

The influence of AI-Driven Employee Performance Management (EPM) Systems in the sustained enhancement of Employee Mobilization, Organizational Performance, and the Change Culture in the healthcare sector: A scoping review analysis

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ABSTRACT

Artificial Intelligence (AI) has caused massive changes in nature of workplaces in healthcare sector. Employee Performance Management (EPM) systems are undergoing a pivotal shift from annual manual data collection of personnel, characterized by subjective, bureaucratic, and demotivating methods into more agile human research operations. Modern methodological assessment emphasizes the importance of recording individual contribution in various areas, assessing not only the fulfillment and quality of assignments, but also aspects such as collaboration, creativity, innovative behavior and professional growth. The delivery of high-quality healthcare depends essentially on the effective functioning of personnel, who are the vital resource for maintaining reputation, fostering a culture of continuous improvement, and ensuring the overall effective operation of the healthcare sector. This scoping review adhered to the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) guidelines and encompassed 29 peer-reviewed empirical studies published from 2020 to 2025. AI-powered EPM platforms result in considerable improvements in efficiency, including increased frequent feedback, heightened employee engagement, identification of potential leaders and significant time savings for managers. Additionally, predictive analytics are vital in orchestrating healthcare organizations' strategic and operational activities, assessing labor shortages, optimizing operations and managing high rates of burnout. Nevertheless, despite the acknowledged advantages of AI, there remain notable challenges to its implementation, including concerns about algorithmic bias, privacy, transparency, job displacement, organizational culture, and issues related to ethical and legal oversight. The analysis underscores the multidimensional nature of AI implementation in human resource management and how AI-driven EPM systems, mark a significant advance in accessing real-time performance data and provide considerable progression when utilized within appropriate guidelines. The successful integration of these systems relies on the synergy between AI technologies and human judgment, allowing healthcare organizations to cultivate a more dynamic, innovative and responsive workforce.

KEYWORDS: employee performance management; artificial intelligence; healthcare; human resources; performance appraisal; skills; measurement; feedback; training and development; fairness; trust; workforce optimization; ethics.

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1. INTRODUCTION

In public sector organizations, Employee Performance Management (EPM) occupies a vital role within Human

Resource (HR) management functions, as the utilization of appropriately placed personnel and their efficiency are essential components for the successful delivery of services.

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This necessity becomes even more imperative when it comes to the health and well-being of a state's population. Hospitals and healthcare centers, as public entities, encompass a wide range of different specialties holding a variety of professional qualifications and specializations, which requires enhanced collaboration to provide sustainable services to one of the most demanding audiences (patients) who have ever-increasing expectations. Therefore, to achieve the desired levels of productivity, satisfaction, motivation and flexibility of their personnel, public health organizations must continuously monitor, evaluate and improve the effectiveness of each individual employee, as well as the collaborative efforts among the work teams that operate together ^[1-3].

The meaning of EPM, can be seen as a systematic and organized methodology properly designed to consider the traits, actions, and outcomes generated by personnel in their roles, with the objective to deliver value to stakeholders. This methodology is fundamentally strategic and integrates various vertical, horizontal, and functional aspects, ensuring that the organization's needs are fully aligned with the individual aspirations. Specifically, within healthcare settings, the development of EPM systems has been based on the belief that they can foster participation, alignment, and accountability among personnel, with the aim of minimizing unexplained deviations in practice, enhancing functionality to boost favorable population health outcomes and controlling expenses. Historically, conventional practices of EPM methodology have been relied on manual processes, hierarchical control, transactional relationships, highly structured job descriptions and roles, and reactive approaches, wherein employees are given performance assessments solely at the end of the year. This methodological approach, rooted in the principles of the early 20th-century of industrial management, aimed to evaluate the performance of personnel in relation to the organization's predetermined objectives, often with a special emphasis on pinpointing weaknesses or areas that required improvement. Typically, these evaluations were conducted within the context of a formal dialogue between the employee and their supervisor, during which the employee's performance was evaluated, and future goals were established. Nevertheless, despite the widespread utilization of this approach, the annual evaluation process faced numerous criticisms, in particular for its retrospective nature, which left many feedback gaps or, even when carried out, proved to be outdated or inadequate in a rapidly changing work environment. As the demands on health systems increase exponentially, performance management has become one of the areas significantly impacted by organizational developments in the digital age. Thus, the importance of immediate information and at the same time the necessity for real-time employee feedback is emerging, thus making it increasingly critical for Performance Management (PM) to lead those methodologies

related to the challenges of data management, which are necessary to include aspects such as practical knowledge, personalization and employee development in evidence-based decision-making. Poorly designed and improperly implemented EPM system can have numerous adverse consequences for both employees and organizations. A significant negative impact is increased employee turnover, especially when the system is viewed as unfair or biased, resulting in employee dissatisfaction and voluntary departures. Inaccurate or inappropriately provided feedback can reduce employee self-esteem and lead to dissatisfaction with management. Furthermore, significant time and financial resources allocated by management, HR professionals, and employees may be wasted if the appraisal process lacks quality and accuracy ^[4-11].

The COVID-19 pandemic has led to a notable and disruptive increase in the adoption of various digital technologies aimed at enhancing value creation for key stakeholders, who benefit from digital healthcare services. As a result, healthcare professionals have faced immense pressure to ensure employee continuity and safety. At least 10%-30% of the workforce is required to work in hybrid or fully remote positions, in an adjacent room or from an off-site location, as a method of reducing the risk of COVID-19 health emergency and protecting themselves, thereby rendering traditional annual personnel evaluations irrelevant. Existing research indicate that three in five employees now find ongoing feedback more appealing than conventional annual reviews, which greatly highlights the positive impacts of continuous performance management. This forced shift has created a growing demand to develop innovative approaches to assessing the productivity of employees with greater autonomy and adapting to this evolution, which is essential for organizations pursuing health workers' mental health and well-being. In the current dynamic landscape of innovation and global challenges, healthcare organizations have improved opportunities to fulfill their mission by providing improved resources to establish more equitable, adaptable, robust, and effective EPM systems, and by applying the capabilities of AI to their human capital strategies, they can gain a significant competitive edge. Indeed, AI is demonstrating its ability to match – and often surpass – human cognitive abilities particularly in relation to specific tasks (usually repetitive) and further transform workplace dynamics. Furthermore, AI and related technologies, including virtual personal assistants and chatbots, are rapidly evolving in professional environments. Essentially, healthcare organizations must gradually integrate AI-based solutions to facilitate processes that focus on their staff, job satisfaction, engagement, motivation, continuous feedback, skill development, personalized coaching, more data-driven assessments, and predictive analytics ^[12-20].

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Based on the previously mentioned premises, our primary objective was to explore, from a holistic viewpoint, the impact of AI-driven EPM Systems on the performance of human resources in healthcare, as researchers have yet to pinpoint the elements that connect these two factors within healthcare organizations. The study also aims to determine what conditions allow AI technology to advance EPM and Human Resource Management (HRM) systems in healthcare organizations, in order to achieve significant improvements in performance for both human resources and their organizational activities. Thereafter, this study explores the main Research Questions (RQs) that form its focus:

- RQ1: How are AI-based platforms changing Employee Performance Management (EPM) Systems and HR practices in Public Health organizations?
- RQ2: What advantages does AI provide in performance management processes that can assist organizations achieve improved outcomes, while fostering a positive cultural transformation and enhancing employee satisfaction and motivation within the healthcare sector?
- RQ3: What are the key factors that organizations should consider when adopting AI technology for the implementation and development of EPM systems?

2. METHODS

2.1. Purpose of the study

Based on stakeholder theory, satisfying an organization’s internal stakeholders, such as human resources, is a matter of vital importance. Without ensuring

this need, meeting the needs of external stakeholders, such as patients who are the recipients of these services, becomes extremely difficult. This scoping review aims focusing on how AI-based EPM systems enable management to understand opportunities and promptly address performance gaps. By using fully up-to-date, analytical data, organizations are better able to predict the future performance of their employees and modify their development programs in such a way that they align with the changing demands of their human resources, ensuring continued effectiveness in an ever-evolving environment. In addition, the impact of the potential negative consequences that the adoption processes of AI may have, both for employees and for organizations, examined. Given the above, this research aims to bridge the gap identified by proposing strategies for the development of strong and effective EPM Systems, with the main goal of facilitating the smoother and more effective integration of AI technologies into performance management practices.

2.2. Material and analysis

The literature review was performed by utilizing a range of databases and digital journals, including Scopus, PubMed/Medline, Embase, Web of Science, PsycINFO, and Google Scholar (see Table 1), included academic articles have been published between 2020 and 2025. Keyword combinations for literature search were created by adding the Boolean operator 'AND' as well as 'OR' to search for related works with increased precision in terms of AI, Machine Learning, Performance management, EPM, Healthcare, and Human Resource Management (HRM).

Table 1. Search Strings for Databases.

Database	Search String
Scopus	("Artificial Intelligence"[Mesh] OR "Machine Learning"[Mesh]) AND ("Performance management"[Mesh] OR "EPM"[Mesh]) AND ("Healthcare"[Mesh] OR "Delivery of Health Care"[Mesh]) AND ("Human Resource Management"[Mesh] OR "HRM"[Mesh])
PubMed/Medline	TITLE-ABS-KEY(("artificial intelligence" OR "machine learning") AND ("performance management" OR "performance management") AND ("healthcare" OR "health system"))
Embase	("artificial intelligence"/exp OR "machine learning"/exp) AND ("performance management"/exp OR "human resource management"/exp) AND ("health care"/exp OR "health care system"/exp)
Web of Science	TS=("artificial intelligence" OR "AI" OR "machine learning") AND TS=("performance management" OR "human resource management") AND TS=("healthcare" OR "hospital")
PsycINFO	SU("Artificial Intelligence" OR "Machine Learning") AND SU("Performance Management" OR "HRM") AND SU("Healthcare Systems")
Google Scholar	TS=("artificial intelligence" OR "AI" OR "machine learning") AND TS=("performance management" OR "EPM") AND TS=("healthcare" OR "hospital") AND ("Human Resource Management"[Mesh] OR "HRM"[Mesh])

In order to perform this scoping review, the researchers complied with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) guidelines to guarantee

methodological rigor and transparency. Consequently, the researchers engaged in a five-stage process: identifying pertinent studies, selecting studies, mapping data,

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synthesizing, and presenting results in accordance with the PRISMA flowchart (see Figure 1) [21-24].

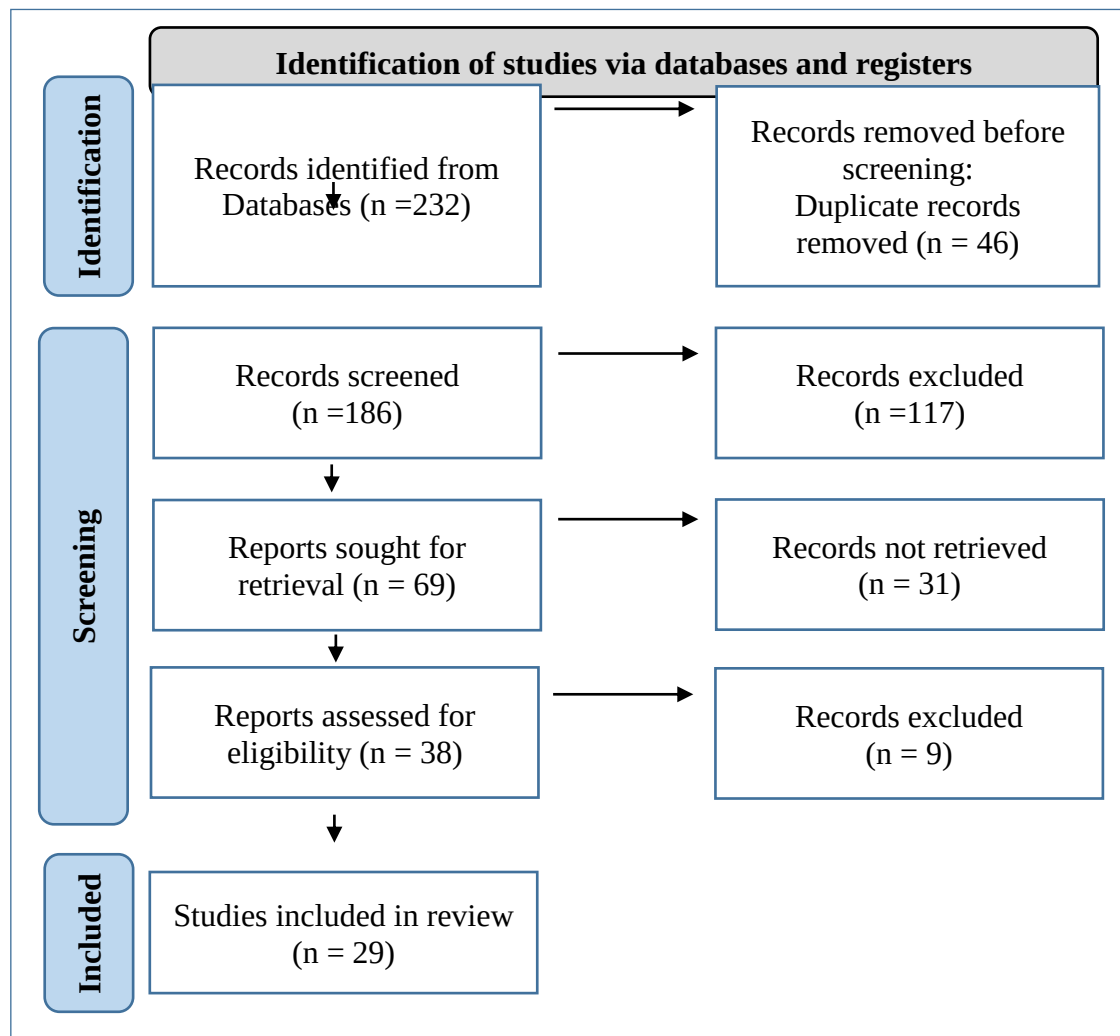


Figure 1. PRISMA-ScR flow diagram of article identification, screening, eligibility, exclusion, and number included for qualitative synthesis.

The literature search initially yielded 232 investigations. The information specialist from the research team exported these findings to Zotero and eliminated duplicates, ultimately retaining 186 articles. After a pilot test, two researchers evaluated the titles and abstracts for their relevance to the study's objectives, concentrating on English-language studies with broadly applicable contributions. As a result, 69 articles retained, of which 117 retrieved. The same reviewers scrutinized the full texts of the chosen references, making decisions based on their alignment with the study objectives. In the final evaluation stage, 9 articles were excluded for failing to meet essential eligibility criteria, leading to the inclusion of 29 articles for qualitative synthesis.

3. RESULTS

3.1. Understanding EPM in the Modern Era in Healthcare Sector

Traditionally, EPM has been associated with the processes of identifying, measuring, and enhancing performance of employees in order to ensure alignment with organizational objectives. It relies primarily on annual performance appraisals, setting goals at the beginning of the year, self-assessments, and discussions about future goals, and feedback from management based on subjective observations and/or occasional performance improvement plans. Nonetheless, methods that focus on performance appraisal processes without prioritize measurable data, are assessments that depend exclusively on human perception and judgment. Such methods generally lack direct feedback, continuous guidance, integrated development, are based on hierarchical structures and centralized decision-making.

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Also, do not take into account contextual factors, are often vulnerable to biases and practices designed to maintain the status quo. Researchers believe that these systems can lead to disengagement of personnel, are rigid and often incompatible with modern organizational dynamics. These weaknesses are further exacerbated by the disruptions and changes in the working environment of healthcare settings brought about by the COVID-19 pandemic. Notably, this includes the emergence of teleworking, the demand for more targeted employment, and the increased aspiration of employees to have their needs recognized more as entities and not simply as employees [4,5,25-29].

Unlike the private sector, the public healthcare sector faces numerous obstacles in the implementation and maintenance of effective performance management systems, which may hinder progress, such as [10,30-35]:

- difficulties in measuring results, unlike in the private sector where profitability is a clear measure of effectiveness, the results of public sector health organizations are difficult to quantify, since the services offered are most often provided free of charge or for a minimal fee, expressing the social face of the state.
- complex accountability, as public sector accountability is complicated by a wide range of stakeholders - including taxpayers, citizens and political entities - which can lead to conflicting objectives.
- the definition of performance, since the precise definition and measurement of performance itself is complicated by the varying and evolving objectives, which sometimes lead to the formulation of incorrect indicators that prioritize short-term results over long-term results.
- bureaucracy and resistance to change, the rigid bureaucratic structures developed in the public sector, frequent reorganizations and employee resistance to change, can slow down or even limit the successful implementation of performance management initiatives. Typically, focusing on past crises rather than future development, performance management systems do not keep pace with and adapt to rapidly changing patient needs, protocols and staff roles.
- budget constraints, public sector managers have as a priority the management of a specific budget that is usually subject to constraints, while providing high quality services, which can limit the costs of training or the resources required for strong personnel management systems. Unfortunately, in the last two decades in the health sector, budget control (closed budget) has been a dominant tool on the basis of which personnel management is carried out. They were introduced and are still widely used by many countries, such as Greece, Italy, Spain, Sweden, Denmark, New Zealand, Finland and Norway, to achieve optimized financial results. In most cases, such policies have led to increased workload, with

fewer and more discouraged staff, increasing levels of stress and fatigue, high absenteeism, staff turnover, while the bureaucracy of the control team in which the boxes must be ticked and compliance with the targets must be demonstrated continues to grow. This problem is particularly important for public hospitals and health centers, since due to the multifaceted and complex structure of the services offered and because the outputs and resulting results are always the product of continuous and rigorous collaboration between different units, departments and professionals.

- risk of dysfunctional behaviors, a poorly designed EPM System has significant potential to lead to unintended consequences, such as data manipulation, tunneling, or an overemphasis on quantifiable metrics at the expense of other, more important tasks.
- excessively sluggish, as annual reviews miss critical real-time performance issues and important opportunities for critical care development.
- subjective and unreliable, as biased judgment and infrequent feedback do not reflect the complex, team-based nature of hospital work.

Indeed, like all performance and control mechanisms, EPM systems are often met with skepticism, fueling feelings of reservation and tension among medical, nursing and administrative staff. This situation inherently creates challenges, since trust in the skills and motivation of staff is a key component sought, especially in human-centered workplaces, where successful collaboration significantly affects the quality of care provided. As healthcare workplaces become increasingly dynamic and teleworking gains ground, the need to develop systems that offer flexibility, interaction and personalization is constantly increasing. Given the existing need to explore the conditions under which staff performance can increase, maintaining or even improving their trust in management, the academic discussion around the use of AI in EPM systems and its practical implications is increasingly enriched [1,10,16,36-40].

3.2. How AI-driven platforms are reinventing Quality Management and HR within Public Health Sector

In healthcare settings, which are characterized for their high operational complexity, the integration of advanced technologies (e.g., robotization) and the imperative need for enhanced collaboration among healthcare personnel, in order to ensuring the safe delivery of healthcare services to patients. Consequently, Quality Management systems must integrate AI through the use of algorithms, data analysis, and machine learning techniques, which are increasingly recognized as dominant instruments for reshaping workplace norms, increasing efficiency and strategic value, with the aim of fostering a more adaptable and competitive organizational environment. The proactive approach they present to problem solving and the supportive capacity they offer to make

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decisions taking into account real data, upgrade Quality Management strategies, which are becoming increasingly attractive, as healthcare professionals are involved in interconnected tasks that require clear prioritization, rapid action and often autonomy in decision-making. There is, of course, a significant part of healthcare services that consists of bureaucratic or routine processes, which through the simplification and standardization of processes and the optimization of human capital management can benefit greatly, bringing about significant improvements in interoperability, accelerating productivity, obtaining measurable data and monitoring performance. In terms of HR systems, there is an emerging need for healthcare organizations to move away from static role definitions and toward dynamic, skill-based architectures. Rather than simply matching people to jobs, HR will increasingly need to match people to problems, projects, and missions, adapting in real time to changing circumstances and technological capabilities. AI is reshaping HR's core responsibilities by collecting performance data in a continuous stream while simultaneously recording the actions and efforts of personnel in real time. This capability allows organizations to develop a robust workforce, monitor and evaluate employee's performance across different projects, and transform the gathered data into formats suitable for analysis and processing. This proactive process aids HR professional's role in identifying skill proximity, formulating job descriptions, job levelling, internal communication, suggesting career paths and matching employees with new roles or projects, in purpose at how organizations achieve their objectives. The interoperability of the AI approach is based on the belief that continuous observation yields much more in-depth and precise information than assessments conducted solely in a specific timeframe, typically on an annually basis. This provides healthcare organizations with the opportunity to reallocate resources from day-to-day operations to more urgent or strategic initiatives. Consequently, professionals are free to concentrate on patient-centered care and on activities that require creativity, critical thinking, and problem-solving abilities, ultimately leading to increased productivity and innovation ^[10,11,40-45].

3.2.1. Real-Time Employee Performance Monitoring and Continuous Feedback Mechanisms

Perhaps the most useful transformation in AI-enhanced EPM systems is the process of moving from traditional annual reviews to a real-time monitoring and ongoing feedback mechanisms of employee performance. Aggregated data can be used to make personnel recommendations, higher employee productivity and engagement, and lower personnel absenteeism rates and turnover. Research suggests that this strategic integration of continuous feedback loops represents a fundamental shift towards a more agile and responsive organizational culture,

as this innovative approach equips leaders with immediate, actionable data to swiftly tackle issues or obstacles promptly, aligning the evolving efforts and needs of both employees and the organization, while reducing the time managers spent on performance reviews. In addition, the ability to approach employee performance assessment through multiple methods and diverse sources, including 360-degree feedback, peers, task completion rates, Key Performance Indicators (KPIs), quality metrics, clinical outcomes, and patient satisfaction scores, is recognized as a best practice for gaining a balanced and holistic evaluation of employee performance. Furthermore, AI-driven EPM platforms are capable of generating interactive dashboards and visual reports that provide managers with actionable visibility into employee productivity and operational efficiency, work patterns, trends, and specific areas that require improvement. A common example is Natural Language Processing (NLP) technologies, which monitor communication channels and analyze the emotional tone and quality of collaboration between employees. This in-depth multidimensional approach, analyzing text data from emails, messaging platforms or other collaboration tools, offers a deeper understanding of employee performance, allowing organizations to determine whether employees are expressing positive, negative or neutral opinions. This latter approach enhances objectivity and cultivates a culture of ongoing effort, learning and adaptation to the goals of the organizations, which enhances their rapid cognitive development, the need for participation, bringing better outcomes for the health system and patients. In the same vein, using supervised and unsupervised learning techniques, managers can proactively address issues and provide recognition or guidance at the most appropriate times. This immediate recognition capability helps prevent unforeseen challenges for both organizations and employees. In addition, AI-based EPM systems have the ability to predict performance outcomes and identify anomalies in work behavior that may indicate emerging issues that require intervention. Finally, the system is capable of identifying potential trainers and mentors within the organization, thereby promoting internal skill improvement and succession planning. It appears that when employees receive consistent feedback on their performance, they develop a clearer understanding of the expectations set for them, along the specific areas in which they must improve their skills. Furthermore, receiving feedback on their performance can trigger or reinforce a feeling of appreciation for their contribution to the organization's goals, subsequently increasing their motivation and active participation in the workplace ^[11,27,46-52].

3.2.2. Objectivity and Equity in Performance Evaluation and Bias Mitigation

Healthcare systems generally face significant challenges in maintaining the objectivity of performance

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reviews and eliminating algorithmic bias. The absence of standardization is a common denominator for variation across departments, especially in organizations with many employees (large hospitals) or decentralized organizations (primary healthcare centers). AI-based solutions by developing clearly defined performance ratings and indicators, across organizations down to the department level, can promote uniformity in the evaluation of all employees, regardless of their position. By setting meaningful Objectives and Key Results (OKRs), organizations have the potential to achieve significant improvements in employee productivity and engagement. Moreover, research indicates that ML models, NLP technologies, and predictive analytics tools demonstrate advanced alignment and subjectivity in decision-making. The application of such algorithms, appropriately modified, can detect biases, memory distortion, infrequent rating cycles, or discrepancies in marking during performance evaluation, ensuring that the resulting ratings accurately reflect actual job performance, while at the same time promoting a fair workplace culture. Fairness, equal opportunities and transparency in assessments can be achieved using AI based on approaches discussed in bias mitigation framework. By instituting retrospective controls and broadening algorithm development teams, organizations can proactively address persistent biases. Therefore, AI-driven EPM systems ought to be regarded as complementary instruments in human-centered performance appraisal systems, rather than replacing managerial judgment, combining algorithmic neutrality ^[53-55].

3.2.3. Personalized Development Planning and Learning Path Enhancement

Traditional employee development programs, while effective at providing general training, often fall short of addressing each individual's unique skill gaps, learning preferences, and career goals. As a result, employees can become disengaged, resources may not be used as well as they could be, and professional growth tends to slow down. AI-powered platforms offer a way to tailor development plans more closely to the needs of individual employees, which could make a real difference. By looking at past data and patterns, it is possible to quickly identify what professionals prefer when it comes to learning, where their skill gaps lie, what they hope to achieve in their careers, and what the organization really needs. Using AI in personalized employee development makes it easier to create customized learning paths and deliver training in ways that best suit each individual's style. These AI-powered tools don't just stop at delivery. They also track employee performance during training and provide timely, actionable feedback. This helps people correct their mistakes early so that these mistakes don't become ingrained habits later on. By focusing precisely on an employee's individual learning requirements, AI significantly shortens the time required for skill acquisition,

thereby enabling a much quicker application of new abilities in the professional environment. Research consistently shows that personalized learning pathways notably boost job satisfaction, engagement, and motivation among personnel, achieved by delivering content that directly addresses their specific requirements. In this context, NLP technologies prove invaluable, as enable a thorough examination of employee communications, performance reviews, and feedback to accurately pinpoint individual strengths, areas for improvement, and career aspirations to forecast future skill demands based on evolving sector trends, proactively preparing the workforce for forthcoming challenges. Moreover, ML algorithms by expertly analyzing and synthesizing these vast quantities of data, and intelligently match it with suitable educational resources, coaching prospects, and relevant project assignments, try to identify learning patterns that align harmoniously with both the employee's personal growth objectives and the organization's overarching strategic objectives. Consecutively, by assessing employees' skill gaps, strengths, and learning preferences, AI-powered Learning Management Systems (LMS) can: a) track employee progress, b) create customized training plans, c) modify development strategies based on real-time feedback, d) suggest relevant e-learning modules or tutors (in many cases virtual assistants and chatbots) accordingly, and e) identify signs of potential future performance. Research to date shows that this dynamic approach of machine-learning algorithms can be used to ensure that employees receive relevant and targeted learning experiences, reducing the time required to acquire competence in new skills and shaping personalized career development that ensures the proper alignment of personal goals with organizational requirements, overcoming the weaknesses of traditional development and training methods ^[7,16,27,56-58].

3.2.4. Operational Efficiency, Data-Driven Decision Making and Strategic Alignment

AI is considered as an important step in the modernization of the health system, as it has the potential to significantly improve resource utilization and reduce administrative burdens, which are closely related to operational efficiency. Findings in the literature show that AI-powered methods, by automating administrative functions, such as generating multiple reports and collecting data in an automated manner, have the ability to increase data accuracy, optimize operational schedules, streamline workflows, and facilitate more up-to-date reporting. In clinical practice, deep learning models that are widely utilized in radiological imaging, along with natural language processing (NLP) tools, extracted from electronic health records, enabling early identification of subtle pathologies and uncommon diseases. Additionally, risk stratification algorithms further optimize diagnostic and interventional pathways, as has already been

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demonstrated by AI-powered skin cancer referral systems that have successfully reduced waiting times and alleviated the workload for clinicians. On the administrative side, predictive analytics forecast patient volumes, allowing managers to improve their decision-making capabilities and the organization's responsiveness to emergency situations. Likewise, this automation has facilitated route planning in terms of inventory accuracy and supply chain management, resulting in improved cost efficiency and less chance of errors, faster delivery times, thus enabling greater focus on strategy, better real-time interaction with employees, and personalization of patient experiences, which ultimately leads to improved outcomes and increased patient satisfaction. Therefore, AI can improve communication and collaboration, job satisfaction, create positive attitudes in personnel, resulting in reduced stress for healthcare professionals, which ultimately increases responsiveness and consistency with processes, while in many cases increases the need for their participation in the organization's strategic decisions. As a result, performance management becomes a truly dynamic process that adapts in real time, responding to changing organizational priorities, monitoring and integrating comprehensive emerging clinical data, or adapting to changes in workforce composition [10,52,59-62].

3.2.5. Building a culture of Continuous Quality Improvement (CQI)

A critical aspect in the health sector is the need for continuous quality improvement, which ultimately benefits both patients and society as a whole. This is an approach to healthcare that has always existed, but it was systematically developed in the early 20th century due to the rapid development of knowledge, technology and information within the field of medical science. In fact, it represents a process of continuous improvement and development for both individuals and teams, grounded on the principles of ongoing quality improvement and innovation, with the utmost objective of closing the gap between research data and clinical practice, thereby converting research outcomes into actionable knowledge for professionals. It is worth to highlight that well-implemented CQI initiatives offer the potential to improve human resource development, leadership, information technology, health financing, health information technology, and the accessibility of supplies, all of which function as building blocks of a health system. Furthermore, effectively implemented CQI initiatives improve the process of care delivery (standards compliance, coordination, consultation, collaboration, and linkages). CQI also clearly improves health care outcomes, including patient satisfaction, accessibility (in terms of timely access and utilization), safety, effectiveness, continuity of care, and ultimately prevent morbidity and reduce mortality. Research to date shows that AI has revolutionized employee training through the use of adaptive learning platforms, coaching

assistants, intelligent teaching systems dynamically modify training modules in real time, thus optimizing employee learning engagement, retention and mastery of knowledge. As a result, CQI becomes a truly dynamic process that adapts in real time, responding to changes in organizational priorities, quality assurance and total quality management, monitoring and integrating comprehensive emerging clinical data, or adjusting for changes in workforce composition [63,64].

3.2.6. Relevance and Contribution to Sustainability of a Health System

Identifying key stakeholders and building partnerships with other organizations is at the heart of a basic element of the framework for sustainable healthcare. This is consistent with the principles of place-based health planning. Patient advocacy groups, public and private service providers and professional associations within the healthcare sector, represent some of the primary stakeholders. Engaging in consultation and collaboration are essential aspects of working together to achieve sustainable healthcare. And this process, should be guided by the effective and efficient management of the whole system, central and decentralized services, with the aim of achieving a collective decision-making process. Management and leadership skills are one of the key variables in the framework for sustainable healthcare. However, considering that health is a worldwide issue, all countries should take into account phenomena such as the aging population which poses an increased risk for chronic diseases development, the unequal distribution of healthcare professionals, unequal access to healthcare which puts pressure on public finances. Additionally, lifestyle choices and national policies that support increasing birth and death rates, and therefore the way in which all these factors impact on the sustainability of the health care system for future years. AI platforms provide the opportunity to closer monitoring of such developments and balance social, environmental, and economic factors within a proactive strategy, along with their impact on employee psychology [65,66].

3.2.7. Change Management, Organizational Readiness and Scalability

The COVID-19 pandemic has highlighted in the most emblematic way the need for more immediate adaptability to the rapid transformations occurring in health worldwide, and the implications for the rest of society. At the same time, it has demonstrated the necessity of rapidly adapting healthcare organizations to the continuous and escalating demands of social needs. Numerous studies show that change management methodologies are essential for the effective adoption of electronic healthcare systems, with improved communication and the provision of adequate training and support are identified as the most effective components. Healthcare organizations are required to invest in comprehensive change management initiatives that enhance their potential for new performance management strategies.

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AI-based EPM systems offer greater potential for significant organizational improvements, including the integration of new technologies, process redesign, or even total organizational transformation, depending on emerging challenges. Successfully implementation of transformation approaches requires alignment between executive leadership and personnel, clear communication about the health system's weaknesses, changes, and benefits, extensive training for both managers and personnel, and ongoing support throughout the transition period. Researchers suggest the establishment of a preliminary deployment phase within designated organizational units for the acquisition of empirical data and formative feedback, allowing for the

iterative refinement of operational protocols prior to its comprehensive institutionalization across the entire organizational. Furthermore, fostering personnel participation in decisions regarding system design, eliciting their perspectives on fairness matters, and ensuring transparency in algorithmic functions serve to significantly augment personnel confidence and thereby facilitate the efficacious assimilation of an EPM system ^[67-69]. The evolutionary shif from conventional EPM systems to those powered by AI, represents a profound reorientation in how organizations assess, develop, and manage their human resources. Table 2 below outlines the differentiations based on their features.

Table 2. Conventional EPM Systems vs. AI-enhanced EPM Systems

Feature	Conventional EPM	AI-enhanced EPM
Structure	Hierarchical; Bureaucratic	Flexible; Empowered
Primary Focus	Administration; Compliance	Strategic; People-Centric
Communication	Limited dialogue; One-way; Typical	Continuous dialogue; Two-way
Data Usage	Historical	Real-time; Diverse data sets (email text, video, etc.)
Data Relevance	Insights might be considered outdated when evaluated; Retrospective	Insights are both timely and relevant to current events; Current
Logic	Efficiency-Driven; Stable; One-size-fits-all approach	Agility; Readiness; Different approaches
Impact on Decisions	Feedback can impact decisions made for the long-term.; Indirect	Feedback shapes real-time decisions; Direct; Data-driven; Reduces bias
Responsiveness	Feedback delayed or outdated	Feedback immediate that enables timely adjustments
Engagement	Limited	High
Trust	Employees may feel their input is infrequent	Employees see direct influence on outcomes
Feedback Loop	Periodic (e.g., quarterly, annually appraisals); Outdated	Real-Time; Relevant; Ongoing
Cultural Influence	Could encourage a passive approach; Periodic input	Encourages a proactive culture of ongoing participation and engagement
Alignment with Change	Responds to past issues; Reactive	Aligns with agile and adaptive transformation; Proactive
Generated Report	Manual	Automated; Data-driven; Intelligent with dashboards

3.3. Challenges and Considerations of AI implementation in EPM Systems

Although AI-driven technologies have demonstrated considerable advantages for enhancing the efficacy of EPM system, their successful assimilation presents substantial challenges that necessitate comprehensive investigation. However, this illustrates the dual nature of AI's impact, highlighting both its transformative advantages and the intrinsic difficulties associated with it. Both the existing challenges in healthcare sector, along with those introduced by the COVID-19 pandemic, necessitate a collaborative effort

between academics and practitioners to understand the essential capabilities of the sector and evaluate their significance in shaping the dynamics, determinants, processes, and possible outcomes. By gaining insights into these different levels of risk and implementing preventive measures and strategies, organizations improve their ability to optimize the effectiveness of AI, while mitigating potential future drawbacks ^[27,70-72].

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3.3.1. Management's absolute dependence on measurable data

As has already been confirmed by several authors, when it comes to monitoring employee performance, there are considerable concerns that AI may overestimate measurable metrics, thus neglecting important qualitative aspects. These reports raise concerns that, although AI is a valuable asset, there are valid concerns about its emphasis on measurable indicators. We believe that this expressed concern is justified, given that the core of EPM Systems revolves around employee metrics themselves. Obviously, while AI has the potential to automate processes and handle limitless data, overreliance on automation could diminish the necessary empathy that only humans can provide. This indispensable human approach is extremely necessary in highly sensitive domains related to career development, conflict resolution and employee well-being. Therefore, depending solely on an AI chatbot to address complaints instead of a human representative can exacerbate feelings of isolation, frustration and dissatisfaction among employees. Similarly, in the realm of employee training and development, recommendations generated by AI may not align organizational goals with individual employee needs, while the significant costs associated with integration could be seen as an obstacle. Because of this, it is crucial to examine the elements that greatly affect the efficacy of the performance measurement management system and that these are fully compatible with the culture of the organization. It seems that the culture of an organization or a healthcare system is crucial to ensure effective measurement and management of performance. Thus, organizations that dedicate significant resources and sufficient time in fostering a performance-oriented culture, along with implementing a thoughtfully designed performance management system, achieve the highest performance. Studies show that for professionals such as doctors, who in many cases rely on their previous professional experience and judgment to make decisions, it is particularly difficult to delimit the ex-ante appropriateness of their actions through rules and procedures (action controls), therefore providing flexibility is recommended. Obviously, while Artificial Intelligence provides valuable insights and adaptability, it should augment - rather than replace - human empathy, context, and discretion [27,71,73-75].

3.3.2. Data Privacy and Employee Surveillance

Employee performance monitoring tools need to achieve significant levels of transparency and confidentiality. Research conducted within public health sector suggests that analyzing both the institutional and historical context of organizations often reveals that healthcare professionals have limited autonomy. This limitation can lead to the perception that formal monitoring practices are often perceived as a threat to their autonomy, i.e., control over their decisions.

More broadly, it is acknowledged that excessive monitoring can lead to increased distrust, frustration, or even violations of labor regulations in some jurisdictions. These observations underscore the significance of establishing a balance between AI-enhanced efficiency and preserving human-centered appraisal methodologies. In light of the above points, organizations should always ensure: a) adherence to the GDPR or applicable privacy regulations, b) clear communication regarding the data collected and the purpose of its collection, and c) the necessity of obtain consent for participation, where relevant [27,71,75-78].

3.3.3. Ethical and legal Considerations about AI introduction in ERP systems

Although AI technologies hold the promise to improve the speed and accuracy of personal data management, there are growing concerns regarding the extent of their autonomy and the necessity for clear guidelines on human oversight. Employees have the right to know and should receive all kinds of explanations so that they understand all the criteria used to assess their progress and those factors that determine decisions about their professional development. Furthermore, it is imperative to maintain the confidentiality of data and performance evaluations, preserve their integrity and to respect for their individual privacy. Solid ethical and legal frameworks are critical elements of any trustworthy HR system and should adhere to the general principle that performance evaluations conform to a widely recognized structure and set of guidelines. Consequently, the enactment and diligent adherence to comprehensive data protection legislation, notably the General Data Protection Regulation (GDPR), alongside robust anti-discrimination policies and established ethical frameworks, is paramount. This integration allows AI-driven Employee Performance Management (EPM) systems to operate effectively within defined legal parameters, thereby substantially mitigating potential liabilities. Crucially, this approach safeguards fundamental employee rights by mandating that organizations secure unequivocal and informed consent from individuals prior to any data acquisition, while simultaneously affording individuals the unimpeded capacity to revoke such consent at any given juncture. Furthermore, to ensure a cohesive and equitable global landscape for AI, it is incumbent upon policymakers to actively promote international cooperation. This collaborative effort is essential to guarantee that governance frameworks for AI in the healthcare sector are consistently informed by harmonized standards across diverse national and regional jurisdictions. Healthcare organizations are obliged to emphasize the transparency of algorithmic operations and ensure that employees are informed about how performance measurements are derived and how recommendations generated by AI are formulated [27,71,79-81].

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3.3.4. Bias Mitigation, Accountability and Fairness

Any AI-driven system relies heavily on the quality of the datasets used to train it. Studies have reported that the effectiveness of an EPM system can vary significantly, based on the metrics defined and employed. Inadequate organization and oversight of AI systems can lead to bias toward specific historical norms, which can consequently lead to biased decision-making for specific marginalized groups, without ensuring fair outcomes. In these cases, AI can unintentionally perpetuate this bias, favoring those candidates associated with specific backgrounds, usually in the context of gender, age, ethnical, racial and sexual identity. Consider, for example, a case where an AI model designed to select medical directors was trained on historical assessment data that revealed a latent bias for specific demographic groups (e.g., a disproportionate representation of men over women or non-binary candidates). Critics contend that unfettered reliance on AI could jeopardize diversity initiatives and hasten the exclusion of highly capable individuals based on superficial metrics rather than their substantive qualifications. It is imperative to incorporate bias checks as a cornerstone of conventional HR methodologies. If biases remain unchecked, they can cause pervasive unfair or biased outcomes in critical assessment mechanisms, such as candidate evaluations, performance appraisals, and career development opportunities. Such outcomes, in turn, can have legal consequences, potentially negatively impacting institutional standing and significantly eroding staff trust. Furthermore, it is widely recognized that periodic refresh of acquired data is necessary and widely recommended to prevent AI systems from perpetuating outdated biases and to ensure continued alignment with evolving societal perspectives [41,71,82-84].

3.3.5. Digital Infrastructure Challenges and Cultural Shift

The robustness of an organization's digital infrastructure profoundly influences its operational efficacy, systemic agility, and innovative potential. A comprehensively developed digital infrastructure, therefore, serves as the cornerstone for cultivating an institutional environment that catalyzes digital transformation, enabling professionals to harness novel technologies and acclimate to evolving procedural methodologies. The integration of expansive data analytics, distributed computing platforms, cooperative software solutions, and automated operational applications fundamentally reshapes various facets of the organizational ethos, consequently demanding a holistic comprehension of these complex interdependencies. The automation of processes is transforming employees' perceptions of their work roles and organizational priorities. This shift in the distribution of tasks may influence the organizational climate by modifying employees' shared views on the organization's policies and practices related to technology utilization and job design. In this regard, HR

professionals must collaborate and communicate closely with AI developers and IT departments to meet rigorous medical requirements to ensure that AI and digitalization integrated seamlessly and securely into healthcare workflows. Moreover, the integration of AI and digitalization in healthcare sector often necessitates long-term modifications and the establishment of a data-driven culture throughout the healthcare ecosystem. A data-driven culture refers to an organizational environment in which decisions made at all levels rely on data analysis instead of intuition or individual experience. Additionally, promoting a culture of continuous learning and adaptability in healthcare settings ensures the ongoing expansion of remote and flexible work arrangements, a dominant trend that is anticipated to have a significant impact on healthcare culture in cases of epidemics, disasters or other emergency circumstances [71,85,86].

3.3.6. Resistance to Change and Skill Gaps

Research has pointed out a variety of perspectives regarding resistance to AI. Usually, managers' lack of experience and necessary data literacy, inadequate personnel training, employees who are concerned about being "monitored", misunderstanding of the advances in knowledge generated by the evolution of AI, job insecurity and algorithmic aversion exacerbate fear and concerns about the fairness and accuracy of employee performance reviews, often resulting in employee dissatisfaction and resistance. Numerous bodies of literature highlight that skills represent one of the most significant development gaps in human resources management. It seems that while many professionals feel optimistic or confident in theory, their practical skills, such as interpreting AI results, using tools responsibly, and understanding data, remain limited. These significant skills gaps are not a concern when they exist in isolation and do not generalize. However, the situation worsens when there is a general reluctance to accept change and mistrust toward AI, issues that lead to technological complexity, stress and deeper introspection, which includes contradictory interpretations. With predictions that AI is likely to transform nearly half of the core skills of healthcare personnel within the next five years, the anxiety surrounding job losses due to AI's ability to automate tasks performed by humans is justified and may contribute to AI resistance in healthcare [71,87-89].

3.3.7. Lack of overall AI Readiness adoption in Human Resources Management

Beyond the skills gaps associated with technological developments, which are always present due to the continuous rapid evolution of technology, many healthcare sectors face a broader challenge, the reluctance of organizations to adopt AI is also very significant. As such, it is imperative for governments develop comprehensive national strategies for AI and digital health. Levels of development worldwide vary considerably, and several of

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countries do not have formal national strategies. Nevertheless, in the absence of strategic frameworks that guarantee sufficient funding, effective leadership, optimized resource allocation, personnel coordination and collaboration, decisive policies, and comprehensive measures tailored to the unique circumstances of each state, the integration of EPM systems into modern healthcare will remain untapped. Therefore, AI's implementation necessitates organizational preparedness and a holistic approach that encompasses five essential components [89,90]:

- Resources**, are there sufficient financial, human, and technical resources available for initiatives related to the development of AI?
- Capabilities**, do organizations have the required technical and analytical expertise, designed in a way that ensures interoperability?
- Objectives**, are they formulated and structured in a manner that guarantees clarity throughout all sectors of organizations, and can they be measured for the effective implementation of AI, in a suitable manner, so that they align with strategic goals in healthcare?
- Culture**, which relates to whether the healthcare system is open to experimentation, adopt innovations, the impact of change management, data-driven decision-making and lifelong learning?

- Governance**, have appropriate laws, transparent policies, government regulations, ethical standards and accountability structures been established and shaped for the development and proper utilization of AI?

3.3.8. Risk levels of AI development in EPM Systems.

Understanding the challenges linked to the integration of AI into EPM systems, without a thorough assessment of the magnitude of the associated risks, often leads to insufficient understanding that usually restricts practical knowledge. Figure 1 illustrates the magnitude of the level of risks involved in the development of AI in EPM systems. Elements categorized as high risk include oversight, ethical framework, safeguards and algorithmic bias issues. Other studies support these findings, indicating that transparency, accountability and privacy remain pressing issues, but assessed at a medium risk level. Failure to address qualitative aspects of HR processes and the technical skills of HR managers shown to carry low risk. However, regardless of the level of difficulty these risks present, they cannot remain and stagnate, it is necessary to address them by developing different policies, sometimes short-term and sometimes long-term in nature, as neglecting them can jeopardize the effectiveness of AI, resulting in inefficiency and dissatisfaction among employees [85,91-93].

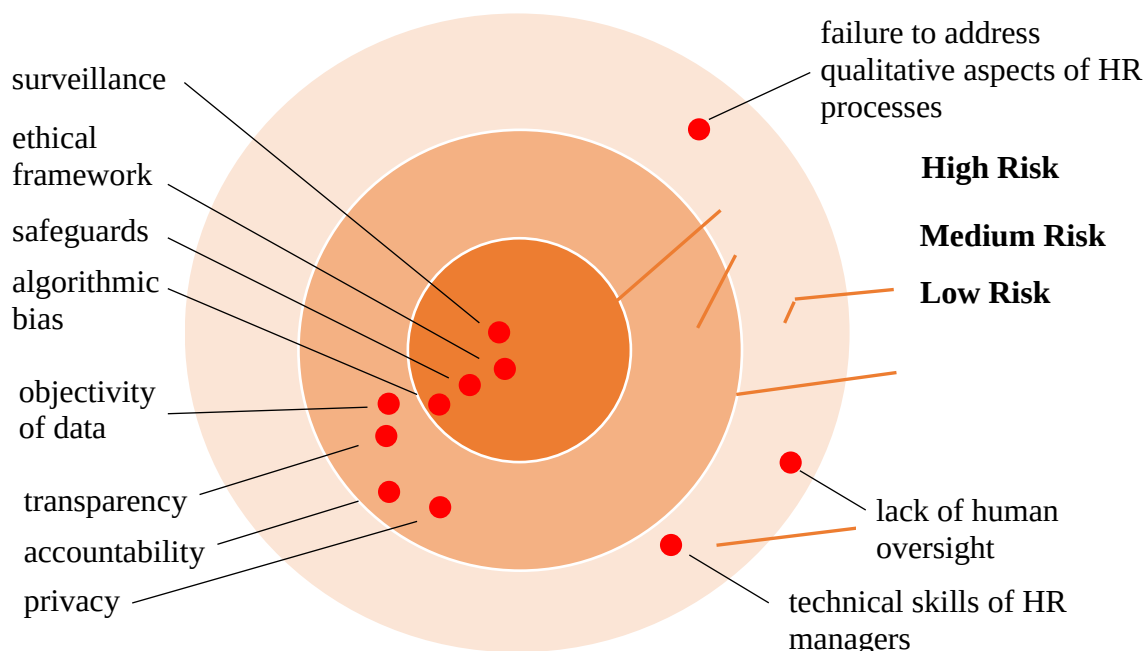


Figure 1. Risks levels of AI development in EPM Systems.

Source: Author's elaboration

3.4. Mitigating Risks levels of AI development in EPM Systems

To overcome the challenges, public sector organizations in healthcare can adopt several proactive

measures to create more effective and sustainable EPM Systems.

- Align individual and organizational goals:** A well-designed EPM system should start with Specific, Measurable, Achievable, Relevant and

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Time-bound (SMART) Objectives and Key Results (OKRs) for employees, with the primary goal of aligning directly with the organization's strategic mission.

2. **Standardization in the collection of performance data:** Gathering performance data of employees in healthcare settings is essential, given the numerous specialties that collaborate to achieve patient care. As such, it is imperative for HR professionals to collaborate closely with managers at the central level to collect and process only the data that is necessary for specific organizations purposes and define KPIs tailored to each job function. This data minimization fosters the development of data standardization and ensures that organizations do not store or use excessive data, which could heighten the risk of privacy violations or data breaches.
3. **Implement continuous feedback loop:** The necessity of providing feedback regularly involves informal discussions between managers and employees about performance, objectives, and development. In this framework, feedback can take many forms, including brief meetings, project evaluations, peer shout-outs, or even informal discussions in the hallway. This strategy offers employees prompt guidance and facilitate their continuous improvement, rather than waiting months to learn about a problem or accomplishment. At the same time, managers stay informed about personnel concerns or ideas, and can tackle minor challenges before they escalate.
4. **Human Oversight and Involvement:** It is essential to uphold a balance between AI methodologies, technological advancements and the human aspect. This collaboration ensures that AI enhances managerial functions instead of replacing them, resulting in a more robust and effective healthcare organization.
5. **Utilize appropriate technology:** Continuous advances in technology have the potential to facilitate the automation of performance monitoring, goal setting and feedback mechanisms. Explainable Artificial Intelligence (XAI) can help human users to understand a system's general functioning and recognizing AI-generated decisions, while also ensuring that algorithmic decisions are considered ethical and fair.
6. **Training and education:** Providing training to managers, HR professionals, and employees about the risks, ethics, and best practices of AI is essential and should not be a one-time event, but

rather an ongoing one. Additionally, organizations need to adopt a more proactive stance to protecting the privacy and security of their employees' data.

7. **Engagement of employees:** It is essential that all employees, regardless of the level of management they occupy, accept the performance criteria, as this is a fundamental requirement. To this end, management must be committed to facilitating the participation of all employees in the processes, which is also a basic principle of change management.
8. **Focus on outcomes over outputs:** Particular emphasis should be placed on the long-term effects of integrating AI on the quality of services provided, rather than on the quantity of work generated.
9. **Continuous Monitoring and Auditing:** Utilizing of AI necessitates a rigorous appraisal to ensure conformity with prevailing legal frameworks and established ethical principles. Furthermore, continuous oversight and systematic evaluations are imperative for identifying and mitigating inherent predispositions and emergent vulnerabilities.
10. **Promote a positive culture:** It is incumbent upon healthcare leadership to foster an environment founded upon principles of mutual trust, organizational agility, continuous professional development, and systemic improvement. Human resource professionals bear a pivotal responsibility in actualizing this objective, thereby establishing an organizational culture wherein personnel experience genuine empowerment and support, as opposed to mere oversight or stringent monitoring, and collectively contribute to a shared dedication towards the optimal provision of healthcare services to the broader populace.

4. CONCLUSION

This scoping review critically examines the advantages associated with AI-based EPM systems within healthcare organizations. Acknowledging the pivotal role healthcare professionals play in strategic planning, the core methodologies identified in this analysis -encompassing continuous performance monitoring coupled with prompt feedback, equitable assessment practices, individualized professional development pathways, advanced predictive analytics for talent cultivation, evidence-based decision-making, and adaptable learning paradigms- collectively contribute to the formation of a comprehensive EPM framework. This integrated ecosystem is designed to foster

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enhanced operational efficiency and workflow streamlining, optimize staff well-being and engagement, ensure professional longevity, cultivate a robust culture of innovation and high performance, and ultimately bolster overall organizational efficacy and adaptive capacity.

Nonetheless, the multiple challenges inherent in implementing advanced systems -including ethical imperatives, data privacy, social equity, and algorithmic transparency, alongside methodological limitations, technical robustness, and potential variations in adoption rates- collectively underscore the critical necessity for prudent and empirically informed development. Consequently, effectively integrating AI into EPM systems essentially requires policymakers and healthcare executives to cultivate a prudent balance between advanced technological capabilities and humanistic principles, while maintaining ethical principles and complying with relevant regulatory frameworks. Managers ought to establish structures that facilitate the broad diffusion of knowledge pertaining to artificial intelligence methodologies. Concurrently, there is a necessity to formulate a hybrid knowledge strategy, effectively integrating computational approaches with personalized insights. This methodology is poised to facilitate professional growth among the workforce, thereby stimulating organizational innovation through the synergistic production of expertise. Moreover, transparent communication regarding the architectural design of work processes and the overarching strategic imperatives concomitant with the integration of artificial intelligence is paramount for enhancing comprehension and cultivating confidence within the employee cohort.

The path towards a promising future necessitates that healthcare organizations embrace workplace transformation, perceiving the integration of AI into EPM systems not solely as a compliance tool or a mechanism for efficiency, but rather as a strategic enabler. This transformative methodology will concurrently foster the sustained growth and agency of personnel, thereby cultivating an environment of augmented efficacy. Through the responsible integration of these advanced systems, healthcare leadership can establish performance governance frameworks that enhance the professional welfare of individuals, mitigate personnel attrition, bolster synergistic collaboration, and elevate institutional effectiveness, needed for delivering outstanding patient care in an ever-evolving healthcare landscape.

Abbreviations: **AI:** Artificial Intelligence; **EPM:** Employee Performance Management; **HR:** Human Resources; **HRM:** Human Resource Management; **IT:** Information Technology; **KPI:** Key Performance Indicators; **ML:** Machine Learning; **NLP:** Natural Language Processing; **PM:** Performance Management;

SMART: Specific, Measurable, Achievable, Realistic, and Time-bound goals.

Author Contributions

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