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THE SIGNIFICANCE OF HUMAN RESOURCES IN IMPLEMENTING BUSINESS PROCESS MANAGEMENT APPROACHES IN CONSTRUCTION COMPANIES AMID INCREASING SUSTAINABILITY REQUIREMENTS

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Abstract. Purpose. The paper aims to substantiate the role of human resources in implementing business process management (BPM) approaches in construction companies under increasing sustainability requirements. **Methodology.** Business process management is considered an integrated managerial framework that combines process regulation, digital tools, and human resource practices to ensure operational efficiency and sustainable development. Particular attention is paid to integrating green HRM instruments with BPM, Lean, Six Sigma, BPR, Kaizen, TQM, Agile, and ERP approaches. **Findings.** It is determined that aligning HR practices with BPM enables systematic waste reduction, improved process transparency, the development of sustainability-oriented competencies, and support for digital transformation in construction companies. A stage-based model of HR impact on BPM is substantiated, covering identification, modelling, evaluation, optimisation, automation, and continuous monitoring of processes. **Practical value.** The results justify practical directions for integrating green HRM into process management to strengthen organisational adaptability, improve environmental and economic performance, and enhance the long-term competitiveness of construction companies.

Keywords: business process management, human resources, green HRM, construction companies, sustainability, process optimisation, digital transformation.

General statement of the problem and its connection with the most important scientific or practical tasks. In the current context, the growing requirements for the sustainable development of construction companies largely depend on how effectively human resources contribute to the management of business processes and how quickly the enterprise can adapt those processes to changes in the external environment, including the challenges of sustainable development. The operation of any organisation in the construction industry occurs through interconnected business processes, in which human resources play a key role in their coordination, control, and continuous improvement, taking into account ecological, social, and economic aspects. However, without a systematic influence of human resources on business process management, the likelihood of imbalance between departments, inefficient resource utilisation, missed project deadlines, and deterioration in the quality of work or services increases, complicating the achievement of sustainability principles, particularly reducing

waste and emissions in projects with high resource consumption and significant environmental impact.

Analysis of research on the problem. Recent research in the fields of HRM and BPM in construction emphasises integrating green HRM to achieve sustainability, especially in industries with high environmental impact [1–4]. A systematic review demonstrates that green HRM practices, such as green training and recruitment, reduce waste and increase productivity. Still, it points to the need for integration with BPM. On the other hand, it summarises the evolution of sustainable HRM, noting gaps in empirical evidence for the development and use of digital tools [2, 5–8]. Research on HRM strategies in construction highlights the roles of motivation and training in optimising processes and reducing risks [9–11].

Formation of the objectives of the article (task statement). The purpose is to reveal the significance of human resources in implementing business process management approaches within construction companies under conditions of

increasing requirements for sustainable development, intending to develop recommendations for integrating green HRM practices, optimising processes, and strengthening organisational adaptability to achieve sustainable development principles, reduce environmental impact, and enhance competitiveness.

Presentation of the main research material with full justification of the scientific results obtained. The significance of human resources in the implementation of business process management approaches in construction companies is evident in their key role in ensuring the consistency, optimisation, and adaptability of processes to sustainability requirements. This allows overcoming inefficient resource utilisation and increasing overall effectiveness. The innovative impact of HR on BPM facilitates BPM-driven opportunities to eliminate functional duplication, reduce costs, and enhance productivity, while aligning daily operations with strategic priorities such as sustainable construction and social responsibility. For example, according to international reports, the buildings and construction sector accounts for around 37% of global energy- and process-related CO₂ emissions [12], highlighting the importance of embedding sustainability into process governance. In this context, integrating HR into BPM through green practices, such as environmental training, is an effective means of improving environmental and operational performance, as evidenced by empirical studies of construction companies that have implemented GHRM practices [13]. In the context of the digital economy, automation and process transformation involving HR, including the use of BPM platforms, ERP, and CRM, as well as data analytics, increase transparency and decision-making speed. Green training enables employees to implement eco-friendly practices, such as effective waste management or BIM technologies for energy-efficient buildings, which directly impacts process sustainability. Additionally, effective HR practices lay the foundation for business scaling and strengthen customer and employee focus, while motivation through green rewards [10] can reduce staff turnover and promote strategic growth with an emphasis on sustainability, where green HRM covers all stages of HR processes except assessment.

It is conceptually appropriate to distinguish between process-oriented management as a general philosophy of efficiency and business process management (BPM) as a managerial methodology that implements this philosophy through standardised tools, data, and the involvement of personnel, including the integration of green HRM practices (notably green recruitment and green training). These practices are regarded in the research literature as effective tools for supporting environmentally oriented managerial decisions, including in the construction industry [10]. The primary purpose of

HR's influence on BPM is to optimise operations, increase motivation, and ensure compliance with labour and environmental regulations, with a focus on strategic talent management and employee well-being. Empirically, green HRM has been shown to have a statistically significant impact on fostering pro-environmental behaviour among employees through psychological mechanisms (attitudes, perceived behavioural control), which are directly linked to the effectiveness of implementing environmentally oriented business processes [14]. The key tasks of HR's influence on business process management are summarised in Table 1, with an emphasis on developing competencies for sustainable projects, such as reducing emissions in construction.

The influence of HR on BPM should be interpreted as purposeful alignment and support of production, supply, and service processes through practices of recruitment, training, motivation, and engagement of personnel with the aim of simultaneously increasing operational efficiency and achieving sustainability [15]. At the process strategy level, such influence is realised through the combination of BPM logic with Lean approaches and digital re-engineering of processes, which allows for reducing resource losses and decreasing the environmental footprint through standardisation of operations and the development of relevant personnel competencies [16]. A substantial body of empirical research indicates that green HRM is associated with improvements in environmental performance and, indirectly, with better economic outcomes, particularly when aligned with sustainable supply-chain and process management practices [17].

The stages of human resources' impact on business process management in construction companies are systematised in Table 2. Process identification involves analysing practices and determining owners with consideration of HR, while modelling creates process descriptions and control metrics (BPMN/process maps) for further management, integrating green HRM practices (recruitment, training, engagement) to assess and develop the competencies of sustainable projects.

This aligns with empirical data from LEED-certified "green buildings" in India, where surveys of 460 employees and SEM analysis showed statistically significant relationships between GHRM, pro-ecological behaviour, and performance indicators [18].

Effectiveness analysis measures indicators and identifies bottlenecks using KPIs/audits, forming the basis for optimisation. This is where re-engineering (BPR) and Lean logic reorient teams to eliminate waste and reduce environmental impact; the potential of this approach is confirmed by case studies that quantify carbon emission reductions in construction planning scenarios. Automation with digital solutions

Table 1

The task of assessing the impact of human resources on the process of managing business processes in construction companies

Task	Description	Example in construction
Identification and analysis of HR processes	Defining boundaries, goals, and participants with a focus on sustainability	Analysis of the personnel shortage for green projects, such as those with LEED certification
Optimisation of motivation and productivity	Increasing engagement through green rewards	Reducing staff turnover in companies through environmental bonuses
Integration with environmental standards	Ensuring compliance with labour and environmental requirements	Implementation of green training to reduce waste in companies
Monitoring and Improvement	Regular review with a focus on sustainable competencies	Quarterly assessment in an MNC for adaptation to market changes
Scaling and development	Supporting growth through HR strategies	Business expansion through green HRM initiatives

Source: compiled by the authors based on [10, 13, 14]

Table 2

Stages of human resources' impact on construction companies' BPM

Stages	Description	Example in construction
Identification	Analysing practices, setting boundaries, and engaging HR.	Survey of 460 employees in LEED-certified green buildings (India); SEM analysis of the relationships between GHRM → pro-environmental behaviour/performance
Modelling and documentation	Creating BPMN models with control metrics.	Identified 34 waste-generation factors with BIM and Lean-based recommendations to reduce losses; based on a comparative analysis of data from 2016, 2021, and 2024 in the surveyed sample, BIM use increased to 63% in 2024.
Analysis and evaluation	KPI measurement, localisation of bottlenecks	Definition of sustainability indicators for process management, like recycling rate and waste/CO ₂ reductions, based on a survey of 199 respondents from Slovakia, Slovenia, and Croatia about BIM's impact.
Optimisation and reorganisation	Removing unnecessary tasks and automating HR processes.	Empirically, GHRM directly boosts sustainable performance and does so via green work engagement (partial mediation). Data from 201 SMEs, SEM/PLS analysis (HR practices → engagement → outcome).
Automation and monitoring	ERP/BI integration with ongoing improvement	S-ERP underpins the integration of sustainability metrics into business processes, validated through two cases, including assessing modular versus conventional construction sustainability using S-ERP data.

Source: compiled by the authors based on [18–22]

(BPM systems, ERP) enhances manageability, and monitoring ensures continuous improvement; in this context, the concept of Sustainable ERP (S-ERP) is used to embed sustainability metrics into the process management framework and support decision-making, as confirmed by case analysis, particularly for comparing the sustainability of construction methods [22]. The impact of HR can be considered through strategic, tactical, and operational levels, forming a comprehensive system for adapting to change; for Polish construction companies, it has been shown that in large firms, green HR practices cover almost all stages of the HR process, while their integration into performance evaluation remains limited, integrating into the sustainable development management framework [10]. Practical methods of HR's influence on BPM are applied (see Table 3), where Lean eliminates waste by reinforcing green HRM to reduce resource consumption and waste; this aligns with survey results and recommendations for

combining BIM + Lean to reduce construction waste and improve process efficiency [19].

Within an integrated management system, BPM is implemented in combination with HR practices such as role distribution, competency requirements, and engagement, which supports cultural transformation and the integration of «green competences» in construction companies [10]. Lean eliminates waste and is supported by personnel development tools like training and engagement. At the same time, the combination of BIM and Lean is used to identify sources of construction waste and develop measures to reduce it [19]. Six Sigma (particularly in the Lean Six Sigma format) ensures accuracy and controllability of changes through measurement and clear roles. It can also be integrated with BIM in manufacturing and installation to improve the efficiency of off-site processes [24].

BPR delivers rapid results through radical redesign but carries the risk of resistance; for

Table 3

Methods and approaches of human resources influence on business process management in construction companies

Method / Approach	Description	Strengths	Limitation	Example in construction
BPM	End-to-end process governance (mapping, roles, metrics)	Transparency, cross-functional integration (incl. HR)	Needs data discipline + cultural change	Process-oriented management model in Polish construction firms (identification, mapping, cycle)
Lean Management	Elimination of waste (Muda) via value-stream logic	Cost/time reduction, higher reliability	Requires stable routines + leadership support	Survey-based evidence from Polish contractors on waste sources + recommendations using BIM + Lean to reduce construction-site waste
Six Sigma (Lean Six Sigma)	Variation/defect reduction using DMAIC (+ Lean tools)	Higher controllability, fewer errors	Needs specialised competencies + measurement system	Case study in an off-site construction company: Lean Six Sigma + BIM used to identify non-value-adding waste and improve delivery/sustainability
BPR	Radical redesign of workflows/process logic	Fast structural effects	High change risk; staff resistance	Target Value Design / Target Costing case in building preconstruction: negotiated target cost reached with a documented reduction vs allowable cost
Kaizen	Continuous improvement through small iterative changes	Flexibility, learning culture	Needs persistence; slower payoff	Construction project case: 43 Kaizen events used to develop Last Planner System components over 43 weeks (implementation guide provided)
TQM	System quality management (process + tools + prevention)	Strong culture of improvement	Time/resources for analysis	Construction-process case study using practical quality tools (flowcharts, Ishikawa, FMEA, 5WHY) to identify causes of errors and propose improvements
Agile Management	Iterative planning + feedback loops (e.g., Scrum)	High adaptability in early phases	Risk of fragmentation at scale	Case study (Mexico) applying Agile/Scrum in pre-construction to improve coordination, engagement, and early issue resolution
ERP	Integrated enterprise data + standardised modules for control	Better integration/visibility across the value chain	Significant investments + adoption barriers	Case evidence from Brazilian construction companies: digital transformation started by implementing ERP for information integration (with BIM as an early DT technology)

Source: compiled by the authors based on [19, 23–29]

example, the application of Target Value Design in pre-project work aims to optimise costs and organise team collaboration [25]. Kaizen emphasises gradual improvements with active staff involvement; notably, the use of Kaizen events to develop components of the Last Planner System in construction projects has been documented [26]. TQM supports improvements through systematic quality management methods and root-cause or risk analysis tools in construction processes, laying the foundation for the digital development of Quality 4.0 [27]. Agile adapts processes to market changes through iterative planning and feedback, as demonstrated in the pre-construction phase of building projects [28]. ERP centralises

data across value chains and can serve as a basis for monitoring sustainable indicators by integrating information and driving digital transformation in construction companies [29]. The application of these approaches should align with company goals and industry conditions to support sustainability-related change, with appropriate reinforcement through green HRM practices to develop competencies and support process transformations.

Conclusions from these problems and prospects for further research in this area. The research confirms that human resources play a systemic, multi-level role in implementing BPM in construction companies, acting as a key integrator of process,

organisational, and sustainability-oriented changes. The integration of HR practices with BPM approaches (Lean, Six Sigma, BPR, Kaizen, TQM, Agile and ERP) enables not only operational efficiency gains but also the embedding of sustainability principles into daily processes. Green HRM instruments strengthen employee competencies, support waste and resource reduction, and facilitate the diffusion of environmentally responsible practices across projects.

The proposed stage-based model of HR impact on BPM demonstrates that consistent identification, modelling, evaluation, optimisation and digital monitoring of processes create a foundation for continuous improvement. Overall, aligning HR strategy with BPM and sustainability objectives enhances adaptability, supports digital transformation and increases the long-term competitiveness of construction companies.

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Гасій О. В., Полтавський університет економіки і торгівлі. **Гасій Г. М.,** Державний університет «Житомирська політехніка». **Значення людських ресурсів у впровадженні підходів до управління бізнес-процесами в будівельних компаніях в умовах зростання вимог до сталого розвитку.**

Анотація. Метою статті є обґрунтування системної ролі людських ресурсів у впровадженні підходів управління бізнес-процесами (BPM) у будівельних компаніях в умовах зростання вимог до сталого розвитку та розробка рекомендацій щодо інтеграції інструментів GHRM для підвищення ефективності, екологічної результативності та адаптивності організацій. Реалізація цієї мети передбачає аналіз взаємозв'язку між управлінням процесами та практиками управління персоналом, а також узагальнення сучасних підходів до поєднання BPM з Lean, Six Sigma, BPR, Kaizen, TQM, Agile та ERP у контексті цифрової трансформації та сталого розвитку. **Методика дослідження.** У статті управління бізнес-процесами розглянуто як інтегровану управлінську концепцію, що поєднує регламентацію процесів, аналітичні та цифрові інструменти з практиками управління людськими ресурсами. Особливу увагу приділено ролі GHRM (зеленого комплектування, навчання, мотивації та залучення персоналу) у формуванні компетенцій для реалізації сталих будівельних проєктів, скорочення втрат ресурсів і зменшення негативного екологічного впливу. **Результати.** Обґрунтовано, що узгодження HR-практик із BPM забезпечує підвищення прозорості процесів, зниження обсягів відходів, розвиток екологічно орієнтованої поведінки персоналу та підтримку цифрової трансформації в будівельних компаніях. Запропоновано поетапну модель впливу людських ресурсів на управління бізнес-процесами, яка охоплює ідентифікацію, моделювання, аналіз, оптимізацію, автоматизацію та безперервний моніторинг процесів. Доведено, що інтеграція GHRM із процесними підходами створює основу для безперервного вдосконалення, підвищення операційної та екологічної ефективності, а також зміцнення організаційної стійкості. **Практична значущість результатів дослідження.** Показано можливість практичного застосування BPM у поєднанні з інструментами управління персоналом у будівельних компаніях з використанням Lean, Six Sigma, BPR, Kaizen, TQM, Agile та ERP. Обґрунтовано доцільність впровадження підходів Sustainable ERP для інтеграції показників сталого розвитку в систему управління процесами. Результати дослідження можуть бути використані для формування HR-стратегії, орієнтованої на сталий розвиток, підвищення конкурентоспроможності будівельних компаній та зниження їх екологічного навантаження.

Ключові слова: управління бізнес-процесами, людські ресурси, зелене управління персоналом, будівельні компанії, сталий розвиток, оптимізація процесів, цифрова трансформація.

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