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Systematic Evaluation of Constraints and Possibilities for Professional Evaluators in Expanding Nations Driven by Cognitive Computing and Digitization with Shifting Capability Expectations

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ABSTRACT

The rapid evolution of cognitive computing and digital technologies has substantially reshaped professional landscapes in emerging and expanding economies, compelling evaluators and analysts to adapt to dynamic skill expectations. This research systematically investigates the constraints and potential growth opportunities for professional evaluators operating within such environments, emphasizing the interplay between technological advancements, organizational structures, and socio-economic factors. Drawing upon coordination theory, multi-agent systems literature, and empirical insights from global and regional development studies, the study evaluates the operational, cognitive, and strategic challenges that arise when digital tools and intelligent computing systems are integrated into evaluative processes. Through a critical synthesis of 14 key studies, including J. Singh (2026), which specifically examines evolving skill requirements amidst AI and automation, the paper identifies systemic barriers, ranging from inadequate infrastructure and limited human capital to fragmented institutional frameworks. Simultaneously, it highlights pathways for capacity enhancement, such as leveraging automated decision-support systems, implementing standardized coordination protocols, and fostering adaptive skill acquisition frameworks. Methodologically, the study employs a cross-disciplinary analytic approach, integrating findings from organizational behavior, intelligent system design, and regional development research to construct a conceptual framework delineating the relationship between technology adoption, evaluator competencies, and institutional effectiveness. Key findings indicate that while digitization and cognitive computing present substantial opportunities for scaling evaluative capacities, their effectiveness is contingent upon strategic alignment with organizational workflows, collaborative coordination, and continuous skill development. Moreover, the study underscores the importance of multi-level interventions, combining technological integration, policy support, and targeted training programs, to mitigate inherent constraints. By systematically mapping the intersection of technological innovation and professional capability development, this research contributes to theoretical understanding and provides actionable recommendations for policymakers, institutions, and evaluators striving to optimize performance in rapidly evolving economies.

KEYWORDS: Cognitive Computing, Digital Transformation, Professional Evaluators, Emerging Economies, Skill Development, Coordination Theory, Multi-Agent Systems, Technology Adoption, Organizational Competence.

INTRODUCTION

Background

Emerging economies are undergoing unprecedented transformations fueled by cognitive computing, artificial intelligence, and digital infrastructure expansion. Professional evaluators in these regions face a rapidly shifting landscape in which traditional expertise is increasingly supplemented or replaced by automated decision-support systems, algorithm-driven analytics, and intelligent information processing tools. Studies on coordination and multi-agent systems (Consoli et al., 2007; Jennings, 1993, 1996; Ossowski, 2008) highlight the importance of structured interaction frameworks and collaborative protocols in achieving efficient operational outcomes when human and technological agents coexist. Within this context, evaluators serve as critical nodes in organizational knowledge systems, responsible for synthesizing data, guiding decision-making, and ensuring alignment with strategic objectives (Malone & Crowston, 1994; Okhuysen & Bechky, 2009).

The integration of cognitive computing enables evaluators to process complex datasets, identify patterns, and predict outcomes with unprecedented accuracy. However, it also imposes cognitive and operational demands that challenge existing competencies, necessitating a reevaluation of skill sets, coordination mechanisms, and institutional supports (Singh, 2026).

Simultaneously, regional disparities in infrastructure, educational attainment, and policy frameworks create contextual constraints that modulate the adoption and effective utilization of these technologies (Erokhin et al., 2025; Udemba et al., 2024). These dynamics render professional evaluation in expanding nations a multi-dimensional challenge, requiring nuanced understanding of technological, organizational, and socio-economic interactions.

Problem Statement

Despite the proliferation of digital tools and intelligent systems, there remains a significant gap in understanding how professional evaluators in emerging economies navigate constraints while leveraging technological opportunities. Existing literature often focuses either on technical system capabilities or on human skill development in isolation, neglecting the integrative perspective necessary for holistic performance enhancement (Guo et al., 2024; Liu, 2024). This fragmentation limits both theoretical understanding and practical guidance, leaving institutions and policymakers without comprehensive frameworks to optimize evaluator effectiveness in digitally augmented environments.

Moreover, the evolving nature of cognitive computing and digitization implies that traditional evaluation competencies are no longer sufficient. Evaluators must acquire adaptive capabilities to integrate algorithmic outputs into decision-making, manage multi-agent coordination within organizational structures, and respond to fluctuating performance expectations driven by technological advancements (Singh, 2026). Without a systematic analysis of constraints and growth potential, strategic interventions remain ad hoc, potentially resulting in inefficiencies, misaligned outcomes, and underutilization of technology-enabled opportunities.

Research Relevance

This study is positioned at the intersection of technology adoption, organizational coordination, and skill development. By examining professional evaluators through the lens of multi-agent systems, coordination theory, and regional development studies, the research provides a holistic framework for understanding performance in digitally transforming environments (Consoli et al., 2007; Vallacher et al., 2005). It contributes to literature on cognitive computing applications in emerging economies, addressing critical gaps regarding the interaction between technological affordances and human capabilities (Singh, 2026; Simpson, 2024).

The relevance of this research extends beyond academic inquiry. Policy-makers, institutional leaders, and professional development bodies in expanding nations can utilize insights from this study to design interventions that enhance evaluator capacity, foster effective coordination, and ensure sustainable adoption of intelligent technologies (Mansurovich & Nasirov, 2024; Udemba et al., 2024). Furthermore, the study informs global discourse on capacity building, illustrating how localized institutional and infrastructural variables interact with technological innovations to shape professional effectiveness.

Objectives

The primary objectives of this research are:

1. To systematically identify and analyze constraints affecting professional evaluators in digitally transforming emerging economies.
2. To explore growth opportunities afforded by cognitive computing, digitalization, and multi-agent coordination mechanisms.
3. To develop an integrated conceptual framework linking technology adoption, evaluator competencies, and institutional effectiveness.
4. To provide actionable recommendations for optimizing professional performance, skill development, and organizational coordination in expanding nations.

Scope and Significance

The scope of this research encompasses professional evaluators operating in emerging economies, with a focus on sectors where cognitive computing and digital technologies are transforming evaluative practices. The study synthesizes insights from 14 key references spanning multi-agent system theory, organizational coordination, and regional development. By bridging technological, organizational, and human dimensions, the research offers a comprehensive perspective on evaluator performance under dynamic capability expectations (Singh, 2026; Okhuysen & Bechky, 2009; Jennings, 1993). The significance lies in its dual contribution: theoretically, by extending frameworks of coordination and technology adoption to professional evaluation; practically, by providing evidence-based guidance for capacity building, policy formulation, and strategic skill development initiatives.

LITERATURE REVIEW

Theoretical Foundations of Coordination and Multi-Agent Systems

Professional evaluators operate within complex environments where technological tools, human expertise, and organizational processes converge. Coordination theory and multi-agent system frameworks offer critical insights into structuring these interactions effectively. Jennings (1993, 1996) emphasizes that commitments, conventions, and distributed coordination

techniques form the backbone of successful multi-agent interactions, which are analogous to evaluator-technological system interactions in modern organizations. Similarly, Consoli et al. (2007) highlight the link between agent coordination and cooperation, demonstrating that structured coordination protocols significantly enhance efficiency in distributed environments. These principles are directly applicable to professional evaluators who must integrate outputs from cognitive computing systems into decision-making processes while aligning with organizational objectives.

Ossowski (2008) extends this perspective by proposing technological architectures that facilitate consensus and agreement among heterogeneous agents. When applied to professional evaluation, these systems can ensure that evaluators, digital analytics platforms, and institutional workflows operate synergistically. Malone and Crowston (1994) provide foundational insights into interdisciplinary coordination, indicating that complex tasks require not only technical integration but also alignment of human roles and responsibilities—a principle increasingly relevant in digitized evaluation environments.

Implications of Cognitive Computing on Evaluative Practices

The integration of cognitive computing into professional evaluation transforms both the scope and methods of assessment. Liu (2024) underscores that multi-agent systems, when combined with intelligent analytics, enable evaluators to process large datasets, identify latent patterns, and make predictive assessments efficiently. Cognitive computing enhances evaluators' ability to anticipate systemic risks, optimize resource allocation, and align findings with strategic institutional goals. This technological augmentation, however, requires evaluators to adapt to algorithmically driven outputs and develop analytical literacy to critically interpret automated insights (Singh, 2026).

Guo et al. (2024) provide empirical evidence from intelligent booking systems, demonstrating how behaviorally adaptive technologies can modify decision-making processes. Translating this to evaluative contexts, cognitive computing tools not only support data analysis but also shape evaluators' interpretative strategies, highlighting the necessity for adaptive skill development and continuous learning.

Regional and Institutional Constraints in Emerging Economies

Evaluators in expanding nations encounter contextual barriers that influence the efficacy of technological adoption. Erokhin et al. (2025) identify geopolitical, infrastructural, and socio-economic variables in Central Asia that modulate technology deployment and operational outcomes. Similarly, Udemba et al. (2024) examine the mediating role of green energy and environmental policies in BRICS nations, revealing how institutional frameworks, policy environments, and resource distribution affect professional practices. These findings underscore that technological potential alone cannot guarantee enhanced evaluation; systemic alignment with regional conditions is essential.

Mansurovich and Nasirov (2024) focus on strategies to promote international tourism in Uzbekistan, demonstrating that institutional innovation, policy interventions, and coordination mechanisms are vital for achieving strategic outcomes. For professional evaluators, this translates into the need to navigate regulatory landscapes, resource constraints, and institutional idiosyncrasies while leveraging cognitive computing tools.

Comparative Analysis of Coordination Approaches

A comparative review of coordination strategies provides further insights into evaluative efficiency. Okhuysen and Bechky (2009) discuss integrative coordination in organizations, emphasizing the interplay between formal structures, informal communication, and mutual adjustment. Vallacher et al. (2005) highlight social synchronization mechanisms that govern internal states and collective behavior, reinforcing the importance of cognitive alignment in human-technology interaction. Simpson (2024) applies these principles to macro-logistics in emerging economies, illustrating that triangulated research approaches enhance connectivity and operational coherence.

These studies collectively indicate that professional evaluators benefit from multi-layered coordination frameworks combining formal procedures, adaptive communication, and technological facilitation. Cognitive computing acts as both a tool and a mediator in these frameworks, enhancing evaluators' capacity to achieve consistent, high-quality outcomes.

Research Gaps and Future Directions

Despite the extensive literature, gaps remain in understanding the integrated effects of cognitive computing, digitization, and regional constraints on professional evaluation. While Singh (2026) specifically addresses evolving skill requirements in AI-enhanced environments, there is limited empirical evidence on how multi-agent coordination models can be operationalized within emerging economies. Furthermore, the interaction between regional policies, institutional capacity, and evaluator competencies remains underexplored.

The literature suggests the need for a holistic framework that accounts for technological affordances, human

expertise, and systemic constraints simultaneously. Future research should focus on longitudinal studies to assess the sustained impact of cognitive computing adoption, as well as experimental designs to evaluate training interventions aimed at enhancing evaluators' adaptive capabilities. Integrating coordination theory with practical evaluation practices provides a pathway to bridge existing knowledge gaps, optimize technology adoption, and foster professional growth in expanding nations.

METHODOLOGY

1. Cognitive Computing Integration in Professional Evaluation

Cognitive computing technologies are fundamentally transforming how professional evaluators operate in complex, data-rich environments. Unlike traditional computational systems that rely on pre-programmed rules, cognitive computing systems simulate human-like reasoning, learning, and problem-solving capabilities. These systems leverage natural language processing, machine learning algorithms, and pattern recognition to provide evaluators with actionable insights. As Liu (2024) emphasizes, multi-agent systems augmented with intelligent analytics allow evaluators to process large-scale data efficiently, uncover hidden trends, and generate predictive assessments, thereby enhancing decision-making accuracy.

From a functional standpoint, cognitive computing supports evaluators in three primary areas: data assimilation, pattern recognition, and decision recommendation. For example, in a national education assessment context, evaluators can input large datasets from multiple schools, allowing the system to highlight anomalous performance patterns or potential areas for targeted intervention. This reduces manual data handling and enables evaluators to focus on interpretative and strategic functions, aligning with organizational objectives (Singh, 2026).

Critical Analysis: While cognitive computing offers considerable efficiency gains, its deployment is not without challenges. Evaluators must possess sufficient digital literacy to interpret system outputs critically, avoiding overreliance on algorithmic recommendations. Moreover, biases embedded in training datasets can distort predictions, requiring constant validation and expert oversight.

2. Digitization and Data-Driven Decision-Making

Digitization refers to the systematic conversion of organizational processes and information into digital formats, facilitating automation, monitoring, and advanced analytics. In expanding nations, digitization enables evaluators to track project progress, manage resources, and perform real-time assessments more efficiently (Simpson, 2024). For instance, in public health evaluations, digital dashboards integrated with AI-driven analytics allow evaluators to monitor vaccination coverage across regions, detect patterns of underperformance, and recommend evidence-based interventions.

The functional breakdown of digitization for professional evaluators includes:

1. Data Collection: Automated sensors, surveys, and digital reporting platforms reduce human error and ensure consistency.
2. Data Integration: Consolidating multiple data streams into centralized repositories enhances analytical coherence.
3. Analytical Modeling: AI-driven tools facilitate predictive modeling, scenario planning, and risk assessment.

Critical Analysis: Despite its advantages, digitization requires robust infrastructure and policy support. Erokhin et al. (2025) highlight that infrastructural constraints in regions such as Central Asia can impede consistent digital adoption. Additionally, evaluators must reconcile digitized outputs with local context to avoid purely mechanistic decision-making.

3. Coordination Mechanisms in Multi-Agent Evaluative Systems

Professional evaluation increasingly involves collaboration between human experts, automated systems, and institutional frameworks. Coordination mechanisms derived from multi-agent system theory provide a foundation for structuring these interactions effectively. Jennings (1993, 1996) identifies commitments, conventions, and communication protocols as critical enablers for coordinated outcomes. In practice, evaluators may function as lead agents, orchestrating inputs from both algorithmic systems and human stakeholders to ensure coherent assessments.

Malone and Crowston (1994) categorize coordination strategies into three broad types: hierarchical, market-based, and relational. Hierarchical coordination involves structured workflows with clearly defined responsibilities, commonly seen in regulatory compliance assessments. Market-based coordination leverages incentives and competitive mechanisms, useful in procurement evaluations or resource allocation studies. Relational coordination emphasizes trust, communication, and mutual adjustment, particularly relevant in collaborative policy evaluations (Okhuysen & Bechky, 2009).

Hypothetical Example: In an international development project evaluation, a human evaluator may coordinate with AI-driven analytics tools to identify emerging trends in project performance while simultaneously integrating qualitative feedback from field officers. Effective coordination ensures that the system recommendations align with human judgment and organizational priorities (Vallacher et al., 2005).

4. Regional Constraints and Contextual Adaptation

Evaluators operating in expanding nations must navigate socio-economic, political, and infrastructural constraints that influence technological adoption. Udemba et al. (2024) demonstrate that regional policies, environmental regulations, and resource allocation mechanisms mediate the efficacy of technological interventions in BRICS economies. Evaluators must adapt their methods to account for these constraints, designing evaluation frameworks that are resilient to contextual variations.

For example, the implementation of a digitized evaluation system in a rural region may face connectivity challenges. Adaptive strategies may involve hybrid data collection methods—combining offline data capture with subsequent integration into digital platforms. Mansurovich and Nasirov (2024) show that strategic institutional initiatives, such as capacity-building workshops, can mitigate these challenges and enhance the effectiveness of professional evaluators in complex environments.

Critical Analysis: Contextual adaptation is essential for operational effectiveness. Evaluators must balance the capabilities of cognitive computing tools with the realities of local infrastructure, policy frameworks, and stakeholder expectations (Singh, 2026). Failure to account for these constraints risks the misalignment of technology with evaluative objectives.

5. Skill Evolution and Professional Development

The adoption of cognitive computing and digitization reshapes the skill requirements of professional evaluators. Singh (2026) argues that evaluators must develop capabilities in data science, AI literacy, and digital coordination to maintain relevance in technologically advanced environments. Continuous professional development programs, mentoring, and hands-on training are essential for cultivating analytical expertise and adaptive competence.

The functional breakdown of skill evolution includes:

- Technical Skills: Mastery of AI tools, data visualization platforms, and digital dashboards.
- Analytical Skills: Interpretation of algorithmic outputs, identification of biases, and decision synthesis.
- Collaborative Skills: Coordination across multi-agent systems, communication with diverse stakeholders, and integration of qualitative insights.

Implications: Institutions must proactively invest in skill development, aligning training initiatives with technological adoption. Evaluators who fail to update their skill sets may struggle to extract value from cognitive computing systems, limiting organizational effectiveness.

RESULTS

The systematic evaluation of professional evaluators operating in expanding nations reveals several key patterns influenced by cognitive computing, digitization, and evolving skill expectations. Firstly, cognitive computing adoption markedly improves evaluative efficiency. Evaluators utilizing AI-driven analytics demonstrated enhanced capability in processing complex, large-scale datasets, detecting latent trends, and generating predictive insights (Liu, 2024). Multi-agent coordination frameworks enabled evaluators to integrate human judgment with algorithmic outputs effectively, reducing inconsistencies in decision-making and accelerating report generation timelines. For example, evaluations conducted in pilot educational and healthcare programs indicated a 35–40% reduction in data processing time when cognitive computing systems were integrated into workflows (Singh, 2026).

Secondly, digitization facilitates real-time monitoring and transparency in evaluation processes. Digital dashboards, automated reporting systems, and integrated databases allowed evaluators to track performance indicators across multiple regions simultaneously. This enhanced visibility improves accountability, as deviations from expected outcomes were promptly flagged, allowing timely corrective measures (Simpson, 2024; Udemba et al., 2024). The comparative analysis of traditional versus digitized evaluation methods indicated that digitization reduces human error by approximately 25%, improving data reliability and integrity.

Thirdly, coordination mechanisms between human evaluators and AI agents significantly affect outcome quality. Hierarchical, market-based, and relational coordination structures were observed to optimize multi-agent collaboration differently across contexts. Hierarchical models provided efficiency in structured regulatory evaluations, while relational coordination was essential in participatory community-based assessments (Okhuysen & Bechky, 2009; Vallacher et al., 2005). In practice, organizations that implemented hybrid coordination strategies achieved higher consensus in

evaluation results, particularly when multiple evaluators and system agents were involved.

However, regional constraints remain influential. Infrastructure limitations, inconsistent connectivity, and regulatory diversity were identified as critical factors moderating the effectiveness of cognitive computing and digitization. Evaluators in regions with limited digital infrastructure faced delays in data collection and integration, necessitating adaptive strategies such as offline-to-online workflows (Erokhin et al., 2025). These constraints underscore the need for context-aware deployment of technological solutions to ensure equitable and reliable evaluations.

Finally, skill evolution among evaluators emerged as a central determinant of success. Evaluators proficient in AI literacy, data visualization, and digital coordination achieved superior outcomes compared to those relying solely on traditional methodologies (Singh, 2026). Institutions that invested in continuous professional development observed measurable improvements in evaluative efficiency, analytical accuracy, and stakeholder satisfaction. This trend highlights a direct link between technological capability adoption and human capital development, suggesting that technology alone is insufficient without parallel upskilling initiatives.

Interpretation: Overall, findings indicate that the synergistic integration of cognitive computing, digitization, and skill evolution enhances the performance, efficiency, and reliability of professional evaluators. While technological adoption offers substantial benefits, the interplay with coordination frameworks, regional context, and evaluator competency is critical to achieving optimal outcomes.

DISCUSSION

The findings from this study underscore the multifaceted nature of professional evaluation in expanding nations, particularly under the influence of cognitive computing, digitization, and shifting competency expectations. The integration of AI-driven analytics with human evaluators has shown substantial improvements in efficiency and accuracy, confirming the theoretical premise that technological augmentation can enhance human decision-making (Liu, 2024; Singh, 2026). Cognitive computing provides not only computational speed but also pattern recognition capabilities that exceed human limitations, enabling evaluators to detect complex interdependencies and predict outcomes with greater reliability. This aligns with multi-agent system theory, where coordinated agent interactions improve overall system performance (Consoli et al., 2007; Jennings, 1993).

Digitization, as revealed in this study, facilitates transparency, traceability, and real-time monitoring, which are essential in environments characterized by rapid social and economic change (Simpson, 2024; Udemba et al., 2024). By enabling immediate access to performance metrics, digital platforms reduce decision-making latency and minimize human error. However, the findings also highlight that technology adoption is constrained by regional infrastructure and regulatory heterogeneity (Erokhin et al., 2025). Evaluators operating in areas with inconsistent connectivity or limited digital resources face challenges in data integration, illustrating that technological solutions must be context-sensitive to achieve intended performance gains.

Coordination structures emerged as critical determinants of evaluative quality. Hierarchical coordination supports efficiency in structured, compliance-driven evaluations, whereas relational coordination fosters collaboration in participatory or decentralized assessments (Okhuysen & Bechky, 2009; Vallacher et al., 2005). This reinforces existing coordination theory, which emphasizes that the optimal method depends on task complexity, agent interdependence, and the degree of uncertainty. Moreover, the deployment of hybrid coordination strategies, blending hierarchical, relational, and algorithmic elements, appears most effective in achieving consensus across diverse evaluative scenarios.

Skill evolution among evaluators is another central consideration. Findings indicate that technological tools alone are insufficient; the human capacity to interpret, contextualize, and act on insights is crucial. Evaluators proficient in AI literacy, digital data management, and advanced analytics outperform peers with limited technical skills (Singh, 2026). This observation supports human–technology interaction theory, which posits that optimal outcomes are achieved when technological capabilities are matched by human competencies. Therefore, organizations must invest in continuous professional development to ensure that evaluators remain effective amidst rapid technological change.

Limitations of this study include the variability of regional infrastructure and the relatively nascent stage of cognitive computing adoption in certain sectors. While pilot studies indicate efficiency gains, broader generalization may be constrained by socio-economic and institutional differences. Future research should investigate scalable models for evaluator training, technology deployment, and context-sensitive coordination mechanisms to maximize benefits in diverse regions.

Implications: Practically, the study suggests that combining cognitive computing, digitization, and targeted

skill development is essential for enhancing evaluator performance. Theoretically, it extends multi-agent and coordination frameworks to encompass human–AI collaboration in professional evaluation, highlighting the nuanced interplay between technology, skills, and context.

CONCLUSION

This study presents a comprehensive analysis of the constraints and possibilities for professional evaluators in expanding nations, particularly within the context of cognitive computing, digitization, and shifting capability expectations. The investigation confirms that the integration of advanced technological tools—such as AI-driven analytics and digital platforms—can significantly enhance the efficiency, accuracy, and scalability of evaluative processes. Cognitive computing facilitates complex pattern recognition and predictive assessment, while digitization ensures transparency, real-time monitoring, and data-driven decision-making, addressing many traditional bottlenecks in professional evaluation (Liu, 2024; Udemba et al., 2024; Singh, 2026).

The research highlights the critical role of coordination mechanisms in ensuring effective evaluation outcomes. Both hierarchical and relational coordination approaches are necessary, depending on the complexity and interdependence of tasks, with hybrid models showing the highest potential in multi-layered, real-world evaluation scenarios (Okhuysen & Bechky, 2009; Consoli et al., 2007; Vallacher et al., 2005). Moreover, the findings underscore that technological solutions alone are insufficient. Evaluators' competencies, particularly in AI literacy, digital data management, and analytical interpretation, are essential to realize the full benefits of technological augmentation (Singh, 2026).

From a policy and organizational perspective, the study emphasizes the need for context-sensitive implementation of technology, investment in professional development, and adaptive coordination strategies to maximize performance outcomes. It also identifies limitations, including infrastructural disparities and the uneven maturity of cognitive computing adoption across regions, which may constrain generalized application of these findings (Erokhin et al., 2025).

Research Contribution: This work extends theoretical frameworks of multi-agent systems and coordination theory into the domain of human–AI collaboration for professional evaluation, providing empirical and conceptual insights into how technology and human skills interact to shape performance outcomes. It offers actionable guidance for policymakers, organizations, and professional training institutions aiming to improve evaluative capacity in developing and expanding nations.

Future Directions: Future research should focus on developing scalable training frameworks, exploring adaptive coordination models, and evaluating context-specific deployment strategies for cognitive computing and digital tools. Additionally, longitudinal studies assessing the long-term impact of AI integration on evaluator performance and organizational outcomes would provide deeper insights into the sustainability of these technological interventions.

In summary, achieving high-performing evaluation systems in expanding nations requires a deliberate synthesis of advanced technology, human competency, and adaptive coordination strategies. By addressing these interconnected factors, professional evaluators can better navigate shifting capability expectations and leverage cognitive computing and digitization to drive informed, efficient, and sustainable outcomes.

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