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Sustainable Human Resource Management with a Focus on Corporate Employee Recruitment

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Abstract: Sustainability principles are becoming an integral part of all aspects of business operations, including human resource management (HRM). Despite extensive research in the field of sustainability, there is a lack of focus on sustainable practices in the recruitment process. This article aims to identify opportunities for sustainable HRM with a focus on the recruitment of new employees in a company. The authors defined three research questions using the PICO method and subsequently applied PRISMA, bibliometric analysis, and content analysis methods to address them. The result is a proposal for a sustainable recruitment model, illustrated using the Milky Way Map framework. The model highlights the key areas of recruitment that need to be considered to achieve sustainable management of the recruitment process. The research emphasizes the importance of implementing a sustainable approach to recruitment. Information systems/information technology (IS/IT) plays a crucial role in optimizing recruitment processes and reducing negative environmental, social, and economic impacts. The implementation of the proposed model can bring benefits such as more efficient talent management, cost reduction, and enhanced sustainability.

Keywords: sustainability; human resource management; recruitment; information systems; technology; sustainable recruitment model; Milky Way Map

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1. Introduction

Recent academic articles on sustainability primarily focus on environmental sustainability. However, there is a significant gap in research on sustainable human resource management (HRM), particularly regarding the processes associated with it. For instance, Ref. [1] highlights this gap and suggests focusing on two aspects: (1) the role of HRM in supporting organizational sustainability, and (2) the sustainability of human resources (HR). Conversely, the authors of [2] emphasize the need to shift research from green and socially responsible HRM to "Common Good HRM." The goal should be to create an overarching framework or typology that helps researchers better define and distinguish various sustainable HRM approaches regarding their ultimate purpose.

In this context, it is important to consider the evolution of the business environment, which has shifted from a VUCA (volatile, uncertain, complex, and ambiguous) environment to a BANI (brittle, anxious, non-linear, and incomprehensible) environment [3]. The VUCA framework emphasized the instability, unpredictability, complexity, and ambiguity of the environment [4]. However, the BANI framework adds a new layer, describing the environment as not only unstable but also brittle, chaotic, non-linear, and difficult to understand [5]. This shift highlights the increasing unpredictability and risk inherent in decision-making processes [6], including those related to sustainable HRM.

In the realm of sustainable HRM, it is emphasized that the success of HRM sustainability heavily depends on the sustainability of individual HRM functions [7]. Therefore, it is appropriate to first analyze individual HR processes in the context of sustainability. Such an analytical approach would clarify the importance of each HRM process in the context of

sustainability and its impact on the overall performance of the organization. Subsequently, synthesizing the results of key HR processes can allow us to discuss the sustainability of HRM. This form of research should ensure a broader perspective on HR sustainability.

The authors of [8] also point out the near-absolute absence of research on sustainable HRM linked to HR systems and new technologies. However, this connection is crucial from various perspectives. In today's digital age, organizations intensively utilize modern technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), and virtual reality (VR) to support a wide range of processes. These technological tools not only enable efficient and intelligent management and analysis of information but also transform how businesses communicate with their customers and manage their operations [9]. By leveraging these tools, companies can create new opportunities, optimize their procedures, and achieve greater competitiveness in today's rapidly changing business environment.

In this article, the authors aim to identify specific opportunities for using modern information systems and/or technologies (IS/IT) to enhance sustainability in employee recruitment. There are recommendations for hiring individuals engaged in environmental activities, but no further details are provided on how to find, select, evaluate, or employ these environmentally engaged individuals [10]. Therefore, the authors focus on identifying specific activities within the recruitment process where integrated modern IS/IT can achieve greater sustainability of this process, as well as the sustainability of HRM.

2. Theoretical Background

In the current era of rapid technological advancement and increasing global interaction, issues of sustainable development are becoming crucial for the future of our world [11]. The concept of sustainability is becoming a central point of discussion not only in academic research [12–16] but also in public life [17–19] and the business environment [20–24]. Sustainability affects all areas of life, including sports [25], education [26], healthcare [27], and tourism [28]. Based on the interconnectedness of all these areas, sustainability can be seen as a significant part of the long-term prosperity of the planet, its inhabitants, and businesses. This comprehensive concept is based on three key pillars [29]:

- Environmental sustainability focuses on preserving ecosystems and biodiversity.
- Economic sustainability seeks a balance between economic growth and long-term stability.
- Social sustainability aims at justice and equitable access to basic needs within society.

Based on these criteria, sustainability can be defined as the effort to meet the current needs of people while preserving the ability of future generations to meet their own needs [30]. An important concept in ensuring corporate sustainability is development [1]. Currently, many experts are researching sustainability in connection with organizations. The ideas of organizational sustainability are reflected in its definition, which involves applying sustainability principles within organizations [31]. Corporate sustainability does not only emphasize environmental protection but has a much broader scope. Sustainable businesses also pursue goals of economic stability and social responsibility. Their management is based on a strategy that ensures sustainable growth of the company in alignment with societal needs and on a global level.

2.1. Sustainable Human Resource Management

Integrating the concept of sustainability into HRM creates a new paradigm: sustainable HRM [1,8]. According to various authors [1,32–37], this integration in organizations leads not only to increased performance but also to the long-term sustainability of specific entities [29]. Sustainable HR practices can also be seen as a response from stakeholders and organizations to the need for more responsible business processes [10].

Sustainable HRM involves the implementation of strategies and practices aimed at achieving economic, social, and environmental goals in the long term [7,29,37]. A key aspect is recognizing multiple, sometimes conflicting goals [38,39]. This approach reflects the complex interactions between HR management systems and their internal and external environments [40]. It focuses particularly on maintaining the long-term sustainability of

resources and managing external influences [41]. Within this concept, the priority is to minimize unintended side effects and negative feedback [42].

From a practical perspective, sustainable HRM means investing in the long-term development of employees, emphasizing achieving greater functional flexibility [43]. This approach leads organizations to shift their investment strategies away from short-term benefits associated with numerical flexibility, focusing instead on creating lasting value and achieving long-term sustainability. This deep perspective enables the necessary alignment in performance management through thoughtful HR decisions, not only within HRM but also in other areas [42]. Two types of tasks can be identified within sustainable HRM [44]:

1. Provide HR strategies based on a systematic and long-term approach to stimulate and support the organization's sustainability strategy.
2. Contributing to the organization's survival by attracting, retaining, and developing employees to maintain a high-quality HR base.

The authors of [8] refer to Ulrich's typology of sustainable HRM from 1997, where two key dimensions were identified. The first dimension is the "predominant orientation of HR activities." Within this dimension, HR activities focus either on people or processes. HR activities oriented towards people define the social role that the HR department plays, emphasizing the contribution of HR to social sustainability and improving employees' quality of life. Key aspects include employee relations, employee welfare, and job security. Process-oriented HR focuses on the technical role that the HR department plays. In this orientation, the instrumental contribution of HR to sustainability is key, achieved through the implementation of various processes and activities (e.g., recruitment, training, evaluation, compensation, etc.).

The second dimension is the "predominant focus of sustainability initiatives." This dimension reflects the organization's orientation towards sustainability within the internal or external environment [8]. This dimension relies on managing stakeholder relationships within HR. The internal dimension focused on organizational sustainability is characterized by an internal approach. It originates from a managerial perspective and is oriented towards organizational effects and goals. This dimension targets the internal aspects of the organization, with the key aim of achieving sustainability and social responsibility within its organizational boundaries. This could involve sustainability across the entire organization or sustainability within HR [45]. Conversely, the external dimension focuses on relationships with the broader environment. Unlike the internal approach, this approach is oriented towards external factors and the organization's activities aimed at achieving sustainability in the external sphere. Typical examples include employee volunteering and philanthropic initiatives [46].

In the current context of digitalization and automation, it is necessary to discuss the use of modern IS/IT, especially in connection with sustainable HRM [47–49]. These tools can provide sophisticated analytical [50–52] and predictive tools [53–56] that are essential for better understanding the potential of HR and its impact on sustainability.

The implementation of modern IS/IT can enable organizations to collect, process, and analyze large amounts of HR data [57–59], thereby streamlining the management of critical information. Based on this data, organizations can make informed and strategic HRM decisions [60–62]. Ultimately, this creates efficient and holistic management that considers not only the current but also the future needs of the organization, supporting its sustainable development. For this reason, it is essential to focus on the integration of IS/IT into HRM processes. This integration can subsequently enhance all quadrants of sustainable HRM.

2.2. Sustainable Recruitment

Results of sustainable HRM are closely intertwined with specific HRM functions. One of the key functions is employee recruitment [7,41,63]. It ensures suitable staffing to achieve organizational goals and meet business needs [64]. This process involves identifying, attracting, and selecting candidates who best match the requirements and qualifications of a given job [65]. The speed of recruitment has become a critical factor for organizational

competitiveness in the job market, creating conditions for successfully acquiring qualified employees [66]. As a result, HR managers have become pivotal in the recruitment process, with their decisions influencing its success [67]. Beyond success, their decisions also impact the sustainability of this process, whether in economic, social, or environmental dimensions [68].

Few authors are focusing on the sustainability of employee recruitment. The most common discussion revolves around the environmental approach known as green recruitment [69]. The goal of this approach is to minimize the negative environmental impacts of the recruitment process [70] and promote corporate social responsibility towards ecology [71]. Green recruitment is a hiring strategy that commits employees to adhering to environmental practices in achieving environmental and sustainability goals [72]. Currently, organizations often conduct paperless interviews in environmentally friendly locations [73]. Recruiters implement green policies as part of their corporate strategies to support their organizations' objectives. Green recruitment often attracts employees interested in environmental issues and willing to actively engage in pro-environmental activities [74,75]. This approach is motivated by organizations' efforts to achieve sustainability goals and create harmony between the values of employees and employers regarding environmental protection [68]. However, there is insufficient consideration of the connections between employee recruitment and other dimensions of sustainability, such as social and economic factors.

As a result, HR managers are reconsidering traditional recruitment approaches and moving towards innovative, high-quality, flexible, and efficient solutions that also take these factors into account [76]. One such solution is electronic recruitment (e-recruitment), which utilizes modern IS/IT to support specific activities within the recruitment process. This approach eliminates the need for paper documents, automates recruitment tasks, shortens the recruitment cycle, reduces recruitment costs, improves the reach of job advertisements, and manages candidates more effectively [77,78]. The use of modern IS/IT in employee recruitment also has a positive impact on sustainable recruitment processes [10,79].

3. Materials and Methods

This article aims to identify opportunities for sustainable HRM focusing on the recruitment of new employees within an organization. To achieve this goal, the authors focus on addressing three research questions. In their work, the authors employed a deductive approach, moving from general principles to specific findings. The first research question pertained to HR in general:

Q_1: Which aspects of personnel management are crucial for sustainable HRM?

To evaluate the current state of academic research on this issue, a bibliometric analysis was conducted using the VOSviewer software version 1.6.20. Secondary sources were identified through the WoS (Web of Science) database, with the search keywords "sustainability" AND "human resources". After identifying key aspects of personnel management related to sustainability, these aspects were grouped into four main categories. This categorization step was conducted using a methodological approach. The categories were created based on similarities and relationships among different aspects of personnel management. Subsequently, the authors proceeded to address the second research question:

Q2: How can these aspects of personnel management be integrated with sustainable employee recruitment?

Answering the second research question required a systematic methodological approach. The method of content analysis of literary sources and existing research studies dealing with employee recruitment and its integration with sustainable HRM was employed. The PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) was used to select relevant sources. Articles were excluded based on three criteria: (1) review of publication titles, (2) analysis of abstracts, and (3) full-text screening.

The authors utilized these secondary sources to categorize various aspects of personnel management, employing a categorization method. Through analysis, it was found that the

use of IS/IT represents a key factor contributing significantly to sustainability amidst the current wave of digitalization. Therefore, the authors focused on the use of IS/IT in the recruitment process, aligning with the third research question:

Q3: In which parts of the employee recruitment process can modern IS/IT be utilized to strengthen specific key aspects of personnel management to support sustainable HRM?

To address this third research question, a content analysis was conducted using the PICO framework to provide a clear focus and structure to the analysis:

- Population: Modern software solutions focused on the employee recruitment process.
- Intervention: Identification of specific recruitment activities supported by selected software solutions.
- Comparison: Analysis of the frequency of use of various software solutions across different recruitment activities.
- Outcome: Compilation of a list of recruitment activities where modern software solutions are most utilized.

This structured approach allowed the authors to systematically examine how modern IS/IT can enhance key aspects of personnel management within the recruitment process, thereby supporting sustainable HRM practices.

The authors of this study employed intentional (purposive) sampling based on Fortune Business Insights' ranking of the top 10 companies in online recruitment technologies. The unit of analysis was the functionalities of various software solutions that correspond to specific recruitment activities. To analyze these, the authors developed a coding scheme comprising 23 categories. Subsequently, axial coding identified six core categories. The reliability of category coding was ensured through two independent coders who coded all 10 solutions in the research sample, achieving an 87% agreement rate, indicating high consistency. The authors of this article were coders, to identify specific functionalities of individual software tools that support various activities within the employee recruitment process, and their objective was to create a comprehensive set of functionalities for software tools focused on employee recruitment. The data were presented by describing the most frequently occurring software functionalities, which served as the basis for a sustainability model of employee recruitment represented using the Milk Way Map technique.

The Milk Way Map, as an analysis and visualization tool, provides a comprehensive overview of organizational structure and functioning. Its advantages lie in its ability to integrate and visualize diverse information perspectives, facilitating a better collective understanding of various organizational aspects [80]. Integrating this map into employee recruitment processes enables HR professionals to gain clearer and more comprehensive insights into the entire recruitment ecosystem. It enhances mutual understanding across different levels of the organization, thereby fostering more effective collaboration in developing and implementing innovative e-recruitment approaches.

To create the Milk Way Map as described in [74], the authors followed these five steps:

1. Identification of Main Value Stream Steps: Initially, they identified and defined the key steps that constitute the value stream within the specific process. These steps should encompass the main phases and activities.
2. Division within Sectors: Next, they grouped the identified steps into major sections that separate different aspects of the process.
3. Identification of Capabilities, Business Processes, and Application Components: Within the specific electronic solution process, they determined the key capabilities, business processes, and application components relevant to each identified section. These should reflect the needs and tasks at each phase.
4. Connecting Elements through Relationships: They then connect the individual elements within sections using specific relationships that identify how information and values flow between different steps and sections.
5. Verification of the Map: In the final step, they reviewed the created map to ensure it provided a clear and coherent view of the specific process.

This structured approach enabled the authors to construct a Milk Way Map, facilitating a comprehensive visualization and analysis of the recruitment process and its electronic solution components. Such maps are valuable tools for understanding and optimizing complex workflows within organizations.

4. Results

In the Web of Science (WoS) database, 3291 articles related to sustainability and HRM topics have been identified. These articles are recorded within the context of research and publications dealing with the continuous relationship between sustainability and HRM across multiple industries. A network graph (Figure 1) illustrates their interconnections through shared keywords.

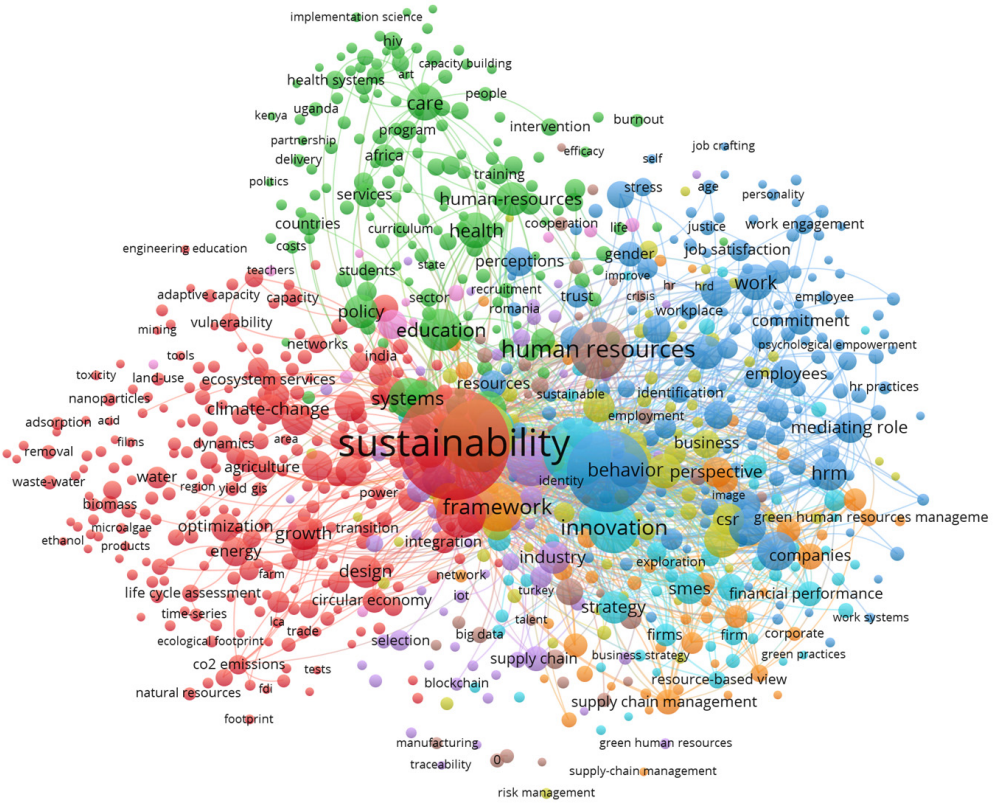

Figure 1. Network graph on sustainability in HRM. Source: own elaboration.

Figure 2 illustrates the overview of publications by year related to the specific issue. The graph shows the years in which more than 10 publications per year were published on the topic of sustainable human resources. This threshold was first exceeded in 2006. From 1991 to 2005 (light blue column), a total of 49 publications were produced. Subsequently, the number of publications continually increased, with the most significant growth observed after 2012. There were slight declines in 2013, 2017, and 2019, but from 2020 to 2023, there was a notable surge. The highest number of articles was in 2021. In the first quarter of 2024, the number of publications had already reached 154, which is almost half of the total publications for the entire year 2023.

Next, Figure 3 shows the distribution of individual publications into specific Web of Science categories, with one article possibly being classified into multiple categories. The most numerous category is Environmental Sciences and Studies, encompassing 43% of publications. The next largest category is Green Sustainable Science Technology, which includes approximately 21% of publications. The third group is Management and Business, which accounts for 19% of publications. More than 100 publications are also found in the following categories: Economics, Public Environmental Occupational Health, Health

Policy Services, Engineering Environmental, Industrial Relations Labor, and Education Educational Research.

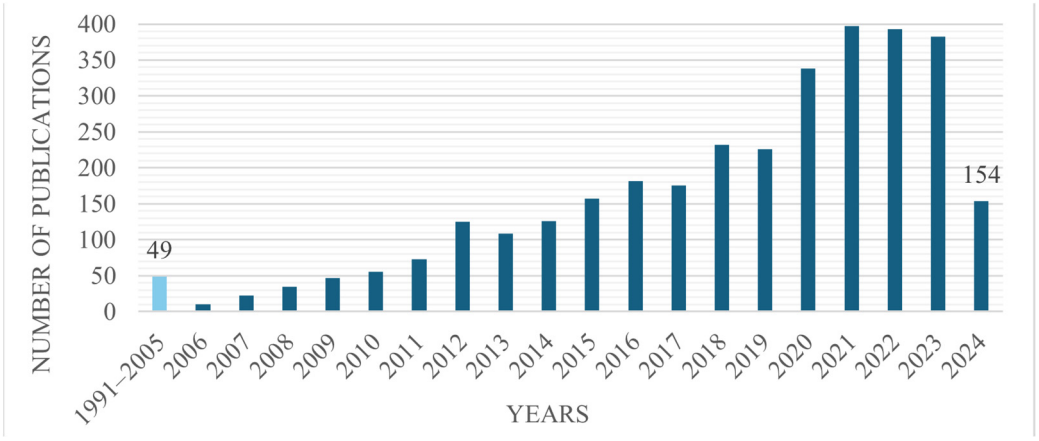

Figure 2. Overview of publications based on years. Source: own elaboration.

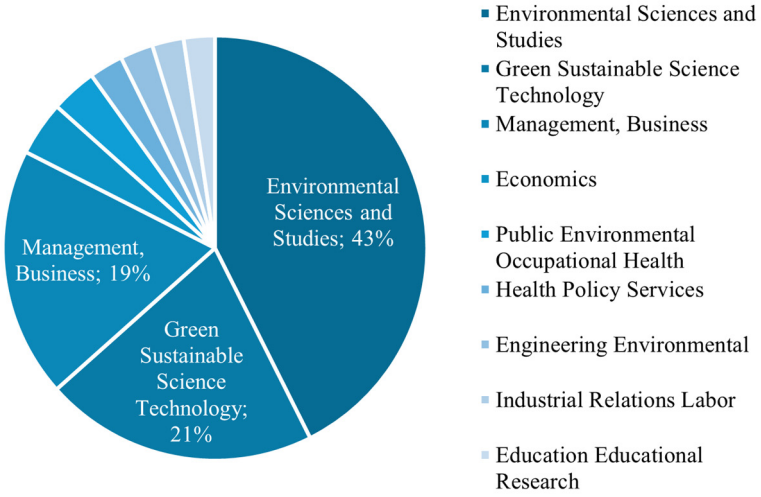

Figure 3. Overview of publications based on the Web of Science categories. Source: own elaboration.

Most commonly, the linkage between sustainability and HR is associated with key terms: Development, Innovation, Impact, Framework, Performance, Education, Knowledge, Systems, and Implementation. These words can be perceived as crucial aspects of personnel management that have the greatest impact on sustainable HRM. "Development" and "Innovation" reflect efforts to develop new approaches and technologies to enhance sustainability through innovation and growth. "Framework" emphasizes the need to analyze and evaluate the impacts of sustainability on society and vice versa. "Performance" and "Education" are critical for understanding efficiency and education in the context of sustainability and HR. "Knowledge" and "Systems" relate to the need to integrate knowledge and management systems to effectively achieve sustainable goals. "Implementation" highlights the practical aspects of implementing sustainable strategies and the obstacles that may arise. These key terms provide a foundation for a deeper understanding of the complex issues surrounding sustainability and HR in scientific and professional literature.

Due to the extensive number of significant aspects of personnel management, these have been categorized into specific groups, considering HRM: Talent Management, Candidate Experience, and Data Management. These groups provide a structured approach to understanding and managing aspects related to HR in the context of sustainability.

These groups of key aspects of personnel management were a pivotal element in the next phase of research and in responding to the second research question, which focused on

how these aspects are linked to the employee recruitment process. A total of 19,050 articles were retrieved from the Web of Science database. However, many of these articles did not specifically address the problem under investigation. Therefore, the PRISMA method was used to select relevant secondary sources (Figure 4).

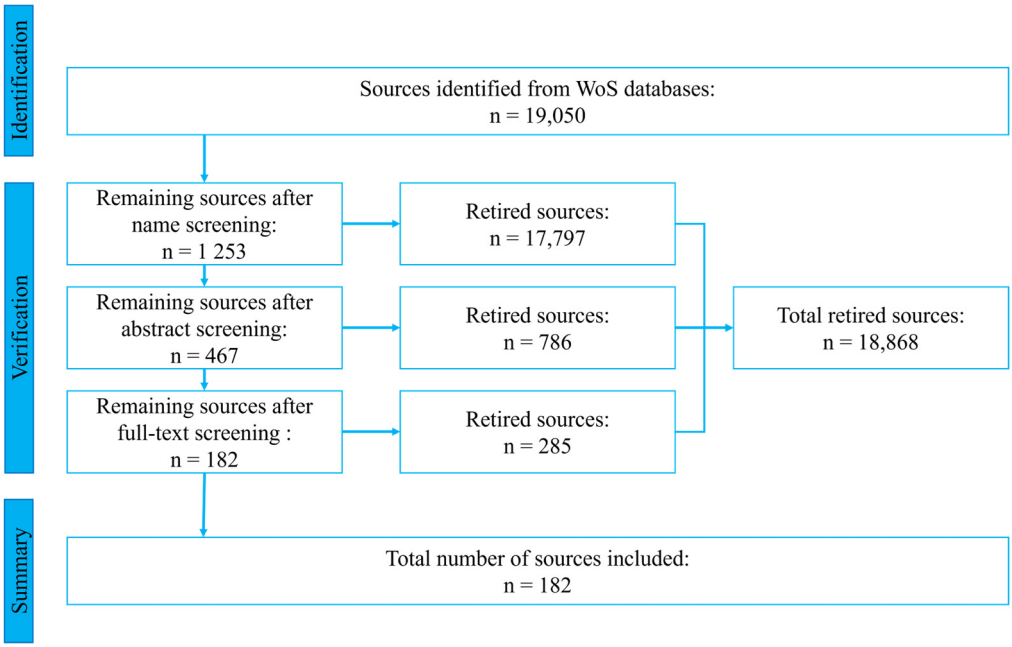

Figure 4. Identification of relevant sources based on the PRISMA method. Source: own elaboration.

Using the PRISMA method (depicted in Figure 4), we systematically conducted a comprehensive search to identify publications specifically focusing on sustainable human resource management (HRM), with a particular emphasis on employee recruitment. Our approach involved a meticulous verification process guided by three distinct criteria. Initially, we screened the titles of publications, excluding 17,797 that did not pertain to sustainable HRM. This initial step ensured that our review was tightly focused on relevant literature. Following this, we conducted abstract screening, where we excluded 786 publications that did not directly address the core research problem related to sustainable HRM practices in recruitment. After applying these first two criteria, we were left with 467 publications that met our initial screening thresholds. Subsequently, we proceeded to conduct a full-text screening of these remaining publications. During this final phase, an additional 285 publications were excluded as their content did not sufficiently address sustainable HRM issues, leaving us with a final set of 182 publications that were deemed highly relevant and aligned with our research objectives. This rigorous methodological approach allowed us to systematically identify and include pertinent literature that contributes significantly to the understanding and advancement of sustainable HRM practices, specifically within the context of employee recruitment strategies.

From these 182 relevant publications, the authors proceeded with content analysis to establish connections between different categories of personnel management aspects and employee recruitment. Regarding recruitment, three groups of personnel management aspects were identified. The first group, Talent Management, focuses on the recruitment and retention of qualified employees, crucial for achieving sustainable HRM. Key aspects included: (1) Development (strategies for attracting and retaining talent), (2) Innovation (innovative approaches and tools for identifying and attracting talent), (3) Impact (the impact of proper talent selection on long-term organizational success), and (4) Framework (frameworks and models to improve the talent acquisition process). The second group is Candidate Experience, emphasizing the importance of a positive candidate experience during the recruitment process, which can influence their subsequent engagement and

loyalty to the company. Key aspects grouped here included: (1) Performance (performance of candidates who undergo a positive recruitment process), (2) Education (education and training for recruiters to enhance candidate experience), and (3) Knowledge (knowledge and skills needed to provide an excellent candidate experience). The third group is Data Management, critical for effectively gathering, processing, and utilizing HR data, enabling better decision-making and process optimization. Key aspects included: (1) Systems (systems for managing and analyzing data) and (2) Implementation (implementation of tools for effective data management). Among all these key aspects of personnel management focused on sustainable HRM, IS/IT was most frequently associated.

To determine where modern technologies can contribute most to the sustainability of the recruitment process, individual activities within this process were analyzed in detail. Through content analysis of ten case studies from practice, specific areas where software solutions can bring the highest efficiency were identified. These case studies showcase current software solutions that streamline the recruitment process. The selection of software was based on the "Top 10 Online Recruitment Technology Companies" ranking from Fortune Business Insights in 2023. Detailed information on the selected companies and their recruitment solutions can be found in Table 1.

Table 1. Overview of the analyzed software solutions and their brief description.

Software Name	Description
BambooHR 4.5.0.896	Offers a comprehensive suite of online recruitment platforms including HR management and reporting, recruitment processes, new employee integration, payroll processing, time tracking, benefits administration, and employee experience and performance management.
HireVue for Candidates 5.0.15	Recruitment platform utilizing AI-driven automation. Offers various solutions including video interviews, assessments, AI-driven conversations, scheduling, interview creation, and text recruiting.
TalentLyft 1.0.6	Software for online recruitment providing solutions for Applicant Tracking System (ATS) and recruitment marketing, enhancing team productivity, agility, and strategic approach. Automates manual tasks to help organizations select high-quality employees.
Yello 1.21.0	Talent acquisition and customer relationship management (CRM) software for online recruitment, used by Fortune 500 companies to attract and develop top talent for their recruitment needs. Focuses on candidates to optimize the recruitment process, reduce hiring time, and ensure a clear return on investment.
Fountain 1.0.0	Solution for enterprises with specific high-volume hourly hiring requirements. Utilizes ATS technology to effectively manage complex recruitment scenarios.
Flair 1.0.3	Technological platform for online recruitment focusing on a wide range of personnel processes from absence management and time tracking to optimizing registration and payroll processes, including employee recruitment.
Hiring 1.0.9	Online recruitment technology provides HR professionals with the necessary tools and insights for successful recruitment. In May 2023, the company announced integration with Sense, enhancing talent discovery using artificial intelligence.
Avature 10.27.0	Talent management and acquisition platform utilizing Applicant Tracking System (ATS) for efficient and fast employee recruitment. In May 2023, Avature introduced recruitment marketing features for WeChat 8.0.46, enabling clients to use leading applications to send social messages to 1.2 billion active monthly users.

Table 1. *Cont.*

Software Name	Description
Recruitee by Tellent 3.4.1	Software solution aimed at streamlining employee recruitment. In April 2023, introduced Candidate Pitch, a web application based on Generative Pretrained Transformer technology. This application uses AI to transform resumes into compelling career profiles, simplifying job searches through summary texts highlighting unique skills for recruiters and job applicants.
TestGorilla 1.3	Innovative online technology software designed to simplify and optimize the employee hiring process. Strengthens recruitment professionals with powerful tools, and facilitates applicant search, application tracking, job offer generation, and candidate evaluation or interviews. Additionally, creates various pre-employment tests within minutes, ensuring the recruitment of highly qualified talent.

Source: processed according to [81].

These software solutions focus on various activities that are somehow linked to employee recruitment. While some activities precede this process and significantly influence its course, others can be directly classified as those typically occurring within this process. However, some activities take place after the recruitment process is completed but are directly related to it. An overview of activities identified by individual coders is provided in Table 2.

Table 2. Identified recruitment activities.

Activity	Researcher 1 *	Researcher 2 *	
Analysis of employee turnover	1	0	DIFFERENCE
Analysis of historical data	0	1	DIFFERENCE
Analysis of employee satisfaction	1	1	MATCH
Forecasting future HR needs	1	1	MATCH
Forecasting employee turnover	0	1	DIFFERENCE
Defining human resources needs	1	1	MATCH
Defining employee requirements	1	1	MATCH
Defining human resources sources	1	1	MATCH
Identifying employee recruitment channels	1	1	MATCH
Recruitment budget planning	1	1	MATCH
Creating recruitment plan	1	1	MATCH
Job posting	1	1	MATCH
Responding to applicant queries	1	1	MATCH
Inviting for job interviews	1	1	MATCH
Gathering relevant documents	1	1	MATCH
Resume screening	1	1	MATCH
Preliminary selection of applicants	1	1	MATCH
Applicant testing	1	1	MATCH
Job interview	1	1	MATCH
Evaluation of applicant testing	1	1	MATCH
Evaluation of job interviews	1	1	MATCH
Decision on applicant acceptance	1	1	MATCH
Evaluation of Electronic Recruitment Effectiveness	1	1	MATCH
Overall percentage match			**87%**

* 0 = The analyzed software solutions do not focus on a specific activity. * 1 = The analyzed software solutions focus on a specific activity. Source: own elaboration.

The first group of the functionalities of analyzed solutions can be categorized as activities that occur before the actual recruitment process in terms of timing. These solutions primarily focus on searching for candidates or talents based on predefined criteria that an employee should meet for a specific job position. An example of such software is BambooHR 4.5.0.896, which not only efficiently searches for talents across various online platforms but also allows recruitment personnel to contact specific job applicants using personalized emails [82]. This candidate and talent search is facilitated through an Applicant Tracking System (ATS) [83], a system integrated into numerous other software solutions.

Another focus of these analyzed software solutions is job posting. Such job postings can be published, for example, on dedicated career websites. Talentlyft 1.0.6 software, for instance, offers a wide variety of different templates for these websites, suitable for desktop and mobile devices [84]. Alternatively, job postings can also be made on social media platforms like LinkedIn, Facebook, or Twitter. Software such as Hiring 1.0.9 from SmartRecruiters enables this feature by collaborating with Facebook Jobs [85]. Some software solutions can even forecast recruitment needs based on employee data, enabling companies to prepare better [86]. Another significant function is the planning of specific recruitment activities. For example, Yello 1.21.0 software has an online recruitment calendar for applicants to manage their interview dates, testing, and more [87]. Some solutions also integrate artificial intelligence (AI) technology, which communicates with applicants and schedules interview dates based on the recruiter's calendar [88]. These examples illustrate that recruitment effectiveness is ensured not only by activities occurring within the recruitment process itself but also by activities preceding it. For this reason, it is possible to see that leading recruitment platforms offer functions that occur even before recruitment itself.

Within the recruitment process, various technological innovations are increasingly being used, such as artificial intelligence (AI), big data, and blockchain, as previously mentioned. Among the analyzed software solutions, these and other technologies focus on various areas. For instance, resume screening is addressed by Hiring 1.0.9 from SmartRecruiters software, where algorithms like SmartAssistant powered by AI are employed to prevent biases, a common issue in traditional physical recruitment processes [89]. Avature 10.27.0 software offers a similar solution using Boolean search to select the best candidates [88]. Another critical activity within recruitment is applicant testing, which is specialized by TestGorilla 1.3 software, creating professional and reliable tests. In creating each test, they utilize Cronbach's alpha, confirming the internal consistency of the questions in the test [90]. The most significant activity in employee recruitment is the job interview. Its importance is highlighted by the fact that all analyzed software solutions somehow address job interviews. HireVue for Candidates 5.0.15 software stands out for its advanced recruitment process, utilizing AI technology. It allows interviews to be conducted anytime and from home. Notably, its advantage lies not only in conducting interviews online but also in using emotion recognition technology (ERT) for candidate assessment [91]. These systems and technical means are capable of identifying, interpreting, processing, and simulating emotions and other affective phenomena in people [92]. This is achieved through computer vision, a subfield of artificial intelligence [93]. The final step in the recruitment process is always evaluating candidates and deciding on the best candidate based on data collected throughout the recruitment stages. Analyzed software solutions support this challenging task by evaluating applicant data and providing specific recommendations for recruitment decisions. Fountain 1.0.0 software supports the final selection of candidates by comparing skills, abilities, and emotional intelligence. Based on these attributes, it can even predict the suitability of candidates for organizational culture and job performance [94]. These activities demonstrate the effective impact of technologies integrated into various solutions, not only accelerating the entire process but also enhancing the quality of candidate selection. Technologies contribute to a recruitment process that is less biased and discriminatory, thus making employee recruitment more transparent.

After the final decision, the process moves on to contract signing. In today's globalized society, many employees work remotely from home for companies located thousands of kilometers away. Recognizing this trend, recruiting software addresses such matters by offering solutions like e-signature, allowing newly hired employees to sign their employment contracts from home [95]. Subsequently, the employees can familiarize themselves with their duties, colleagues, and other aspects of the job. This process is commonly referred to as onboarding in professional literature, and it represents a significant step immediately following the recruitment process. Many recruitment-focused software solutions include features designed for this stage. For example, Fountain software emphasizes onboarding as one of its main functions. It aids newly hired employees in better integrating into

the work environment through various videos that introduce them to job responsibilities, colleagues, partners, clients, and more [96]. For recruitment teams and entire organizations, evaluating the recruitment process is crucial. Objective evaluation is provided, for instance, by flair, which creates various dashboards capturing all aspects of recruitment from job posting to contract signing. It assesses the time and financial efficiency of the process and suggests improvements to streamline the entire operation [97]. These activities collectively contribute to refining future processes and enhancing employee satisfaction and loyalty.

From the identified activities, it was necessary to create specific groups of activities and assign them to individual personnel processes that occur within organizations. These groups are as follows:

1. Job Analysis—This group focuses on a thorough analysis of job positions, identifying key qualifications and competencies. Their role is to define HR needs within organizations and create precise job profiles, which are then crucial foundations for successful recruitment.
2. Forecasting—Activities in this group concentrate on forecasting future workforce needs based on labor market analysis. Together with the planning group, they aim to ensure adequate HR is available for current and planned organizational needs.
3. Planning—This includes coordinating and strategizing for efficient HR utilization. They plan and manage activities to attract qualified candidates.
4. Communication—Specializing in building and maintaining communication channels with potential candidates. They aim to create a positive impression of the organization and inform potential applicants about job positions.
5. Recruiting—Focuses on managing the entire recruitment process. They ensure that selection processes are well-structured, fair, and effective in selecting the best candidates.
6. Assessment—Monitors and evaluates the success of new employees after their arrival. They ensure that new employees receive the necessary support and environment for an effective start in the organization. They also assess the entire recruitment process and identify potential areas for improvement.

An overview of these groups and their respective activities can be seen in Figure 5.

Based on this division, it is possible to identify specific personnel processes that contribute most to the sustainability of the recruitment process, influencing not only HRM but also the overall functioning of the organization. The sustainable recruitment process has been designed according to the Milky Way Map (Figure 6). Similar to the corporate Milky Way Map for the entire organization, this map has been created with the understanding that a visual representation of processes is more intuitive and easier to understand than textual or tabular descriptions. This single-page map is designed to be understandable for all involved in the recruitment process, including senior managers, recruiters, and job applicants.

The Milky Way Map in the recruitment process helps visualize important aspects and allows all involved parties to focus on key areas. This tool is used by team members to understand and communicate the overall flow of recruitment, ensuring that everyone has a clear overview of how the process operates. The map identifies core value streams at its center, representing the overall flow of the recruitment process. These value streams are Job Analysis, Forecasting, Planning, Communication, Recruitment, and Assessment. Each of these value streams forms a segment on the map, detailing the capabilities of the organization and corresponding activities. These activities are specific functionalities of the analyzed software solutions assigned to the seven capabilities of organizations:

1. Management of Job Analysis: Involves effectively managing the job analysis process. It identifies key competencies, requirements, and responsibilities for specific job positions, providing a clear framework for recruitment and assessment of suitable candidates.
2. HR Forecasting: Focuses on predicting the future needs of the organization in terms of HR. This includes analyzing labor market trends, demographic factors, and other relevant variables to adequately plan necessary resources and personnel.

3. HR Planning: Deals with systematic planning of organizational HR needs. It includes managing available employees, identifying internal resources, and creating strategies for their effective deployment.
4. Recruitment Planning: Encompasses effective planning and organization of the recruitment process. This involves defining strategies, setting timelines, and preparing resources for identifying and engaging suitable candidates.
5. Management of Candidate Relationships: Concentrates on managing and maintaining positive relationships with potential candidates. This includes effective communication strategies, providing relevant information, and ensuring positive candidate experiences throughout the recruitment process.
6. Employee Recruitment Management: Involves coordinating the entire recruitment process from start to finish. It includes monitoring progress, making necessary plan adjustments, and ensuring that recruitment proceeds efficiently and in line with defined goals.
7. Assessment of Recruitment Success: Focuses on evaluating candidates, including their abilities, experiences, and values in line with job position requirements. It also involves providing sufficient information for decisions on candidate acceptance or rejection. Additionally, it assesses the effectiveness and success of the recruitment process. This capability also includes analyzing the quality of found candidates, time efficiency, and the extent to which organizational expectations are met. Evaluation allows identifying areas for improvement and optimizing future recruitment activities.

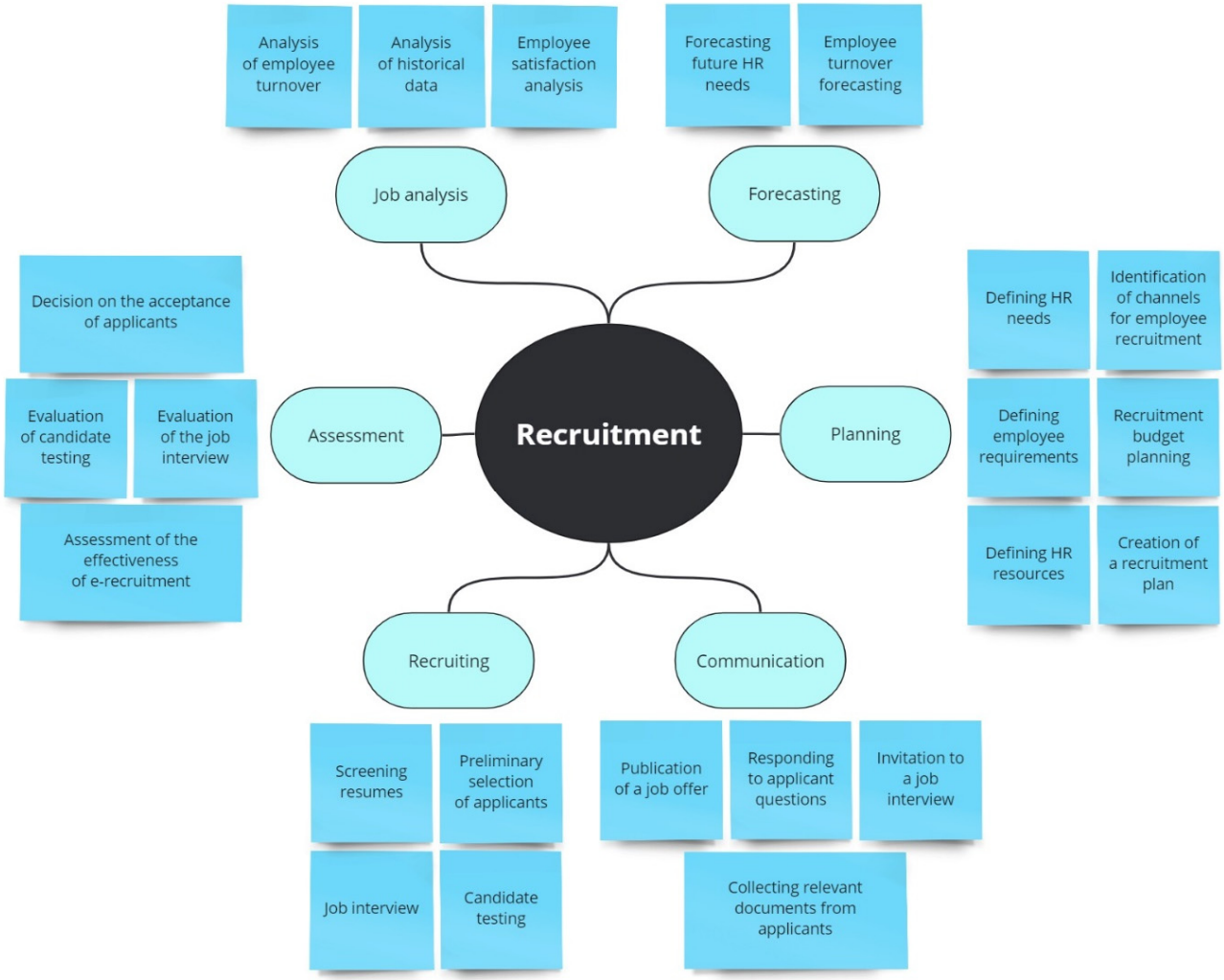

Figure 5. A mind map of the main groups of recruitment activities. Source: own elaboration.

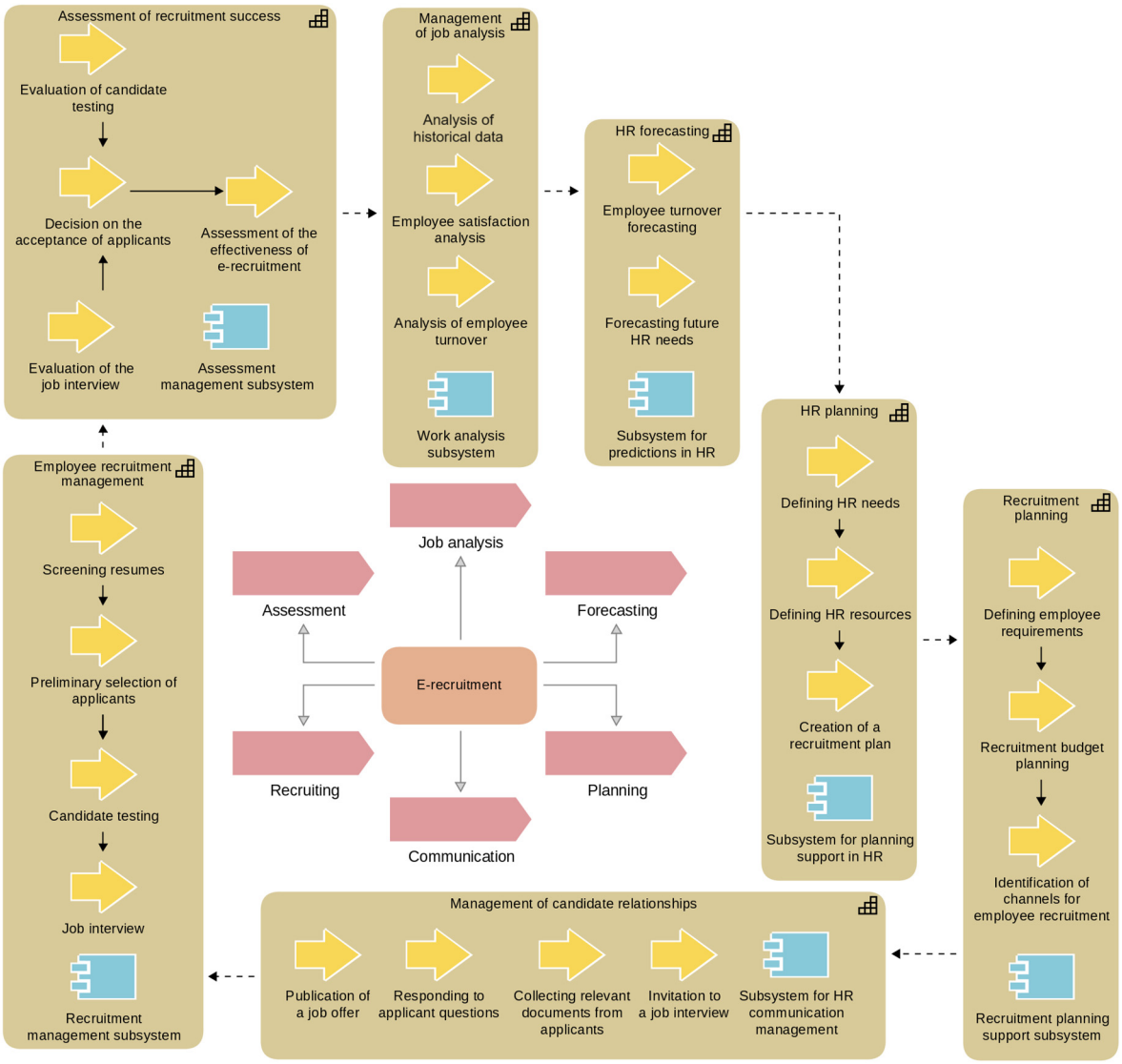

Figure 6. Sustainable recruitment Milky Way Map. Source: own elaboration.

5. Discussion

The Milky Way Map significantly contributes to sustainability in HRM, particularly in employee recruitment. This map introduces and supports transparency and equal opportunities for all applicants, which are key aspects of a sustainable recruitment process [98,99]. As a result, it reduces the risk of discrimination [100] and enhances applicants' trust in the fairness of the recruitment process [10]. Furthermore, a clear and concise definition of skills and competencies allows for more effective evaluation of candidates [101,102], thereby improving the quality of hired employees and contributing to the long-term sustainability of the organization.

The application of the Milky Way Map technique for sustainable recruitment entails systematic and long-term relationship building with potential candidates, focusing on their continuous development and integration into the organization. This approach emphasizes building loyalty, fostering long-term relationships, and ensuring sustainability in the recruitment process. The Milky Way Map specifically highlights the use of IS/IT in specific employee recruitment activities, contributing not only to strengthening the environmental pillar, as seen in green recruitment [103], but also to the economic and social pillars of sustainability.

In terms of the environmental pillar, the Milky Way Map contributes by eliminating paper usage. All documents, communications, and interactions with candidates can be

conducted electronically, reducing paper consumption and waste. Additionally, it decreases emissions associated with transporting candidates to meet with specific recruitment personnel [104,105].

The Milky Way Map streamlines processes such as interviews, testing, and resume screening, leading to reduced recruitment costs [106]. For instance, utilizing online platforms and digital tools allows for quick and efficient execution of these steps without significant financial and time investment in physical resources [16,107].

From a social perspective, the Milky Way Map supports inclusive and effective communication channels [108] that enhance interaction with candidates and promote transparency throughout the recruitment process [109]. Online platforms and digital tools facilitate faster and more efficient communication, improving the overall candidate experience and increasing their engagement [110]. These interactions are much quicker, contributing to enhanced candidate loyalty to the organization [111].

In contrast, recruitment activities labeled as unsustainable often rely on short-term solutions such as rapid recruitment campaigns focused on immediate gains and short-term effects, disregarding the long-term sustainability and engagement of new employees. These techniques frequently result in high turnover rates and lower employee loyalty [112–114].

Due to its visual power, the Milky Way Map enables transparent visualization of the entire recruitment procedure. The identification of skills, value streams, and competencies is clearly defined, enhancing recruitment transparency and building employee trust throughout the process [115]. Moreover, each step in the value stream is thoroughly described, ensuring that all employees have equal access to information and adhere to the same recruitment standards. This eliminates potential inconsistencies in the process [116,117].

The Milky Way Map not only ensures transparent and equitable conditions but also serves as a tool to identify and optimize areas for improving employee recruitment sustainability. For instance, digitizing the entire process not only streamlines and accelerates procedures [118,119] but also significantly reduces environmental impact. By eliminating the need for paper documents and minimizing the use of physical resources [120], this digitization represents a step towards a more responsible and eco-friendly approach to recruitment, aligning perfectly with sustainability goals.

This Milky Way Map approach supports the BANI concept (brittleness, ambiguity, nonlinearity, and incompleteness). The Milky Way Map systematically reduces the brittleness of recruitment processes, where each step is structured and defined, thereby eliminating ambiguities and ensuring consistency and transparency. This approach effectively addresses non-linear and incomplete information in recruitment activities, contributing to a more sustainable and stable human resources environment.

6. Conclusions

This article aimed to identify opportunities for sustainable HRM focusing on the recruitment of new employees within an enterprise. Based on their analysis, the authors addressed three key research questions that provided a comprehensive view of the issue.

The first research question concerned the identification of key aspects of personnel management for sustainable HRM. Through bibliometric analysis, the main aspects were identified and grouped into four major categories. This analysis helped us understand which aspects are most important for sustainable HRM and provided a foundation for further exploration.

The second research question focused on linking the identified aspects with employee recruitment. A systematic content analysis of literary sources was used to answer this question, revealing that IS/IT is crucial for sustainability in modern recruitment processes. Findings indicated that implementing IS/IT can significantly contribute to more efficient and sustainable recruitment management.

The third research question explored specific activities in the recruitment process where modern IS/IT can strengthen key aspects of personnel management. The use of the PICO framework structured the analysis and identified the main activities where modern

software solutions contribute to sustainability. This resulted in creating a list of activities commonly supported by software solutions and identifying six basic categories through axial coding.

The results of these analyses were presented using the Milky Way Map framework, providing a comprehensive overview of the structure and functioning of the recruitment process. This map enables HR professionals to better understand the entire recruitment ecosystem, leading to more effective collaboration and implementation of innovative approaches.

Findings indicate that sustainable HRM in the recruitment process can be achieved through the strategic use of IS/IT. Modern technologies not only increase efficiency but also support sustainability, which is crucial for business success in the digital age. Integrating these technologies into the recruitment process can significantly contribute to creating sustainable and effective personnel management.

One of the limitations of this study is its reliance on the Web of Science (WoS) database for secondary data analysis. The exclusive use of WoS means that if a different database had been utilized, the findings might have differed. Each database has its unique set of indexed journals and publications, which can influence the breadth and depth of the data retrieved. Consequently, the insights drawn are somewhat dependent on the scope of WoS's indexing. Furthermore, the search strategy, including the selection of keywords and the date range of the publication retrieval, plays a crucial role in shaping the results. Variations in these parameters could yield different sets of relevant publications, potentially altering the study's conclusions. This limitation is equally applicable to the selection of specific software solutions analyzed within the study. Different software solutions might offer varying features and capabilities, which could influence their perceived effectiveness in supporting sustainable HRM practices.

In the future, it is crucial to explore further opportunities and applications stemming from the findings outlined in this article. This research identifies specific activities in the employee recruitment process that have the greatest impact on recruitment sustainability. It also pinpoints areas where the integration of modern IS/IT is most beneficial, as these technological innovations significantly influence sustainability in the corporate environment. Future studies could investigate the implementation of these identified practices and technological solutions in real-world conditions across different organizations. Monitoring their impact and effectiveness would enable further refinement of these approaches and the development of robust, universally applicable guidelines for sustainable human resource management. This would greatly enhance the practical relevance and applicability of the findings of this study, contributing to more efficient and sustainable human resource management globally.

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