E-ISSN: 3108-4192

APSSHS

Academic Publications of Social Sciences and Humanities Studies
2025, Volume 5, Page No: 90-109
Available online at: https://apsshs.com/

Asian Journal of Individual and Organizational Behavior

Exploring the Interplay Between Knowledge-Based HRM Practices and Organizational Performance: The Moderating Effect of Intellectual Capital in Amhara Universities

Mohd Faizal Iskandar[1], Nurul Izzati Aziz[1], Khairul Anwar Mustapa[1*]

1. Department of Business, Management, and Technology, ALFA University College, Malaysia.

Abstract

In the era of a knowledge-centered economy, how organizations manage their human resources plays a decisive role in shaping their overall performance. Yet, the outcomes of such management practices are not consistent across institutions, as they often depend on the level and effective application of intellectual capital (IC). This research examines how knowledge-based human resource management (HRM) practices influence organizational performance, highlighting the moderating effect of IC in universities located in Ethiopia's Amhara regional state. The study aims to uncover the extent to which intellectual capital enhances or alters the relationship between HRM practices and performance outcomes. Adopting a quantitative research approach, a cross-sectional survey was conducted among 364 employees selected using stratified sampling methods. Data were gathered through structured questionnaires to analyze the connections among the core variables. Findings demonstrate that knowledge-based HRM practices substantially improve university performance, and that intellectual capital strengthens this impact. To fully benefit from IC, universities are encouraged to invest in enabling infrastructures—such as laboratories, technology systems, and innovation hubs—that support their strategic goals. Such initiatives are essential for stimulating knowledge creation and building an innovative culture, which are critical to achieving sustainable success in the competitive academic landscape.

Keywords: Knowledge-based HRM, Intellectual capital, Human capital, Relational capital, Structural capital, Organizational performance

How to cite this article: Iskandar MF, Aziz NI, Mustapa KA. Exploring the Interplay Between Knowledge-Based HRM Practices and Organizational Performance: The Moderating Effect of Intellectual Capital in Amhara Universities. Asian J Indiv Organ Behav. 2025;5:90-109. https://doi.org/10.51847/dOnkYoY4rW

Received: 23 December 2024; **Revised:** 27 February 2025; **Accepted:** 02 March 2025
Corresponding author: Khairul Anwar Mustapa
E-mail ✉ k.anwar.mustapa@yahoo.com.my

Introduction

Although scholars define organizational performance in various ways, there is general agreement that it reflects how effectively an organization utilizes its resources to achieve its strategic objectives. Performance encompasses both efficiency and effectiveness across multiple dimensions, including financial stability, innovation, customer satisfaction, and employee engagement. Recent research [1] emphasizes that organizational performance should be assessed more holistically, extending beyond financial measures to include human skills, technological capabilities, and innovation capacity [2].

In today's dynamic and knowledge-driven environment, intangible assets such as expertise, creativity, and skills have emerged as crucial sources of competitiveness. Since individuals are the originators and implementers of new ideas, effective human resource management (HRM) practices are essential to organizational success [3]. Knowledge and innovation, being inherently human-centered, are strongly influenced by HRM policies and processes. Key HRM functions—such as

recruitment and selection, training and development, performance appraisal, and compensation—shape organizational behavior, productivity, and performance [4].

Universities, as institutions dedicated to generating and disseminating knowledge, are particularly well-positioned to benefit from knowledge-based HRM systems [5]. Evidence shows that higher education institutions (HEIs) adopting such practices tend to achieve stronger research output, higher teaching quality, and improved institutional outcomes. The rapidly evolving landscape of higher education highlights the growing importance of HRM practices grounded in knowledge management for improving academic performance and innovation.

A considerable body of literature has explored the relationships among intellectual capital (IC), knowledge-based HRM, and organizational innovation [6-8]. Universities are increasingly recognizing IC as a key driver of efficiency, innovation, and competitiveness. Strategic HRM practices that focus on managing intellectual resources have therefore become central to achieving institutional excellence [1]. Intellectual capital—comprising human, structural, and relational components—supports creativity, innovation, and sustainable growth. To maintain strong IC, organizations must prioritize attracting, developing, and retaining talented individuals to gain a competitive edge [9].

Kianto *et al.* [1] categorized IC into three dimensions: human, structural, and relational capital, exploring their interconnections. However, their study approached HRM as a unified construct rather than examining individual HRM practices. This limitation left uncertainty about which specific practices are most closely related to IC and organizational performance. To address this gap, the present research evaluates distinct HRM practices to determine their unique effects.

Prior research has consistently shown that IC enhances both innovation and organizational performance. For instance, Mahmood and Mubarik [10] highlighted how human and structural capital jointly promote flexibility and innovation in U.S. manufacturing firms. Likewise, Ashmond *et al.* found that when IC components are analyzed separately, all positively affect performance; yet when examined collectively, structural and relational capital have the strongest influence on innovation. Similarly, Kloutsiniotis *et al.* [11] demonstrated that structural and relational capital strengthen the connection between human capital and innovation, suggesting that these components mediate the link between human capital and performance outcomes.

Despite these insights, limited research has explored how IC moderates the relationship between specific HRM practices and organizational performance within higher education settings. Most prior studies treat IC as a single construct, overlooking the distinct roles of its subcomponents. Moreover, the majority of existing evidence comes from corporate or Western contexts, leaving a significant gap in understanding how knowledge-based HRM affects university performance in developing nations such as Ethiopia. This study aims to bridge that gap by examining how context-specific HRM practices influence institutional performance through the strategic use of IC in Ethiopian public universities.

Ethiopian HEIs face persistent challenges in aligning HRM systems with knowledge-driven goals. Constraints such as limited funding, outdated structures, and weak institutional support impede the recruitment, development, and retention of talented academics [12]. Training programs often fail to meet the standards of the global knowledge economy, leaving staff underprepared for innovation-based initiatives. Furthermore, performance appraisal and reward systems rarely motivate creativity, interdisciplinary research, or productivity, resulting in slow institutional progress [13]. Structural capital, including systems that support knowledge sharing and innovation, remains underdeveloped, while relational capital—collaborations and partnerships crucial for research and funding—is insufficiently leveraged [14]. These constraints collectively weaken the ability of Ethiopian universities to nurture innovation and compete globally.

The central objective of this research is to investigate how knowledge-based HRM practices influence organizational performance, focusing on the moderating role of intellectual capital within HEIs in Ethiopia. Specifically, it seeks to answer two key questions:

1. How do knowledge-based HRM practices—recruitment and selection, training and development, performance appraisal, and compensation—affect university performance?
2. To what extent does intellectual capital—human, structural, and relational—moderate this relationship?

By addressing these questions, this study aims to deepen theoretical understanding of the intersection between HRM and IC while offering practical guidance for enhancing innovation, teaching quality, and research productivity in Ethiopian higher education.

Literature Review

Introduction

This part reviews key theoretical foundations and prior empirical studies related to the topic. The discussion builds primarily on two frameworks—Intellectual Capital (IC) Theory and the Resource-Based Theory (RBT)—which together offer a strong conceptual lens for analyzing how internal resources contribute to institutional performance.

IC theory focuses on the significance of intangible assets—namely human, structural, and relational capital—as essential contributors to an organization's success [15]. In contrast, RBT explains that organizations achieve superior performance when they effectively utilize resources that are valuable, rare, difficult to imitate, and irreplaceable (Bhandari *et al.*, 2020).

By combining these two perspectives, this study seeks to explain how universities can strengthen their performance by leveraging and integrating their intellectual and resource-based capacities.

The concept of intellectual capital

The idea of intellectual capital (IC) has its roots in human capital theory. Nobel Laureate Gary Becker, as cited in Faggian *et al.* [16], suggested that investments in education, training, and healthcare generate **human capital** rather than physical or financial assets, because individuals carry their skills and knowledge wherever they go [17]. More recent studies [18, 19] further note that although organizations can nurture and develop employee capabilities, ownership of these skills ultimately rests with the individuals themselves.

Human capital represents a blend of technical expertise and personal attributes—such as leadership, creativity, adaptability, and problem-solving—that help organizations sustain competitiveness and growth. According to Mohammed *et al.* [20] and Chowdhury *et al.* [21], organizations that invest consistently in employee development tend to outperform those that do not, particularly in knowledge-intensive fields like education. In academic settings, human capital development translates into improved research quality, innovation, and adaptability—factors that are essential for long-term institutional success.

Structural capital refers to the organizational systems and processes that enable employees to perform effectively. It includes elements such as databases, routines, management systems, patents, and corporate culture. Unlike human capital, structural capital remains with the organization even after employees leave, acting as a repository of organizational knowledge [22]. It reflects how institutions organize, store, and apply knowledge through their structures and policies. Although it originates from human input, structural capital becomes an independent organizational asset—for example, a patent created by a researcher becomes the property of the university once registered.

Relational capital constitutes the external dimension of IC and reflects an organization's ability to create and maintain productive relationships with external stakeholders. These relationships—with suppliers, customers, competitors, partners, and government institutions—generate valuable insights and facilitate the flow of knowledge [23, 24]. A crucial subset of relational capital is **customer capital**, which embodies the organization's market orientation and responsiveness to changing stakeholder needs. Ortiz *et al.* [23] describe market orientation as the ability to generate, share, and use market intelligence to respond to current and future customer expectations.

Relational capital thus extends beyond market relationships to include broader collaborations and networks that support growth and innovation. It has become an integral concept in strategic management frameworks such as the **balanced scorecard**, and it contributes to the notion of the **learning organization**, where continuous interaction and feedback from the external environment drive organizational learning and performance [25].

Theoretical background

Theory of intellectual capital

The theory of intellectual capital (IC) highlights the importance of intangible assets—human, structural, and relational capital—as core elements that drive organizational success and value creation. IC is especially critical in knowledge-based sectors like education, where an organization's ability to create, share, and use knowledge determines its overall performance. The theory rests on the idea that intangible assets are essential for innovation, continuous learning, and long-term growth. Over time, scholars have expanded this framework to better understand how its components influence performance outcomes. For example, Budiarti [26] investigated the link between IC and innovation in knowledge-intensive organizations, identifying human capital as the strongest factor promoting innovation. She suggested that firms investing in employee growth and fostering knowledge-sharing cultures are more likely to develop creative ideas and solutions—supporting IC theory's view of human capital as the foundation of innovation.

Extending this idea, Lewin and Teece [27] explored how IC supports dynamic capabilities—the capacity of firms to adapt and reconfigure resources in rapidly changing environments. They found that organizations rich in human expertise and tacit knowledge are better equipped to recognize and seize emerging opportunities. This reinforces the theory's central claim that IC enhances adaptability and competitiveness.

The structural dimension of IC has also been widely studied. Al-Jinini *et al.* [28] analyzed how structural capital—such as systems, processes, patents, and databases—impacts performance. Their results showed that well-developed structural capital improves efficiency, protects intellectual property, and boosts organizational performance. This supports the argument that structural capital provides the framework through which human and relational capital can create value and sustain an advantage.

Recent research has also highlighted the importance of relational capital. Abd-Elrahman and Ahmed Kamal [29] found that strong networks and customer relationships help firms, particularly in service industries, enhance performance by gaining market insights, improving services, and building loyalty. Similarly, Zioło [30] emphasized that organizations must measure

and manage IC as a strategic resource, introducing models to integrate IC into decision-making and long-term planning. These insights underline that IC's multidimensional structure is central to modern organizational success.

In higher education, Saeed *et al.* [31] examined how universities leverage IC to improve teaching and research outcomes. They observed that institutions prioritizing human and relational capital tend to attract high-caliber faculty, foster collaboration, and achieve higher rankings. This aligns with IC theory's perspective that managing knowledge resources effectively enhances institutional performance. Overall, the theory continues to be a vital lens for understanding how intangible assets fuel innovation, competitiveness, and sustainability. As confirmed by Farzaneh *et al.* [32], organizations that strategically cultivate and utilize IC are more capable of adapting, innovating, and thriving in evolving environments.

Resource-based theory

The resource-based theory (RBT) argues that an organization's success depends on its ability to effectively utilize a unique mix of valuable, rare, and inimitable resources. These resources—financial, physical, human, and organizational—enable firms to design, produce, and deliver products or services that sustain competitive advantage [33]. Maximizing the potential of these resources, particularly human capital, is crucial for long-term performance.

Employees are instrumental in building organizational knowledge and networks, which form the basis of competitive differentiation [34]. Leadership and HR professionals play a key role in mobilizing human capital, promoting collaboration across departments, and aligning individual contributions with strategic objectives [35]. Knowledge, as a strategic asset, is embedded in HR practices—such as recruitment, training, appraisal, and compensation—that collectively strengthen organizational capability and performance [1].

Empirical literature review

Enhancing performance through knowledge-based HRM practices

In recent years, a large number of studies [36-38] have emphasized that managing people through knowledge-oriented HRM systems is a key element in strengthening institutional performance. Practices such as selective hiring, continuous development, performance evaluation, and fair compensation do more than manage staff—they actively shape how knowledge is generated, shared, and applied within an organization. These practices indirectly build intellectual capital (IC), which functions as a bridge between HRM initiatives and improved performance outcomes.

According to previous findings, reward systems and performance reviews that value innovation and knowledge-sharing tend to inspire employees to contribute ideas, exchange expertise, and solve problems creatively [36, 37]. Knowledge-based HRM also shifts recruitment priorities toward individuals who can learn quickly, collaborate effectively, and adapt to complex knowledge environments [38]. In this sense, human resource systems are not only operational tools but also mechanisms for creating intellectual value.

Lei *et al.* [39] argue that an innovative organization cannot emerge without a workforce that constantly learns and shares knowledge, suggesting that HRM policies must be designed to encourage these behaviors. Some researchers, including Gupta [36], also point out that components of IC—such as human and structural capital—can reinforce the effectiveness of HRM practices, acting as moderators in their relationship with performance outcomes.

Despite these contributions, most existing studies take a broad, cross-industry perspective. They often neglect sector-specific characteristics that might shape how HRM and IC interact. In the context of higher education institutions (HEIs), especially within Ethiopia, universities operate under unique knowledge environments and governance structures. Their performance is influenced not only by internal HRM systems but also by external academic, regulatory, and technological factors. Consequently, the effects of HRM practices in universities may differ substantially from those observed in corporate organizations—a distinction that remains underexplored.

Furthermore, research has rarely unpacked how each form of IC—human, structural, and relational capital—uniquely moderates the HRM–performance link. Human capital may directly enhance recruitment and training results, while structural capital could play a larger role in knowledge-sharing and innovation processes. Relational capital, in turn, may strengthen collaboration and institutional reputation. This study aims to fill these gaps by providing a more detailed examination of how the different components of IC shape the relationship between knowledge-based HRM practices and performance in universities.

Knowledge-based recruitment and selection

Recruitment involves attracting potential candidates, while selection determines which individuals best align with both job demands and institutional values [40]. In higher education, these processes are central to building strong academic and administrative teams that can drive teaching and research excellence.

Recent empirical work highlights that recruitment based on knowledge, skills, and cultural alignment can significantly improve institutional outcomes. Pandit and Paul [41] found that universities that adopt knowledge-centered hiring

approaches—prioritizing expertise, adaptability, and intellectual fit—tend to perform better in areas like research productivity, teaching quality, and student engagement. Stirpe *et al.* [42] also noted that valuing interpersonal and collaborative abilities during selection increases faculty motivation and performance.

Similarly, Soomro and Khan [43] reported that institutions with structured recruitment strategies—balancing internal promotion with external hiring—are more adaptable and achieve higher student satisfaction and research output. Chien *et al.* observed that bringing in diverse talent from academic and industry backgrounds boosts institutional innovation and agility. Collectively, these findings suggest that strategic, knowledge-focused recruitment and selection are essential for fostering long-term competitiveness in higher education.

Knowledge-based training and development

Employee knowledge naturally depreciates over time, and without consistent development opportunities, performance levels can decline. To maintain a competent and innovative workforce, universities must implement training programs that continuously renew and expand staff expertise.

Evidence shows that knowledge-oriented training initiatives have a strong positive effect on university performance. Makri *et al.* [44] found that faculty members who participate in academic seminars, research-focused workshops, and technology training demonstrate higher innovation and teaching effectiveness. Aithal and Maiya [45] further noted that promoting lifelong learning within academic institutions fosters a culture of creativity and continuous improvement, directly enhancing research output and instructional quality.

Alshammari *et al.* [46] added that when universities invest in training related to leadership, research methods, and emerging technologies, faculty engagement and satisfaction rise—factors that translate into better institutional performance overall.

Knowledge-based performance appraisal

Evaluating employee performance remains one of the most critical mechanisms for directing and improving behavior within organizations, particularly in higher education institutions (HEIs). To genuinely support their teaching and research missions, universities need appraisal systems that prioritize development, feedback, and knowledge enhancement rather than mere accountability.

Recent research has shown that knowledge-based performance appraisal (KBPA) frameworks can significantly enhance institutional outcomes. Khan *et al.* [47] observed that universities implementing KBPA are better at recognizing faculty members who contribute to research, pedagogical innovation, and knowledge creation—factors that directly strengthen engagement and productivity. Similarly, Tariq and Akbar [48] argued that by incorporating broader criteria such as mentorship, research quality, and governance involvement, KBPA systems foster a culture of continuous improvement among faculty.

Other scholars, including Mehmood *et al.* [49], found that when appraisal systems blend both quantitative and qualitative indicators—such as research output alongside teaching impact—faculty feel that their intellectual contributions are fairly acknowledged. This recognition enhances job satisfaction and motivation. Camilleri [50] further emphasized the importance of regular, constructive feedback as part of KBPA, noting that it promotes transparency, helps academics identify their strengths and weaknesses, and encourages personal development.

When appraisals are viewed as equitable and aligned with academic goals, faculty members tend to develop stronger loyalty toward their institutions and greater commitment to their mission [51]. Consequently, KBPA not only improves individual performance but also strengthens institutional cohesion, trust, and long-term effectiveness.

Knowledge-based compensation

Compensation systems serve as powerful tools for shaping behavior and encouraging knowledge-sharing within universities. When pay structures are tied to intellectual contributions—such as research achievements, teaching excellence, and innovation—they act as incentives that drive faculty toward higher levels of performance.

Andrew-Favour [52] highlights that both tangible rewards (like bonuses or salary increments) and intangible ones (such as recognition and career opportunities) can be used to foster a culture of knowledge creation and collaboration. Supporting this view, Hassan [53] found that linking compensation to knowledge-based achievements—publications, research impact, or innovative teaching—leads to higher motivation, satisfaction, and professional growth among faculty members. Rewarding academic and creative output, in turn, contributes to improved institutional reputation and sustained performance.

Rehman *et al.* [54] also demonstrated that universities aligning their pay systems with intellectual value creation are more successful in enhancing global visibility and attracting top scholars. In contrast, traditional compensation structures focused solely on tenure or seniority often fail to inspire innovation and may even discourage academic excellence.

Recent scholarship suggests that HRM strategies in HEIs are increasingly shifting from isolated practices to integrated, bundle-oriented systems. Instead of treating recruitment, training, appraisal, and compensation as separate processes, universities are adopting holistic frameworks that connect these practices to the broader goal of knowledge management and

institutional development. Lewin and Teece [27] argue that such integration strengthens intellectual capital and leads to sustainable organizational success.

H1: Knowledge-based HRM practices have a positive and significant impact on the performance of public universities in Ethiopia.

Intellectual capital and university performance

University performance reflects how effectively institutions achieve their primary goals, including teaching, research, and societal engagement. In today's global knowledge economy, higher education institutions are increasingly expected to shift from traditional, locally focused approaches to more dynamic, innovation-driven models [55]. Ethiopian public universities face the challenge of enhancing both academic and managerial performance while responding to growing demands for accountability. Balzer [56] argues that measuring university performance should prioritize educational quality and research productivity, as these dimensions capture the institution's core contributions.

Intellectual capital (IC) is widely recognized as a critical asset for improving organizational performance across different sectors [6]. Universities, as centers of knowledge creation, are particularly suited for examining IC because their outputs—such as research publications, trained graduates, and collaborative initiatives—reflect the institution's intellectual capacity. Furthermore, public universities increasingly need to demonstrate their social and economic impact, often through partnerships with other academic institutions and global networks. Despite the clear benefits of IC, many universities have yet to fully exploit it as a tool for innovation and competitiveness [56].

In the higher education context, IC is commonly understood as comprising three interrelated dimensions: human capital, structural capital, and relational capital. Human capital encompasses the knowledge, skills, creativity, problem-solving abilities, and intellectual agility of the university workforce. Research consistently shows that human capital is closely linked to organizational performance, as the competencies of staff influence the efficiency of academic processes, quality of teaching, and research outputs [57]. In universities, investing in academic personnel and research activities is essential for generating and disseminating knowledge [58].

Structural capital refers to the systems, processes, and organizational infrastructure that support the storage, sharing, and utilization of knowledge. It ensures that intellectual resources remain within the institution and are effectively applied to achieve its objectives, even when individual employees depart. Relational capital represents the university's external networks and partnerships, including relationships with students, other institutions, industry stakeholders, and government agencies. These relationships facilitate knowledge exchange, collaborative research, and access to additional resources, ultimately strengthening institutional performance.

The interplay of human, structural, and relational capital forms the foundation of IC in universities, enabling them to innovate, adapt to changing environments, and maintain competitiveness. Studies indicate that the effective management and strategic deployment of IC components are closely associated with enhanced teaching quality, research productivity, and overall institutional success. By nurturing intellectual capital across these dimensions, universities can build sustainable competitive advantages while meeting the evolving demands of the knowledge economy.

Structural capital, as a fundamental dimension of intellectual capital, refers to the institutional systems, policies, organizational frameworks, and resources that support the efficient functioning of an organization [59]. It provides the necessary infrastructure that allows employees to transform their knowledge into productive outcomes, facilitating innovation, creativity, and enhanced performance. In higher education, structural capital is particularly important as it underpins teaching, research, and professional development activities, ensuring institutions can maintain high academic standards and cultivate future leaders [60]. The effectiveness of human capital is closely tied to the robustness of these structural elements, as well-designed systems enable knowledge to be captured, organized, and applied effectively.

Relational capital, the third component of intellectual capital, concerns the quality and strength of an institution's external relationships and the knowledge exchanges these relationships enable [61]. Universities increasingly rely on relational capital not only to expand their academic and research collaborations but also to generate additional income through consulting, training, and other services beyond tuition fees. Establishing and maintaining strong partnerships with industry, government bodies, and other educational institutions enhances institutional sustainability and overall performance [12]. Relational capital thus acts as a bridge between internal knowledge resources and the external environment, facilitating both influence and learning from stakeholders.

Intellectual capital has been shown to play a significant role in strengthening the impact of knowledge-based human resource management practices on organizational outcomes. Practices such as targeted recruitment, specialized training, performance assessments, and knowledge-linked compensation can develop intellectual capital, which in turn supports institutional performance. Prior research indicates that these HRM activities enhance human capital while leveraging structural and relational resources to maximize innovation and productivity [1, 62]. In universities, for example, robust structural systems and well-managed external partnerships help faculty apply their expertise more effectively, thereby improving institutional results [63].

The relationship between IC and HRM practices is mutually reinforcing. Well-established IC creates an environment in which knowledge-focused HRM initiatives can thrive, while these HRM practices further strengthen intellectual capital. Performance evaluation systems and compensation structures that are aligned with knowledge management goals encourage employees to contribute actively to knowledge creation and dissemination, enhancing overall organizational capacity. This synergy is particularly critical in knowledge-intensive contexts such as higher education, where human expertise and external networks play a pivotal role in advancing teaching, research, and institutional services [64, 65].

Despite the insights from prior research, most studies focus on developed countries with well-resourced universities and treat IC as a single, uniform construct. This approach overlooks contextual differences in resource-limited environments, such as Ethiopian public universities, where financial constraints, outdated administrative procedures, and inconsistent policy frameworks can impede both HRM implementation and IC utilization. Furthermore, while the tripartite model of IC—comprising human, structural, and relational capital—is widely recognized, many studies fail to examine the distinct contribution of each component within specific academic contexts. For example, human capital may be more influential in driving research outcomes, while structural capital might be key to improving administrative efficiency and knowledge management.

To address these gaps, this study investigates the individual effects of IC components on university performance and their interplay with knowledge-based HRM practices in resource-constrained settings. This approach provides a more nuanced understanding of how universities can strategically invest in and manage intellectual capital to achieve institutional objectives. Based on this discussion, the study formulates the following hypotheses: H2 posits a general relationship between intellectual capital and university performance, while H2a, H2b, and H2c examine the specific contributions of human, structural, and relational capital, respectively. Evidence from previous studies supports the importance of effective HRM practices, such as recruitment and selection, in attracting and retaining talented personnel, which in turn enhances institutional performance [66, 67].

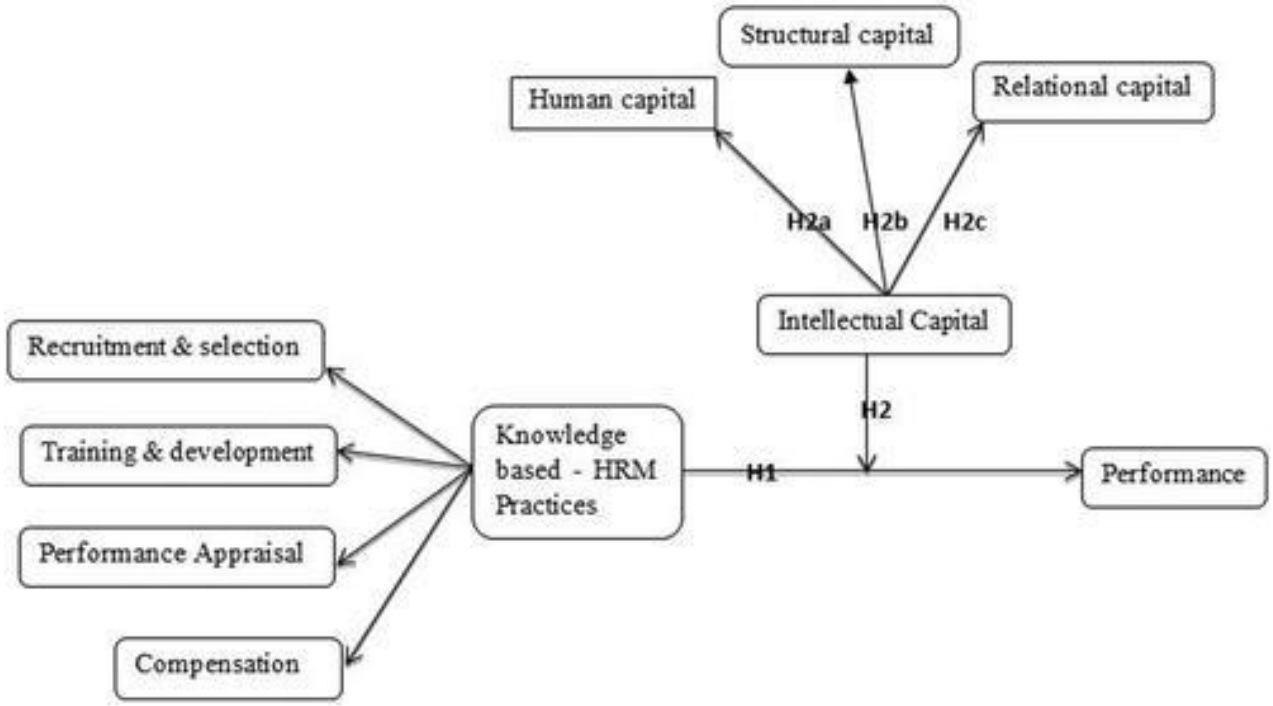

Figure 1. Conceptual framework of the study

Knowledge-based human resource practices play a crucial role in enhancing the components of intellectual capital. Strategic recruitment and selection contribute to the development of human capital by attracting employees who possess the necessary skills and expertise to foster innovation and maintain competitive advantage [36]. HRM policies that establish clear organizational structures, routines, and processes help strengthen structural capital, supporting efficiency and operational effectiveness. Additionally, fostering partnerships and external networks enhances relational capital, facilitating knowledge sharing and collaborative initiatives. When implemented effectively, knowledge-based HRM practices integrate these elements of intellectual capital, promoting outcomes beyond financial performance, including innovation, sustainability, and long-term organizational success [68].

Materials and Methods

Research design, approach, and method

This study adopted an explanatory research design to evaluate the influence of knowledge-based human resource practices on university performance. Explanatory research is intended to identify causal links between independent and dependent variables, as well as to explore the relationships among the independent variables themselves [69].

A quantitative research approach was employed, given its suitability for determining the variables that affect outcomes, assessing the effectiveness of interventions, and identifying key predictors of performance. Quantitative methods are particularly effective for testing theoretical frameworks and hypotheses [70]. The study followed a post-positivist paradigm, which assumes that outcomes are influenced by identifiable causes. This perspective emphasizes reductionism, breaking complex phenomena into measurable variables suitable for empirical testing, such as those specified in the study's research questions and hypotheses.

The data were collected using a cross-sectional survey design. This method enables the measurement of theoretical constructs at a single point in time, allows for timely data collection, and facilitates rigorous statistical analysis to identify patterns and relationships among variables.

Population and sampling

The target population included all academic staff from four public universities in the Amhara regional state of Ethiopia, with one university selected from each of the four generational cohorts based on their establishment period. This selection strategy was designed to account for potential differences in intellectual capital, particularly structural and relational components, as well as their possible influence on institutional performance.

Stratified sampling was used to select the universities according to their generational cohort, and the final universities were chosen based on geographic accessibility for the research team. Administrative staff were excluded, as the study focused primarily on academic personnel who drive the core teaching and research functions. The sample size was determined using Yamane's formula, as referenced by Muyembe Asenahabi and Anselemo Ikoha [71], with a 95% confidence level and a 5% margin of error.

The formula is as follows:

$$n = \frac{N}{1 + N\,(e)^{\,2}} = \frac{5994}{1 + 5994(0.05)^{\,2}} = 375 \quad (1)$$

where n is the sample size, N is the population size that is equal to 5994 and e is the sampling error/level of precision.

Once the total sample size was established, a proportional sampling method was applied to distribute participants across the selected universities according to the actual size of their academic staff. This approach ensured that each university contributed a sample reflecting its staff population, as illustrated in **Table 1**, with the number of respondents for each institution aligned proportionally to its workforce.

Table 1. Sample size determination.

S.No.	Name of the university	Total number of academic staff	Proportional sample drawn	
			Percentage	Sample
1	Bahir-Dar University	2507	0.42	157
2	Debre-Markos University	1586	0.26	99
3	Debre-Tabor University	1341	0.23	84
4	Injibara University	560	0.09	35
	Total	5994	1.00	375

Source: SPSS output, 2024.

After determining the sample size for each university, the researchers applied a convenience sampling method to collect the required data from accessible participants who were willing to engage in the study. This method facilitated efficient and timely data collection from respondents readily available during the research period.

Type and source of data

The study utilized both primary and secondary data to ensure comprehensive and relevant information. Primary data were obtained directly from academic staff at the selected universities through a structured questionnaire. Secondary data were drawn from scholarly articles, books, and institutional records, including non-financial performance indicators such as publications, authored books, and technological innovations.

Ethics approval

The research, titled "Knowledge-based Human Resource Management Practices and Organizational Performance in Selected Universities of Amhara Regional State, Ethiopia: The Moderating Effect of Intellectual Capital," was classified as low-risk and adhered to ethical standards to safeguard participants' rights. Informed consent was obtained from all participants,

ensuring voluntary participation with the option to withdraw at any stage without any consequences. The study's design included measures to protect participant privacy, including anonymization of responses and restricted access to sensitive information. Data were stored and managed in accordance with both institutional and international data protection regulations. The study received formal approval from the Ethics Committee of Injibara University under registration number IU/IRERC/06/24.

Consent for participation

The researchers initiated the process by submitting a cooperation letter to the office of the academic vice president at the selected universities. Following this, the vice president notified college deans, who then informed department heads about the planned data collection. The researchers directly approached faculty members to explain the study's objectives and emphasize voluntary participation. Participants provided verbal consent before completing the questionnaires. Additionally, the introductory page of the questionnaire requested written confirmation of their willingness to participate. It also informed participants that the study findings would be published, assured confidentiality, outlined their rights, reiterated the voluntary nature of participation, and guaranteed anonymity.

Method of data analysis

The collected data were analyzed using both descriptive and inferential statistical techniques. Multiple linear regression analysis was employed to examine the relationships between independent and dependent variables and to assess the moderating effect of intellectual capital. This method allowed for a clear interpretation of the findings and the identification of significant predictors of university performance.

Multiple regression analysis accounted for the inter-correlations among all variables involved in the study, providing a comprehensive understanding of their relationships.

The regression equation was:

$$Y = \beta_0 + \beta X1 + \beta X2 + \beta X3 + \beta X4 + \beta X5 \quad (2)$$

where Y represents the universities' performance, B0 is the intercept of the regression model, X1 stands for recruitment and selection, X2 denotes training and development, X3 refers to performance appraisal, X4 indicates compensation, and X5 represents intellectual capital, acting as a moderator.

Results and Discussion

Survey research typically considers a 50% response rate acceptable, 60–70% as satisfactory, and anything above 70% as excellent [72]. In this study, out of 375 questionnaires distributed to academic staff, 364 were returned completed, resulting in an exceptionally high response rate of 97.06%, indicating strong engagement from participants.

Reliability of the instrument

The reliability of the questionnaire was evaluated to ensure that the items consistently measured the intended constructs. Cronbach's Alpha was used as the measure of internal consistency, yielding a value of 0.804. This surpasses the generally accepted threshold of 0.7 [73], indicating that the instrument is highly reliable.

To confirm validity, the questionnaire underwent content validation through consultation with specialists in higher education and intellectual capital. Their feedback was used to refine the items, ensuring they accurately reflected the research objectives and were relevant to the respondents. These steps confirm that the instrument was both reliable and valid, providing a trustworthy basis for subsequent data analysis. The results of the reliability test are presented in **Table 2**.

Table 2. Results of the reliability test.

Variables of the study	No. of items included	Cronbach's Alpha value	Decision
Recruitment and selection	6	0.849	Acceptable
Training and development	7	0.833	Acceptable
Performance appraisal	6	0.785	Acceptable
Compensation	5	0.810	Acceptable
Human capital	8	0.755	Acceptable
Structural capital	7	0.932	Acceptable
Relational capital	7	0.846	Acceptable
Performance of the university	9	0.804	Acceptable

Source: SPSS output, 2024.

Diagnostic tests

Before applying multiple linear regression, it is necessary to verify that key assumptions are met to ensure the validity of the analysis [74]. In this study, the main assumptions examined were normality, linearity, and homoscedasticity. The data were assessed to confirm these conditions prior to conducting the full regression analysis. The outcomes of these diagnostic checks, including tests for normal distribution **(Figure 2)**, linear relationships **(Figure 3)**, and equal variance of residuals (homoscedasticity, **Figure 4**), are presented in the appendix. Results indicate that all assumptions required for multiple linear regression were satisfactorily met, validating the suitability of the dataset for subsequent analysis.

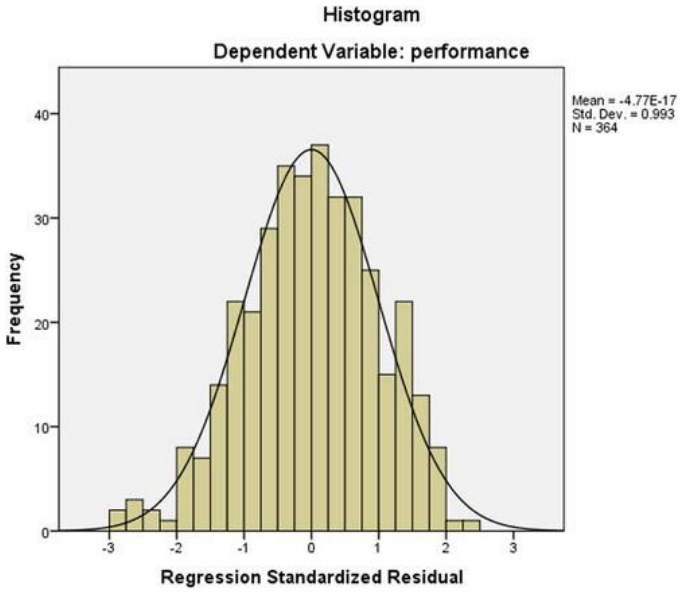

Figure 2. Histogram of regression standardized residuals

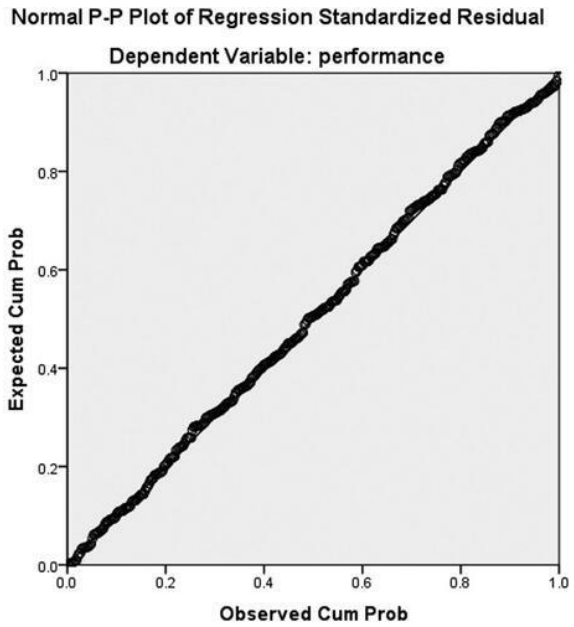

Figure 3. Normal P–P plot of regression standardized residuals

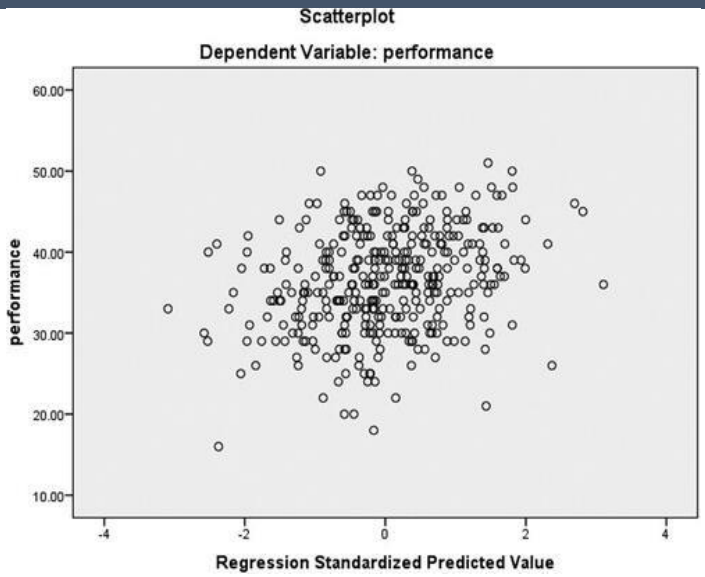

Figure 4. Scatterplot of regression standardized predicted values

Multiple linear regression analysis and hypothesis testing

This study employed inferential statistical techniques to analyze the relationships among variables. Specifically, multiple regression and correlation analyses were used to determine both the strength and significance of the effects of independent variables on the dependent variable [75]. This approach allowed for a detailed examination of how individual HRM practices influence university performance and the extent to which intellectual capital (IC) moderates these effects.

Data collected from academic staff at the selected universities were analyzed to assess both faculty and institutional performance. In this framework, knowledge-based HRM practices—recruitment and selection, training and development, performance appraisal, and compensation—served as the independent variables, while non-financial university performance acted as the dependent variable. The moderating role of IC was also incorporated, with its three dimensions—human capital, structural capital, and relational capital—considered separately and collectively to evaluate their influence.

Based on the study's hypotheses and conceptual framework, IC was hypothesized to moderate the relationship between HRM practices and university performance. To examine this, five models were analyzed:

Model 1 assessed the direct impact of HRM practices on university performance, exploring how recruitment, training, performance appraisal, and compensation individually contribute to non-financial outcomes.

Model 2 focused on the moderating role of human capital, evaluating how the knowledge, skills, and abilities of academic staff affect the efficacy of HRM practices in enhancing performance.

Model 3 examined structural capital as a moderator, investigating how organizational systems, procedures, and culture influence the effectiveness of HRM interventions.

Model 4 evaluated relational capital, considering how external relationships and networks with stakeholders impact the performance outcomes resulting from HRM practices.

Model 5 tested the combined moderating effect of all three IC components, providing insights into how the collective influence of human, structural, and relational capital shapes the impact of HRM practices on university performance.

The regression results **(Table 3)** indicate that the four HRM practices collectively account for 51.6% of the variance in university performance. This suggests that over half of the non-financial performance outcomes can be explained by recruitment, training, appraisal, and compensation, while the remaining 48.4% of performance is influenced by factors outside the scope of this study.

Table 3. Model summary-1

Model	*R*	*R*-square	Adjusted *R*-square	Std. error of the estimate	Change statistics					Durbin–Watson
					R-square change	*F* change	df1	df2	Sig. *F* change	
1	0.755a	0.570	0.516	6.25460		2.223	4	359	0.003	
2	0.825b	0.680	0.637	6.17829	0.126	9.922	1	358	0.002	1.436

Source: SPSS output, 2024.

[a]Predictors: (Constant), training, recruitment, appraisal, compensation.

[b]Predictors: (Constant), training, recruitment, appraisal, compensation [Moderating: human capital].

In Ethiopian higher education institutions, knowledge-based HRM practices have a critical influence on organizational performance. Given the limited resources and rapidly changing educational environment in Ethiopia, the findings indicate

that universities can improve their outcomes by emphasizing strategic recruitment, continuous professional development, equitable performance evaluations, and competitive compensation packages. This also highlights the importance of aligning HRM initiatives with both national higher education policies and the universities' own strategic objectives to achieve sustainable performance improvements. Accordingly, the study's first hypothesis (H1: HRM practices have a significant and positive effect on university performance) is supported.

The second hypothesis (H2) suggests that human capital positively moderates the relationship between HRM practices and university performance. As shown in **Table 3**, human capital indeed acts as a moderating factor. Incorporating human capital into the analysis enhances the impact of HRM practices on university performance. Specifically, the combined effect of HRM practices and human capital explains about 63.7% of the variance in performance outcomes. The R-square change value of 0.26 further confirms that human capital has a significant positive moderating effect. Therefore, it can be concluded that human capital strengthens the link between HRM practices and non-financial performance in the target universities.

This result underscores the pivotal role of human capital in the Ethiopian higher education context. Universities that invest in faculty expertise, ongoing professional development, and skill enhancement can better leverage HRM strategies to achieve superior performance. The additional 26% improvement attributed to human capital highlights the value of fostering talent development, knowledge sharing, and continuous learning. Consequently, hypothesis H2a, which posits that human capital positively moderates the relationship between HRM practices and university performance, is confirmed.

Table 4 presents the effect of structural capital on the relationship between HRM practices and non-financial performance. While the direct impact of HRM practices remains consistent with the previous model, incorporating structural capital as a moderator produces notable changes. In this model, the adjusted R-square increases from 51.6% (Model 1) to 62.3%, with an R-square change of 0.91. This indicates that structural capital significantly enhances the effect of HRM practices on university performance, confirming that well-developed organizational systems, processes, and infrastructure are essential for maximizing the effectiveness of HRM strategies in Ethiopian HEIs.

Table 4. Model summary-2

Model	*R*	*R*-square	Adjusted *R*-square	Std. error of the estimate	Change statistics					Durbin–Watson
					R-square change	*F* change	df1	df2	Sig. *F* change	
1	0.755a	0.570	0.516	6.25460		2.223	4	359	0.003	
2	0.789b	0.623	0.532	6.17829	0.091	9.922	1	358	0.040	1.415

Source: SPSS output, 2024.

[a]Predictors: (Constant), training, recruitment, appraisal, compensation.

[b]Predictors: (Constant), training, recruitment, appraisal, compensation [Moderating: structural capital].

Structural capital is a key factor that enhances how HRM practices affect the performance of universities in Ethiopia. The analysis shows that when structural capital is considered, the explanatory power of HRM practices rises from 51.6% to 62.3%. This indicates that institutions with well-defined administrative systems, effective knowledge management routines, a supportive organizational culture, and modern technological tools are better able to translate HRM initiatives into measurable performance gains. Essentially, strong structural capital provides the foundation for HRM strategies to achieve long-lasting results. Based on these findings, hypothesis H2b—that structural capital positively moderates the relationship between HRM practices and university performance—is supported.

The impact of relational capital was also examined. **Table 5** presents the direct effects of HRM practices and the influence of relational capital as a moderating factor. Initially, recruitment, training, appraisal, and compensation explained 51.6% of variation in university performance (Model 1), indicating a significant relationship ($p = 0.03$). When relational capital is included as a moderator (Model 2), the adjusted R-square rises to 63.1%, suggesting that relational capital strengthens the link between HRM practices and institutional performance. This effect is statistically significant ($p = 0.01$), confirming that external relationships, collaborations, and stakeholder networks enhance the effectiveness of HRM initiatives.

However, developing relational capital in Ethiopian higher education faces obstacles. Limited financial resources restrict opportunities to establish partnerships, while strict regulatory frameworks hinder external engagement. In addition, universities often have minimal experience leveraging these networks effectively. Overcoming these challenges by fostering professional collaborations, engaging stakeholders more actively, and introducing flexible policies could enable institutions to fully utilize HRM practices and achieve sustainable improvements. Therefore, hypothesis H2c—that relational capital positively moderates the effect of HRM practices on university performance—is validated.

Table 5. Model summary-3

Model	*R*	*R*-square	Adjusted *R*-square	Std. error of the estimate	Change statistics					Durbin–Watson
					R-square change	*F* change	df1	df2	Sig. *F* change	

1	0.755a	0.570	0.516	6.25460		2.223	4	359	0.003	
2	0.836b	0.698	0.631	6.17829	0.081	9.922	1	358	0.001	1.479

Source: SPSS output, 2024.

[a]Predictors: (Constant), training, recruitment, appraisal, compensation.

[b]Predictors: (Constant), training, recruitment, appraisal, compensation [Moderating: relational capital].

Table 6 provides a summary of the overall regression model used in this study. In the first model, the R-square value of 0.570 indicates that HRM practices account for 57% of the observed variation in the performance of the selected universities. The remaining 43% of performance differences are explained by factors outside the scope of this study. The results further reveal that all examined HRM practices—including recruitment and selection, training and development, performance appraisal, and compensation—have a significant impact on the non-financial performance of higher education institutions in the Amhara regional state. This relationship is statistically significant, as indicated by a p-value of 0.03, which falls below the 0.05 threshold.

Table 6. Model summary (cumulative)

Model	*R*	*R*-square	Adjusted *R*-square	Std. error of the estimate	Change statistics			Durbin–Watson
					R-square change	*F* change	Sig. *F* change	
1	0.755a	0.570	0.516	6.25460		2.223	0.003	
2	0.884b	0.781	0.707	6.09568	0.197	7.321	0.000	1.459

Source: SPSS output, 2024.

[a]Predictors: (Constant), training, recruitment, appraisal, compensation.

[b]Predictors: (Constant), training, recruitment, appraisal, compensation [Moderating: intellectual capital].

In Model 2, the analysis incorporates intellectual capital (IC) as a moderating variable to examine its influence on the relationship between HRM practices and the non-financial performance of the target universities. The moderating effect of IC is reflected in key indicators, including R-square, adjusted R-square, ΔR^2, and the significance of the F-change. Compared with Model 1, which only assessed the direct impact of HRM practices on performance, the explanatory power of the independent variables increased from 51.6% to 70.7%. This indicates that approximately 70% of variations in university performance can be attributed to the combined influence of HRM practices and IC, leaving 30% explained by other factors not included in the model.

The ΔR^2 value represents the increase in the proportion of variance explained when a new variable, such as IC, is added to the regression model. A larger ΔR^2 suggests that the added variable provides substantial explanatory value. According to Rights and Sterba [76], ΔR^2 values between 0.01 and 0.05 denote a small effect, values from 0.06 to 0.10 indicate a moderate effect, 0.11 to 0.20 reflect a substantial effect, and values above 0.20 suggest a strong effect. Even small increases in ΔR^2 can hold theoretical significance, especially in complex models where subtle moderating effects are expected. In this study, the ΔR^2 of 0.197 implies that IC contributes an additional 19.7% to the explanation of variance in university performance, representing a substantial moderating effect and underscoring its critical role in enhancing the predictive power of the model. The Durbin–Watson statistic was calculated to assess the presence of autocorrelation in the regression residuals. This statistic ranges from 0 to 4, with values near 2 indicating no autocorrelation, values below 2 suggesting positive autocorrelation, and values above 2 indicating negative autocorrelation. The computed value of 1.459 points to a mild positive autocorrelation among the variables, including IC. Nonetheless, IC was found to significantly and positively moderate the relationships between HRM practices and university performance, with a p-value of 0.000.

Table 7 presents the unstandardized regression coefficients (B) for each independent variable in Model 1, representing the change in the dependent variable resulting from a one-unit change in the independent variable while holding other variables constant. These coefficients demonstrate that fluctuations in HRM practices are directly associated with variations in the non-financial performance of the target universities, providing insight into the strength and direction of each relationship.

Table 7. Regression analysis of unstandardized coefficient.

	Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.
		B	Std. error	Beta		
1	(Constant)	32.549	1.510		21.555	0.000
	Recruitment	0.070	0.143	0.032	0.601	0.062
	Compensation	0.187	0.166	0.122	1.125	0.001
	Appraisal	0.116	0.077	0.123	1.505	0.004
	Training	0.142	0.145	0.124	0.983	0.002
2	(Constant)	25.159	2.233		11.269	0.000
	Recruitment	0.121	0.131	0.067	0.922	0.000
	Compensation	0.327	0.163	0.083	0.779	0.001

Appraisal	0.266	0.076	0.069	0.862	0.005
Training	0.275	0.143	0.031	0.245	0.002
Intellectual capital	0.252	0.057	0.239	4.404	0.000

Source: SPSS output, 2024.

A regression coefficient of zero would indicate that changes in an independent variable do not systematically affect the dependent variable, meaning there is no linear relationship between the two. In this study, compensation emerged as the strongest predictor of university performance, with a B value of 0.187. Training follows with 0.142, performance appraisal at 0.116, and recruitment and selection at 0.070. Together, compensation and training account for about one-third of the variation in performance, while recruitment and appraisal explain the remaining portion.

The standardized beta values show how much each HRM practice contributes relative to the others. They reflect how much performance changes with a one-standard-deviation increase in each HRM variable, while keeping all other factors constant. The results indicate that all four HRM practices positively relate to performance, but only recruitment and selection was not statistically significant ($p > 0.05$).

When intellectual capital (IC) is included as a moderator, the regression equation becomes:

Performance = 25.159 + 0.121 (Recruitment) + 0.327 (Compensation) + 0.266 (Appraisal) + 0.275 (Training) + 0.252 (Intellectual Capital)

This equation shows how each HRM practice, along with IC, contributes to predicting the performance of the universities. Including IC in the model increases the explanatory power by about 25%, showing that IC strengthens the effect of HRM practices on performance. This supports the hypothesis that IC moderates the HRM–performance relationship.

Discussion

HRM practices and university performance

Training and development showed a clear positive effect on performance ($\beta = 0.275$, $p = 0.002$). Well-designed training programs improve teaching, research skills, and overall faculty engagement. They also encourage collaboration and adaptability to changes in the academic environment. In essence, investing in training equips staff to perform better, which benefits both the faculty and the university. Similar trends were reported in studies of universities in Palestine [77] and Jordan [78]. The impact of HRM practices can vary depending on local culture and the institutional environment [79].

Compensation also had a positive effect ($\beta = 0.327$, $p = 0.001$). This indicates that rewarding faculty for their contributions can boost performance. Previous studies support this link between pay and productivity [80, 81]. Yet, the impact of compensation may be limited in some academic settings, where intrinsic factors such as professional growth, recognition, and career development can play a bigger role. For instance, in Nigerian and European universities, non-monetary incentives were often more influential than pay alone [82-84].

This demonstrates that in universities, while financial rewards matter, supporting faculty development and recognizing contributions are equally, if not more, important in improving performance.

The results in **Table 7** indicate that performance appraisal practices in the target universities positively influence overall institutional performance. When academic staff receive well-structured evaluations based on clear and fair criteria, it allows for identifying and addressing performance gaps. This contributes to a 26.6% improvement in institutional outcomes. Supporting this, Shawn [85] found that constructive feedback through performance appraisals can motivate employees and enhance their performance in academic settings. Valluvan [86] similarly noted that effective appraisal systems improve productivity and job satisfaction. Kabwe [87] also highlighted that regular feedback boosts engagement and performance across multiple organizational contexts, including education.

However, some research suggests that appraisals can have negative effects if poorly executed. Rosyafah and Pudjowati [67] argued that perceived unfairness or bias in appraisal systems can lower morale and motivation. Neher and Maley [88] also emphasized that without genuine feedback, performance appraisals may fail to improve outcomes, leading to dissatisfaction among staff.

Regarding recruitment and selection, **Table 7** shows a positive and significant effect on academic staff performance ($\beta = 0.121$, $p = 0.000$). Ngoye Laetitia [89] supports this, reporting that careful hiring practices ensure the right candidates are chosen, enhancing performance. Lawal *et al.* similarly noted that structured recruitment equips new staff to meet job demands effectively. Yet, Mugambi and Omuya [90] argue that recruitment alone is insufficient if organizational support and culture are weak. Anitha [91] also suggested that without adequate training and onboarding, recruitment has limited impact, highlighting the importance of complementary HR practices. These findings underline that context and support systems shape how recruitment and selection influence performance.

The moderating role of intellectual capital (IC) was also confirmed. IC strengthened the relationship between HRM practices and non-financial university performance, with a β value of 0.252, indicating approximately a 25% enhancement when IC is

considered. Kianto *et al.* [1] showed that IC promotes knowledge sharing and innovation, increasing the effectiveness of HRM practices. Similarly, Sokolov and Zavyalova [92] found that combining knowledge-based HRM with IC improves organizational capabilities and overall performance.

However, some studies report mixed results. Aboramadan [77] noted that in certain institutions, IC may not significantly boost the HRM–performance link, with factors like institutional culture and external conditions playing a larger role. Scafarto *et al.* [93] also highlighted that IC's impact varies across sectors, implying its moderating effect may be weaker in higher education compared to other industries. These contrasting findings suggest that while IC can enhance HRM effectiveness, its influence is context-dependent and shaped by institutional and environmental factors.

Key findings

This study explored the influence of HRM practices on the performance of higher education institutions (HEIs) in Ethiopia's Amhara region. The findings reveal that recruitment practices in the target universities often lack innovative approaches, such as stress assessments or advanced selection techniques. Compensation is linked to work output but generally falls below market standards, potentially reducing staff motivation, engagement, and productivity. Performance appraisals help monitor staff activities and guide corrective actions, yet employees report receiving limited feedback, counseling, or post-appraisal training. Similarly, the training programs offered fail to introduce new ideas or practical methods for improving job performance, exposing a gap between appraisal outcomes and staff development. Addressing this gap with improved feedback and targeted, innovative training could enhance both individual and institutional productivity.

Regarding human capital, staff possess the necessary skills and experience but often lack motivation and innovation for proactive problem-solving. This suggests a need for universities to create initiatives that boost engagement, expand skill development opportunities, and cultivate a culture of creativity. Statistically, HRM practices significantly and positively affect university performance. Among these practices, compensation has the most substantial impact, whereas recruitment shows the least effect and is not statistically significant at the 95% confidence level. The study also highlights that intellectual capital (IC) significantly strengthens the link between HRM practices and performance. Its components—human, structural, and relational capital—enhance the effectiveness of HR strategies, emphasizing the importance of combining robust HR practices with strong IC to achieve higher institutional performance.

Recommendations

Based on the findings, the study proposes several recommendations to improve the non-financial performance of HEIs in Amhara and similar regions:

Strategic recruitment is vital for building a capable workforce. Universities should prioritize hiring candidates who align with institutional values and promote diversity, enhancing human capital by bringing in varied expertise and perspectives. This diversity can foster innovation and strengthen intellectual capital overall.

Post-recruitment, universities should implement training programs tailored to the needs of academic staff, addressing both technical and soft skills. Training plans should be informed by performance appraisal results or identified gaps. Encouraging a culture of continuous learning through workshops, seminars, and online courses ensures staff remain up-to-date on best practices and innovations in teaching, research, and administration, ultimately enhancing institutional effectiveness.

Performance appraisals should go beyond routine evaluations. Universities should assess not only academic output but also contributions to team projects, research, innovation, and community engagement. Providing regular feedback will improve communication, ensure alignment with strategic objectives, and support staff development.

Compensation systems should reward both individual and collective achievements, including research contributions and community engagement. Regularly reviewing pay scales against cost-of-living changes ensures competitiveness and helps retain top talent. Aligning incentives with performance across multiple dimensions encourages a culture of excellence and commitment.

Finally, universities should invest in human and relational capital by promoting mentorship, knowledge sharing, and professional growth opportunities. Building partnerships with other institutions, industry, and community organizations can enhance relational capital. Adequate infrastructure—labs, technology resources, and innovation centers—is also essential to support both immediate and long-term goals. Focusing on these areas will strengthen the overall institutional framework and improve university performance while advancing strategic objectives.

Implications of the study

Theoretical implications

This study contributes to management research by clarifying the relationship between HRM practices and institutional performance in higher education. It extends existing theory by showing how intellectual capital (IC) can moderate this relationship, emphasizing its importance in improving organizational outcomes. Additionally, the findings highlight the need

for theoretical models that consider the interaction between skill development, motivation, and performance, offering a foundation for future research focused on enhancing academic staff capabilities and institutional effectiveness.

Practical implications

The findings provide actionable insights for HEI administrators, particularly in developing contexts like Ethiopia. Universities can improve recruitment by designing focused campaigns to attract talent aligned with institutional goals and values. Performance appraisal systems should be updated with role-specific templates and metrics that capture contributions to research, innovation, and other IC elements. Compensation strategies should be aligned with industry benchmarks to boost motivation and staff retention.

In resource-constrained environments, implementing knowledge-driven HRM practices may be challenging. Cost-effective strategies can help, such as using online platforms for training, forming partnerships with international academic networks, and establishing mentorship programs to develop in-house expertise. Non-monetary incentives—recognition programs, career development opportunities, and flexible working arrangements—can further enhance engagement despite budget limitations.

To address training gaps, universities should implement needs-based programs informed by regular skills assessments, targeting emerging trends, research methods, and technology integration in teaching. Continuous feedback and performance evaluation, such as a 360-degree system involving students, peers, and supervisors, can provide a complete picture of faculty development needs.

Performance appraisals should extend beyond teaching to include research, community engagement, and mentorship. Developing a multidimensional evaluation framework ensures comprehensive assessments. Encouraging knowledge-sharing through mentorship programs and collaborative research groups will foster professional growth and strengthen intellectual capital.

Finally, partnerships with industry and community organizations can enhance relational capital, providing faculty with additional resources and growth opportunities. Joint research projects, internships, and guest lectures can ensure faculty remain current with academic and industry developments. Collectively, these strategies can improve both faculty performance and institutional outcomes.

Limitations and future research

Despite its contributions, this study has limitations. It focused on four public universities in the Amhara region, with a sample of 362 academic staff, representing a small proportion of Ethiopian HEIs. Future research should expand the sample size and geographic scope and include private institutions to improve generalizability.

Methodologically, this study relied on quantitative surveys. Future studies could incorporate qualitative methods, such as interviews or focus groups, to gain deeper insights into HRM practices and IC dynamics.

Originality

The study is unique in examining how knowledge-based HRM practices interact with IC to influence university performance in Ethiopia, where non-financial indicators are critical. While prior research mainly focused on corporate settings, this work highlights the role of IC—specifically human, structural, and relational capital—in higher education. By integrating these elements into the analysis, the study offers a nuanced understanding of how universities can leverage intangible assets to enhance performance. The use of a large-scale survey and stratified sampling strengthens its empirical contribution, providing context-specific insights relevant for both scholars and HEI leaders in emerging economies.

Acknowledgments: The authors extend their sincere gratitude to all who contributed to this study. Their valuable insights, support and encouragement were instrumental in bringing this research to fruition. Special thanks to their colleagues, participants and academic mentors for their unwavering guidance and assistance. Their contributions are deeply appreciated.

Conflict of interest: None

Financial support: None

Ethics statement: None

References

1. Kianto A, Sáenz J, Aramburu N. Knowledge-based human resource management practices, intellectual capital and innovation. J Bus Res. 2017;81:11-20.
2. Angelopoulos S, Bendoly E, Fransoo JC, Hoberg K, Ou C, Tenhiälä A. Digital transformation in operations management: Fundamental change through agency reversal. J Oper Manag. 2023;69(6):876-89.

3. Bhandari KR, Rana S, Paul J, Salo J. Relative exploration and firm performance: Why resource-theory alone is not sufficient? J Bus Res. 2020;118:363-77.
4. Anjani L, Fajri ML, Rohmatiati R, Alwi M. The strategic role of HR management in increasing the company's excellence and competitiveness. Indones J Multidiscip Sci. 2024;3(6).
5. Kapetaniou C, Lee SH. A framework for assessing the performance of universities: The case of Cyprus. Technol Forecast Soc Change. 2017;123:169-80.
6. Abualoush S, Masa'deh R, Bataineh K, Alrowwad A. The role of knowledge management process and intellectual capital as intermediary variables between knowledge management infrastructure and organization performance. Interdiscip J Inf Knowl Manag. 2018;13:279-309.
7. Mehralian G, Nazari JA, Ghasemzadeh P. The effects of knowledge creation process on organizational performance using the BSC approach: The mediating role of intellectual capital. J Knowl Manag. 2018;22(4):802-23.
8. Ramadan A, Safavi HP. Impact of strategic management practices on organizational performance: Empirical studies of selected firms in Libya. Adv Decis Sci. 2022;26(2):1-17.
9. Obeidat BY, Tarhini A, Masa'deh R, Aqqad NO. The impact of intellectual capital on innovation via the mediating role of knowledge management: A structural equation modeling approach. Int J Knowl Manag Stud. 2017;8(3/4):273-98.
10. Mahmood T, Mubarik MS. Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. Technol Forecast Soc Change. 2020;160:120248.
11. Kloutsiniotis PV, Mihail DM, Gounioti S. The effects of transformational leadership and HRM practices on employee outcomes and productivity in the Greek hospitality industry during COVID-19. Employee Relat. 2023;45(3):653-76.
12. Keltu TT. The effect of human resource development practice on employee performance with the mediating role of job satisfaction among Mizan Tepi University's academic staff in Southwestern Ethiopia. Heliyon. 2024;10(8).
13. Mesfin S. The effect of servant leadership on the organizational citizenship behavior of instructors in public universities in Amhara region. Cogent Bus Manag. 2023;11(1):2288711.
14. Bekele TA, Cossa J, Barat S. Toward building strategic international university-society partnerships in Africa. Mod Africa Polit Hist Soc. 2022;9(2):82-115.
15. Jordão RVD, Novas JC. Information and knowledge management, intellectual capital, and sustainable growth in networked small and medium enterprises. J Knowl Econ. 2024;15(1):563-95.
16. Faggian A, Modrego F, McCann P. Human capital and regional development. Handbook of regional growth and development theories2019. p. 149-71.
17. Kim S, Wang Y, Boon C. Sixty years of research on technology and human resource management: Looking back and looking forward. Hum Resour Manag. 2021;60(1):229-47.
18. Arslan A, Cooper C, Khan Z, Golgeci I, Ali I. Artificial intelligence and human workers interaction at team level: A conceptual assessment of the challenges and potential HRM strategies. Int J Manpow. 2022;43(1):75-88.
19. Raffiee J, Byun H. Revisiting the portability of performance paradox: Employee mobility and the utilization of human and social capital resources. Acad Manag J. 2020;63(1):34-63.
20. Mohammed G, Hamid B, Fatiha ED. Inputs and outputs of higher education: A reading of the Algerian higher education system in the light of the knowledge index. Int J Prof Bus Rev. 2024;9(11):e05084.
21. Chowdhury M, Prayag G, Patwardhan V. The bright and dark sides of the relationship between relational capital and organizational resilience: The moderating role of human capital. Int J Hosp Tour Adm. 2024:1-31.
22. Abdirahman MD, Tarique R. Impact of structural capital and innovation capability on firm performance (Case study of Pharma industry in Karachi-Pakistan). Strateg J Bus Change Manag. 2020;7(1):736-48.
23. Ortiz B, Donate MJ, Guadamillas F. Inter-organizational social capital as an antecedent of a firm's knowledge identification capability and external knowledge acquisition. J Knowl Manag. 2018;22(6):1332-57.
24. Wanambiro RV. Influence of intellectual capital initiatives on value creation in universities in Kenya. JKUAT-COHRED; 2019.
25. de Matos Pedro E, Alves H, Leitão J. In search of intangible connections: Intellectual capital, performance and quality of life in higher education institutions. High Educ. 2022;83(2):243-60.
26. Budiarti I. Knowledge management and intellectual capital-a theoretical perspective of human resource strategies and practices. Eur J Econ Bus Stud. 2017;8(1):148.
27. Lewin D, Teece DJ. Human resource management strategy and practice: From individual motivation to dynamic capabilities. Handbook of research on strategic human capital resources2019. p. 183-97.
28. Al-Jinini DK, Dahiyat SE, Bontis N. Intellectual capital, entrepreneurial orientation, and technical innovation in small and medium-sized enterprises. Knowl Process Manag. 2019;26(2):69-85.
29. Abd-Elrahman AEH, Ahmed Kamal JM. Relational capital, service quality and organizational performance in the Egyptian telecommunication sector. Int J Emerg Mark. 2022;17(1):299-324.
30. Zioło K. Human capital as a essentials element of intellectual capital. Eur J Serv Manage. 2018;28(4/2):541-8.

31. Saeed BB, Afsar B, Hafeez S, Khan I, Tahir M, Afridi MA. Promoting employee's proenvironmental behavior through green human resource management practices. Corp Soc Responsib Environ Manag. 2019;26(2):424-38.
32. Farzaneh M, Wilden R, Afshari L, Mehralian G. Dynamic capabilities and innovation ambidexterity: The roles of intellectual capital and innovation orientation. J Bus Res. 2022;148:47-59.
33. Chen CHS, Liu G, Roushan G, Nguyen B. Exploring information technology capabilities from multiple aspects of the resource-based theory. Inf Syst Front. 2024:1-31.
34. Emegwa TJ. The management of cross and inter-functions in organizations: Integrative research findings, lessons learned, and new horizons for research. 2023.
35. Ferraris A, Mazzoleni A, Devalle A, Couturier J. Big data analytics capabilities and knowledge management: Impact on firm performance. Manag Decis. 2019;57(8):1923-36.
36. Gupta K. Impact of knowledge-based HRM practices on organizational performance: Mediating effect of intellectual capital. Int J Knowl Manag. 2021;18(1):1-22.
37. Haider SA, Akbar A, Tehseen S, Poulova P, Jaleel F. The impact of responsible leadership on knowledge sharing behavior through the mediating role of person–organization fit and moderating role of higher educational institute culture. J Innov Knowl. 2022;7(4):100265.
38. Idrees H, Haider SA, Xu J, Tehseen S, Jan N. Impact of knowledge management capabilities on organisational performance in construction firms: The mediating role of innovation. Meas Bus Excell. 2023;27(2):322-40.
39. Lei H, Khamkhoutlavong M, Le PB. Fostering exploitative and exploratory innovation through HRM practices and knowledge management capability: The moderating effect of knowledge-centered culture. J Knowl Manag. 2021;25(8):1926-46.
40. Acikgoz Y. Employee recruitment and job search: Towards a multi-level integration. Hum Resour Manag Rev. 2019;29(1):1-13.
41. Pandit JM, Paul B. Strategic human resource management in higher education. India Stud Bus Econ. 2023.
42. Stirpe L, Profili S, Sammarra A. Satisfaction with HR practices and employee performance: A moderated mediation model of engagement and health. Eur Manag J. 2022;40(2):295-305.
43. Soomro FA, Khan F. Impact of intellectual capital on sustainable organizational performance with mediating role of human resource and moderating role of employee engagement. Int J Bus Manag Sci. 2023;4(4):128-56.
44. Makri A, Vlachopoulos D, Martina RA. Digital escape rooms as innovative pedagogical tools in education: A systematic literature review. Sustainability. 2021;13(8):4587.
45. Aithal PS, Maiya AK. Development of a new conceptual model for improvement of the quality services of higher education institutions in academic, administrative, and research areas. Int J Manag Technol Soc Sci. 2023;8(4):260-308.
46. Alshammari AM, Alshammari FF, Thomran M, Altwaiji M. Integrating technological knowledge into higher education curricula: An essential measure for attaining sustainable development in Saudi Arabia. Sustainability. 2023;15(22):15956.
47. Khan MZ, Niqab M, Ali N. Analyzing the mediating effect of organizational citizenship behavior on the relationship between HRM practices and intellectual capital in educational settings in Pakistan. Pak J Humanit Soc Sci. 2023;11(1):21-37.
48. Tariq M, Akbar N. Upgrading human resources practices of manufacturing sector to sustainable green human resources practices in Pakistan. City Univ Res J. 2023;13(2):292-305.
49. Mehmood KK, Masood S, Hanaysha JR. A moderated model for the effect of human resource management strategy on organizational outcomes. Manag Labour Stud. 2023;48(4):457-77.
50. Camilleri MA. Using the balanced scorecard as a performance management tool in higher education. Manag Educ. 2021;35(1):10.
51. Buller JL. Best practices in faculty evaluation: A practical guide for academic leaders: John Wiley & Sons; 2012.
52. Andrew-Favour DC. Reward system on employees' commitment. 3rd International Conference on Institutional Leadership and Capacity Building in Africa2023. p. 847.
53. Hassan Z. Employee retention through effective human resource management practices in Maldives: Mediation effects of compensation and rewards system. J Entrep Manag Innov. 2022;18(2):137-73.
54. Rehman K, Khan MK, Khank A, Saadat UR, Khan FU. Does the working environment matter? The mediating influence of the working environment between compensation and employees' performance. Al-Qanṭara. 2023;9(4).
55. York TT, Gibson C, Rankin S. Defining and measuring academic success. Pract Assess Res Eval. 2019;20(1):5.
56. Balzer WK. Lean higher education: Increasing the value and performance of university processes: Productivity Press; 2020.
57. Pakurár M, Haddad H, Nagy J, Popp J, Oláh J. The service quality dimensions that affect customer satisfaction in the Jordanian banking sector. Sustainability. 2019;11(4):1113.

58. Alfawaire F, Atan T. The effect of strategic human resource and knowledge management on sustainable competitive advantages at Jordanian universities: The mediating role of organizational innovation. Sustainability. 2021;13(15):8445.
59. Edalatkhah Touli F, Doostar M, Mehrabi J. Presenting an interpretative structural model for promoting intellectual capital in the database of public organizations. Int J Knowl Process Stud. 2024;4(4):74-88.
60. Bucăţa G, Tileagă C. The role of human capital in the universities' management efficiency process. Land Forces Acad Rev. 2023;28(2):136-47.
61. Ganguly A, Talukdar A, Chatterjee D. Evaluating the role of social capital, tacit knowledge sharing, knowledge quality and reciprocity in determining innovation capability of an organization. J Knowl Manag. 2019;23(6):1105-35.
62. Rangus K, Černe M. The impact of leadership influence tactics and employee openness toward others on innovation performance. R&D Manag. 2019;49(2):168-79.
63. Kuzminov Y, Sorokin P, Froumin I. Generic and specific skills as components of human capital: New challenges for education theory and practice. Форсайт. 2019;13(2eng):19-41.
64. Giampaoli D, Sgrò F, Ciambotti M, Bontis N. Integrating knowledge management with intellectual capital to drive strategy: A focus on Italian SMEs. VINE J Inf Knowl Manag Syst. 2024;54(1):22-42.
65. Jordão RVD, Novas J, Gupta V. The role of knowledge-based networks in the intellectual capital and organizational performance of small and medium-sized enterprises. Kybernetes. 2020;49(1):116-40.
66. Martinson B, De Leon J. Testing horizontal and vertical alignment of HR practices designed to achieve strategic organizational goals. J Organ Effect: People Perform. 2018;5(2):158-81.
67. Rosyafah S, Pudjowati J. What are the key determinants of human resource management effectiveness in enhancing organizational financial performance? Atestasi: Jurnal Ilmiah Akuntansi. 2024;7(1):525-60.
68. Po HY, Ting IWK, Osman AA, Tan SY, Asif J. Investigating the relationship between human capital and organizational performance: Insights from the construction industry in Malaysia. Int J Ind Manage. 2024;18(3):152-65.
69. Benitez J, Henseler J, Castillo A, Schuberth F. How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research. Inf Manag. 2020;57(2):103168.
70. Maksimović J, Evtimov J. Positivism and post-positivism as the basis of quantitative research in pedagogy. Res Pedag. 2023;13(1):208-18.
71. Muyembe Asenahabi B, Anselemo Ikoha P. Scientific research sample size determination. Int J Sci Technoledge. 2023;11(7).
72. Customer Thermometer. Average survey response rate—what you need to know. Customer Thermometer; 2021.
73. Vaske JJ, Beaman J, Sponarski CC. Rethinking internal consistency in Cronbach's alpha. Leisure Sci. 2017;39(2):163-73.
74. Montgomery DC, Peck EA, Vining GG. Introduction to linear regression analysis: John Wiley & Sons; 2021.
75. Mertler CA, Vannatta RA, LaVenia KN. Advanced and multivariate statistical methods: Practical application and interpretation: Routledge; 2021.
76. Rights JD, Sterba SK. New recommendations on the use of R-squared differences in multilevel model comparisons. Multivar Behav Res. 2020;55(4):568-99.
77. Aboramadan M. The effect of green HRM on employee green behaviors in higher education: The mediating mechanism of green work engagement. Int J Organ Anal. 2022;30(1):7-23.
78. Bani-Hani J. The moderating influence of managers strategic thinking on the effect of talent management on organization core competency. Manag Sci Lett. 2021;11(1):213-22.
79. Abyaba FA, Achibane M. Influence of national and organizational culture on HRM practices in an international company: A conceptual model proposal. Int J Account Finance Audit Manag Econ. 2023;4(3-1):686-709.
80. Gerhart B, Fang M. Pay, intrinsic motivation, extrinsic motivation, performance, and creativity in the workplace: Revisiting long-held beliefs. Annu Rev Organ Psychol Organ Behav. 2015;2(1):489-521.
81. Jameel AS, Ahmad AR. Factors impacting research productivity of academic staff at the Iraqi higher education system. Int Bus Educ J. 2020;13(1):108-26.
82. Bagodi V, Bagodi V. Motivation of teachers in higher education: A private technical university in India. Int J High Educ Sustain. 2024;5(1):29-54.
83. Mabaso MC. The influence of rewards on job satisfaction and organizational commitment among academic staff at selected universities of technology in South Africa. 2017.
84. Ogbonnaya SC, Gambo N, Abubakar HS. Compensation administration and employee's performance among private universities in north central Nigeria. Int J Bus Manag Rev. 2024;12(5):39-70.
85. Shawn E. Efficacy of performance appraisal systems in enhancing employee engagement. Int J Human Resour. 2023;1(1):24-35.
86. Valluvan S. The impact of performance appraisal on employee motivation. Libr Prog Int. 2024;44(3):28972-8.

87. Kabwe N. Exploration of the perceptions of academic staff on performance appraisals in some selected private universities in Lusaka district, Zambia. The University of Zambia; 2024.
88. Neher A, Maley J. Improving the effectiveness of the employee performance management process: A managerial values approach. Int J Prod Perform Manag. 2019;69(6):1129-52.
89. Ngoye Laetitia NW. The effects of effective recruitment on organizational performance: A study of Njeiforbi Company, Buea-Cameroon. 2024.
90. Mugambi FN, Omuya J. Effect of recruitment and selection on employee's performance in public universities in Meru County, Kenya. Asian J Econ Bus Account. 2023;23(22):122-37.
91. Anitha J. Determinants of employee engagement and their impact on employee performance. Int J Prod Perform Manag. 2014;63(3):308-23.
92. Sokolov D, Zavyalova E. Human resource management systems and intellectual capital: Is the relationship universal in knowledge-intensive firms? Int J Manpow. 2021;42(4):683-701.
93. Scafarto V, Ricci F, Scafarto F. Intellectual capital and firm performance in the global agribusiness industry: The moderating role of human capital. J Intellect Cap. 2016;17(3):530-52.