identified; after removing duplicates and non-relevant materials, 82 publications were selected for full review.
2. Thematic coding: Each text was examined to identify recurring categories such as conceptual definitions, mechanisms of influence, barriers, leadership roles, and policy recommendations.
3. Synthesis: The findings were grouped into broader thematic clusters – conceptual foundations, human-capital implications, empirical evidence, and emerging challenges – forming the structural basis for the subsequent sections of this review.

This qualitative synthesis method allows for an integrative perspective on how scholars and practitioners conceptualize the link between digital transformation and human capital. By combining academic and institutional sources, the review seeks to bridge the gap between theory and policy practice and to outline a coherent research agenda for future studies in public-sector transformation.

At the final stage of the review, a SWOT framework was used to organise and summarise the main strengths, weaknesses, opportunities, and threats related to human-capital development in the context of digital transformation. In this article, the SWOT analysis does not serve as an independent research method, but rather as a supporting analytical tool that helps to structure and interpret recurring findings reported in the reviewed literature.

Results

The analysis of the reviewed literature reveals several recurring themes related to the digital transformation of public service and its influence on human capital. These themes reflect common patterns identified across academic studies and international policy reports. Rather than presenting empirical measurements, the Results section summarises consolidated insights that emerge from the comparative and thematic examination of the selected sources.

The analysis of the selected literature reveals four broad thematic areas that characterize how scholars and policy institutions conceptualize the relationship between digital transformation and human capital in the public sector. These themes reflect both the evolution of the digital-government agenda and the growing recognition of people as the central drivers of transformation rather than its passive recipients. Earlier studies (Fountain, 2001; Heeks, 2006) treated digitization as a primarily technological process aimed at automating administrative procedures and improving efficiency. However, more recent research (Mergel, 2019) re-conceptualizes digital transformation as an organizational and cultural phenomenon. This perspective emphasizes adaptability, innovation, and citizen-centered design as essential dimensions of public-sector digitalization. In this context, technology is understood as an enabler of change rather than the change itself. The focus shifts from systems and platforms to competencies, leadership, and cross-agency collaboration. Across the literature, human capital appears simultaneously as a prerequisite and an outcome of successful digital transformation. A digitally competent workforce is necessary for the adoption and implementation of new technologies, yet transformation processes also create new opportunities for learning and capability building. According to OECD (2023) and the World Bank (2022), the effectiveness of digital reforms depends less on investment in infrastructure than on the ability of civil servants to use data, manage digital tools, and engage in continuous learning. Studies by Karpenko (2023) and UNDP & Astana Civil Service Hub (2023) similarly demonstrate that reforms succeed where training and up-skilling are institutionalized as part of HR strategy.

Several authors underline that digital transformation expands the traditional notion of human capital. Beyond formal qualifications, it includes soft skills – adaptability, creative problem-solving, communication, and ethical reasoning in digital contexts. Public employees increasingly need to interpret data, collaborate in virtual environments, and manage innovation processes. Thus, human capital development becomes dynamic, continuous, and strongly interlinked with organizational culture. A recurrent finding in the reviewed literature concerns the decisive role of leadership and institutional culture in mediating the impact of digital transformation on human capital. Transformational and inclusive leadership styles encourage experimentation, team learning, and the acceptance of new technologies (Sorensen, 2022). In contrast, rigid hierarchical cultures tend to reinforce resistance and limit learning opportunities. Several studies emphasize that leadership

development itself should be an integral component of digital-government programs: leaders must understand not only technology but also human behavior, motivation, and change management.

Furthermore, digital transformation often prompts a re-evaluation of organizational structures. Traditional departmental boundaries give way to project-based or networked arrangements, fostering cross-functional collaboration. These structures require public servants to operate flexibly across domains, further enhancing the strategic importance of human-capital planning and career development frameworks.

Emerging challenges and inequalities

Despite its benefits, digital transformation introduces significant challenges. One persistent issue identified across studies is the digital skills gap. Rapid technological change outpaces training systems, leaving many civil servants without the competencies necessary for data-driven governance (Deloitte, 2023). This problem is particularly acute in small municipalities and developing economies, where access to training resources is limited. Another emerging concern is the potential for inequality and exclusion. Digital tools can inadvertently reinforce existing divides – between younger and older employees, urban and rural offices, or central and peripheral agencies. Research also warns of psychological and ethical risks associated with algorithmic management, employee monitoring, and data surveillance (Alon-Barkat, 2023). These factors may erode trust and motivation, thereby diminishing the very human capital that digitalization seeks to enhance.

Finally, the literature points to **institutional fragmentation** between technology-oriented agencies and HR departments. Without coordination, digital strategies and human-capital policies often develop in parallel rather than in synergy. Bridging this divide requires integrated governance frameworks that treat workforce development as a strategic component of digital transformation, not as an auxiliary task.

Overall, the reviewed works converge on several shared insights:

- Digital transformation in public service is fundamentally a human process: technology succeeds only when supported by competent, motivated, and adaptable personnel.
- The development of human capital is both a condition for and a consequence of digitalization.
- Organizational culture, leadership, and institutional learning mechanisms determine whether digital reforms strengthen or weaken the workforce.
- Persistent challenges – skill gaps, inequality, and resistance to change – highlight the need for comprehensive capacity-building and evidence-based HRM.

These results form the analytical basis for the subsequent **Discussion and Conclusions**, where the implications for policy, governance, and future research are examined.

Discussion and Conclusions

This section discusses the implications of the findings presented above for the understanding of digital transformation in public administration. While the Results section outlines the main patterns identified in the literature, the Discussion focuses on their interpretation, comparison of different perspectives, and relevance for human-capital development in the public service.

The literature reviewed in this article provides a comprehensive picture of how digital transformation reshapes the nature of public administration and the role of human capital within it. Across diverse contexts, one central idea recurs: the effectiveness of digital transformation in government depends primarily on people – their skills, adaptability, motivation and capacity to learn – rather than on technologies themselves.

Rethinking the human dimension of digital transformation

Much of the literature converges on the understanding that digital transformation should not be viewed as a purely technological reform but as a profound reconfiguration of administrative culture and capabilities. In this sense, technology acts as both a catalyst and a mirror, revealing the strengths and weaknesses of existing human capital within public institutions. Successful transformation therefore requires public organizations to re-conceptualize their workforce as a strategic resource rather than an operational cost. Public-sector digitalization also demands a shift in managerial philosophy. Traditional bureaucratic systems, designed for stability and predictability, must evolve toward adaptive learning organizations. This implies promoting flexibility, cross-

departmental collaboration, and continuous skill renewal. Several studies (OECD, 2023; Sorensen, 2022) underline that such transformation begins with leadership – leaders who communicate vision, encourage innovation, and tolerate controlled risk-taking.

Integrating human capital and digital strategies

The findings suggest that many governments still treat digital transformation and human-capital development as separate policy streams. Information technology departments manage digital infrastructure, while HR divisions handle recruitment and training. Yet the two agendas are deeply interconnected. Without an adequately skilled and motivated workforce, investments in technology fail to yield expected returns; conversely, well-trained employees require modern digital tools to fully realize their potential. An integrated approach is therefore essential. Human-capital strategies should explicitly reflect digital objectives, incorporating digital literacy, data management, and innovation competencies into career frameworks and evaluation systems. At the same time, digital strategies must include measures for training, change management and employee engagement. The alignment of these two domains ensures that technological progress translates into institutional learning and better public outcomes.

An important conclusion drawn from the reviewed literature is that digital transformation does not automatically improve the performance of public organisations or the quality of human capital. Its outcomes depend largely on institutional conditions, leadership capacity, and the extent to which digital initiatives are integrated with human-resource policies. This suggests that digital transformation should be viewed not merely as a technological upgrade, but as a broader organisational and cultural change within public service.

Challenges and opportunities: a SWOT perspective

The synthesis of research highlights that digital transformation generates both opportunities and vulnerabilities for the public-sector workforce. To summarize these dimensions, Table 2 presents a SWOT analysis based on the reviewed literature.

Table 2. SWOT Analysis of Human-Capital Development in the Context of Digital Transformation

Strengths	Weaknesses
Technological readiness and innovation capacity in leading countries.	Persistent digital-skills gap, especially at local or sub-national levels.
Expansion of e-learning platforms and data-driven HR analytics for civil servants.	Fragmented governance between IT and HR departments; lack of integrated evaluation metrics.
Growing global cooperation and exchange of best practices (e.g., Singapore, Estonia).	Cultural resistance to change and limited managerial flexibility.
Opportunities	Threats
AI-enabled personalized training and predictive workforce analytics.	Ethical and privacy risks related to algorithmic management.
Promotion of inclusive leadership and gender-balanced digital careers.	Deepening inequality between digitally advanced and lagging institutions.
Development of international standards for digital competencies.	Dependence on external technologies and cybersecurity vulnerabilities.
Note. Compiled by the authors based on sources: Deloitte (2023), OECD (2023), Sorensen (2022), UNDP & Astana Civil Service Hub (2023), and World Bank (2022).	

This SWOT analysis encapsulates the dual nature of digital transformation. The strengths and opportunities reveal that governments possess the tools and momentum to modernize human-resource systems through innovation, analytics and collaboration. However, weaknesses and threats underscore the urgency of addressing skill imbalances, ethical governance and organizational inertia. The challenge for policymakers is to amplify the enabling factors while mitigating risks through targeted capacity-building and inclusive leadership. Despite growing scholarly attention, the nexus between digital transformation and human capital remains under-theorized. Future research could benefit from longitudinal and comparative analyses tracing workforce evolution over time, especially in transitional administrations. Interdisciplinary perspectives combining public-administration theory, information-systems research and behavioral studies would also deepen understanding of how digital reform interacts with learning and motivation.

The findings of this review point to several practical implications for public-service reform. First, digital-transformation initiatives should be closely linked with human-capital policies, especially in relation to training, reskilling, and career development. Without such alignment, technological reforms are unlikely to produce lasting benefits. Second, public organisations need to invest in continuous learning systems that support the development of digital competencies across different levels of administration. Third, the governance of algorithmic management tools should be guided by ethical and transparency principles in order to maintain trust and motivation among public servants. Finally, greater attention should be given to leadership development, as leadership capacity plays a key role in fostering organisational learning and adaptability in the digital era.

In summary, digital transformation and human-capital development are interdependent processes. Technologies accelerate the pace of administrative change, but people determine its quality and sustainability. Policymakers must therefore balance investments in hardware and software with continuous investment in “human ware” – education, leadership and organizational culture. For researchers, this intersection represents a dynamic field that links governance innovation with societal progress.

Ultimately, the true measure of digital transformation will not be the sophistication of systems but the competence, integrity and empathy with which public servants use them to serve citizens in the digital age.

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МЕМЛЕКЕТТІК ҚЫЗМЕТТІҢ ЦИФРЛЫҚ ТРАНСФОРМАЦИЯСЫ ЖӘНЕ ОНЫҢ АДАМИ КАПИТАЛДЫ ДАМУЫҒА ӘСЕРІ

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ЦИФРОВАЯ ТРАНСФОРМАЦИЯ ГОСУДАРСТВЕННОЙ СЛУЖБЫ И ЕЁ ВЛИЯНИЕ НА РАЗВИТИЕ ЧЕЛОВЕЧЕСКОГО КАПИТАЛА

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