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Advanced technologies enabled human resources functions: Benefits, challenges, and functionalities: A systematic review

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INFORMATION & TECHNOLOGY MANAGEMENT | REVIEW ARTICLE

Advanced technologies enabled human resources functions: Benefits, challenges, and functionalities: A systematic review

Omar Ali^{1*}, Kristina Krsteska¹, Dina Said¹ and Mujtaba Momin¹

Abstract: Human resource information systems have enhanced monitoring, documenting, and recording functions for organizations, and consequently have accelerated swift completion of routine processes. This change demonstrates the critical impact of adopting and using advanced technologies in the human resources function; in multiple functional gamut's, particularly in recruitment, selection, training and development. This manuscript presents a systematic review of academic articles on the impact of adopting and using advanced technologies in

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the human resource management function. The current review draft considered a total of 1246 academic articles and aggregated review of 101 articles to present a classification framework with three distinct dimensions: Advanced technologies-enabled human resources benefits, which give an overview of the main benefits of using advanced technologies within this sector. Advanced technology-enabled human resources challenges, which give an overview of the main challenges that have been faced by using advanced technologies within this sector. Advanced technologies-enabled human resources functionalities, which give an overview of the main functionalities that have been added by using advanced technologies within this sector. Implications for future research and their directions are identified in the areas of value-added human services for decision-making, security, and privacy for customer and organization data, monitoring features, and creative IT service delivery models.

Subjects: Artificial Intelligence; Information & Communication Technology (ICT); Management of IT

Keywords: Advanced technologies; human resources; benefits; challenges; functionalities

1. Introduction

The present and future success of organizations is modulated by the attraction of suitable incumbents, followed by a prediction of their potential job performance, and the final selection of candidates with high quality and adequate potential for superior performance (Tufts et al., 2015). Additionally, Nwafor (2022) has demonstrated that training and development increase employees' skills in performing their jobs; and thus, lead to the overall qualitative progress of an organization. Organizations have reiterated the significance of recruitment and selection, by suggesting that the methods used for recruitment and selection influence employee and organizational performance (Manneh & Adesopo, 2022). On the other hand, the relationship between the number of people employed and aspects of information storage and its manipulation is recognized as significant (Ball, 2001). In addition, Choudrie and Dwivedi (2005) suggested that HRIS enhanced the monitoring, documenting, and recording functions of the organization; and consequently, has added towards swifter acceptance of these processes in routines.

However, the effectiveness and value of human resource (HR) practices have been a theme of research interest for long (Becker & Smidt, 2016). More specifically, HR-Information Systems (ISs) have been shaped as a specific mechanism, and have become fundamental to all the other derived systems (Marler & Fisher, 2013; Stone et al., 2015). Intriguingly, the advantage is acquired when enterprise resource planning system bears nexus with the gamut of HR; and HRIS is established as a subsystem (Nagendra & Deshpande, 2014). Notwithstanding, technology has impacted HR management (HRM), in a plethora of ways (Bagdasarov et al., 2020; Myounghoon, 2017); and remarkably supported the gamut of HRM (Melesse et al., 2020). Along, with the growth of relevant technologies and the increasing need for a systematic approach to HR management, the establishment of the people is being created (Alkhwaldi et al., 2022). It is significant to emphasize the contemporary systems that besides hardware and software applications; encompass people, policies, procedures, and data required to manage the HR function (Gupta, 2013). Moreover, the implications of IS in HRM pertain to the apprehension of talent inventories, workforce planning, and training processes (Mayfield et al., 2016). Exclusively, the adoption of HRIS was manifested in manpower recruitment and training functions (Balasundaram & Venkatagiri, 2020; Fisher et al., 2014; Zang & Ye, 2015).

Given the above, this research implies that overall results, currently are associated with the evolution of HRIS. In such context, it is noteworthy that a relatively new trend concerning HRIS is

the inclusion of artificial intelligence (AI), social media, big-data, robotics, and algorithmic (Bagdasarov et al., 2020; Chen & Gaffney, 2020; Dery et al., 2018). More recently, big data is witnessed as another productive opportunity that intends to renovate the system of HRIS, within organizations and their existence (Chen & Gaffney, 2020). Shibu and Banu (2020) have suggested that HRIS has the scope and potential to offer more intelligent capabilities, to increase the effectiveness of recruitment and selection processes. Successively, numerous organizations have been using AI or digital technologies in the automation of HR activities (Ali, Momin, et al., 2023; Yawalkar, 2019). The adoption of HRIS in small and medium-sized enterprises is continuously progressing (Wallo & Kock, 2018). Besides the positive aspects of the advancement with the emergence of new technology, we learn from past; challenges such as internet outrages and connectivity problems that were noticeable difficulties in the past (Mabad et al., 2021). Moreover, other studies indicate that when HRIS systems are designed to deal with people resources, then organizations experience difficulties at technology – behaviour interface; which could be more specifically characterized as the strategic transformation phase (Ali et al., 2022; Dery et al., 2018; Morley et al., 2006). Our research target is to cope initially with the competence of people (referring to the selection of matching candidates and ensuring that they are equipped with the right skills, all the way long their employment); and as more technologies come under the ambit of these two functions; we attempt to optimize our research in one logical sequence of recruitment, selection, training and development. In our subsequent research papers, we aim to do a sequential study of the other HR sub-functions that can be enhanced with the use of IS (Performance; aligned compensation; and retention).

However, to extend the comprehension of recruitment, selection, training, and development; scholars have performed a range of systematic reviews (SRs). For instance, Lang et al. (2011) and Okolie and Irabor (2017) dedicated their systematic research to e-recruitment. A noteworthy review of the perspectives of each stakeholder and each level was suggested by Al-Shibly (2011). Similarly, the need for SR was proposed by Strohmeier and Piazza (2013). Also, Chakraborty and Mansor (2013) pointed out that most organizations face challenges related to HRIS, which implies further study as well. In addition, Landers and Schmidt (2016) challenged social media in the gamut of selection and recruitment; and stressed the need for a faster and more comprehensive approach to studying it. In relation to the same point, Rezaei and Beyerlein (2018) conducted systematic research targeting talent development and there was no particular attention to technology or overall training and development. Another perspective on AI in recruitment and selection was provided by Albert (2019). Moreover, an SR identified the challenges of the blend between the face-to-face and online learning components positioned around students, teachers, and educational institutions without considering the companies and employees (Rasheed et al., 2020). Another review study conducted by Potočník et al. (2021), this study focused on literature reviews from the last decade on the selection and recruitment research and practice and included the technical view as well. Lastly, it is evident that there have been contextual reviews in the area (Quaosar & Rahman, 2021; Udekwe et al., 2021); Surprisingly, still, broader adoption of the technology in people management systems is needed as reported by Florkowski (2018) and Mushore and Kyobe (2022).

After thorough review and literature analysis, we observe that there is a dearth of studies that present a comprehensive review, of staffing (recruitment and selection) and training and development, in conjunction with advanced technologies. Moreover, by covering a longer timeline for the review; challenges and functionalities will be substantially, and holistically coped. Conclusively, by conducting the current review, the study tends to look at the existing specific areas; and categorically discuss, the technologies that are coming under the ambit of HRIS; lastly, the study tends to offer relevant insights into the advantages and weaknesses. Thus, researchers choose qualitative analysis, which shall capture studies in the domain of HRIS; and specific to staffing (recruitment and selection), and training and development.

Given the complexity, dynamics, and nexus between HRM and the technology presented above, this research is suggesting SR. Thus, the current review will elaborate on the outcomes of the previous studies in one decade; and will attempt to identify the benefits, challenges, and functionalities of the staffing, training and development function; by utilization of an SR which entails a period of one decade; Also, this review, tends to enrich the theory and science; with important insights on the development and current conditions of staffing (recruitment and selection), training and development that should support further research, as well. Moreover, the current review study tends to provide points of attention for practitioners, at their end. Lastly, it provides necessary suggestions for policymakers. Though a detailed review is convenient for the variety of research in this sphere; moreover, to build-on-theory for a more comprehensive empirical and explorative research; and ultimately for practitioners, who might easily utilize the knowledge while adopting, maintenance and developing HRIS.

An overview of the related work on the use of advanced technologies in the HR sector is presented next. This is followed by the research methodology detailing the SR mapping process, and presenting research results; based on the classification framework. Subsequently, a discussion of current literature in terms of the three dimensions of benefits, challenges, and functionalities of using advanced technologies in the HR sector, is presented. Finally, implications for future research and practice are highlighted.

2. Review planning and methodology

The main objective of any SR lies in identifying, analysing, and interpreting all relevant research on a given topic, so that a research question can be developed (Kitchenham & Charters, 2007). An SR is also defined as a methodology that summarizes the process of gathering, organizing, and evaluating the current literature within a review area (Dabić et al., 2020). The SR in the current study matches closely the study objectives to identify research gaps and make recommendations for future research (Eteokleous et al., 2016; Hao et al., 2019). Moreover, it makes a major contribution to the knowledge of the study field by identifying and proposing future research directions (Khatoon & Rehman, 2021). Palmatier et al. (2018) for instance classified SRs into several sub-themes such as domain, theory, and method-based reviews, whereas Paul and Criado (2020) divided domain-based reviews into structured theme-based or framework-based reviews, bibliometric reviews, hybrid reviews, and conceptual reviews.

Scholars suggest that SRs are gaining greater relevance in the HR and ISs area as users need to remain aware of the changes within an ontological discipline (Kamboj & Rahman, 2015; Moher et al., 2015). Furthermore, SRs are frequently used as a starting point for establishing HR and ISs practice standards (Moher et al., 2015). The current SR is based on Watson (2015) suggested structural procedure, which lays out the various phases and methods to be followed such as planning, implementation, and the reporting process. According to Boell and Cecez-Kecmanovic (2015), SR is an efficient technique since it follows a predetermined protocol and uses a specific search process. Because of the large quantity of constantly updated HR and IS publications, it is extremely difficult for HR and IS consultants to examine important papers for evidence-based practice (Bastian et al., 2010). That is, when researchers make choices, they should not base their conclusions on limited study designs since such designs provoke certain prejudices rendering the findings ambiguous (Abbas et al., 2008). Therefore, researchers might better rely on solid empirical evidence to influence both practice and theory. An SR according to Evans (2003), is thus one of the most effective methods for assisting and promoting evidence-based HR and IS practice.

The chosen SR technique should follow an established set of norms and principles (Kitchenham & Charters, 2007). According to scholars, the SR will be very efficient if it begins with a methodology to discover, select, and analyse relevant literature (Tranfield et al., 2003). The method should be repeatable, objective, transparent, unbiased, and thorough (Boell & Cecez-Kecmanovic, 2015). The current paper's SR technique incorporates recent scholarly findings and a set of collective

norms and guidelines proposed by Ali et al. (2018, 2020, 2021) and Kitchenham and Charters (2007). Taken together, the rules and guidelines included identifying the necessity for the SR process, defining a categorization framework, adding research questions, and explaining research methodologies. The current paper utilized a keyword search and applied filters where the researchers' read titles and abstracts, followed by reading the complete articles. A backward snowballing approach and a quality evaluation process were used in the execution stage by adding missing papers from the SR. This study's reporting phase involved categorizing the selected papers and discussing the findings. Figure 1 shows the processes, as well as the criteria and guidelines followed.

The following parts of the paper explain each SR stage in more detail.

3. Planning stage

The *first* phase was to determine the requirements of the SR process. Researchers are required to synthesize all known knowledge of a phenomenon in a complete and unbiased manner, which justifies the complex process. Despite the dynamic research on the advanced technologies enabled HR sector, and as discussed earlier, there is a dearth of reviews that outline various discoveries while simultaneously providing a thorough analysis of prior research and practice techniques used pertaining to the benefits, challenges, and functionalities of the advanced technologies in HR sector (Ali et al., 2020).

The *second* phase in the planning stage was to define the research questions (Ali, Momin, et al., 2023), where relative success is gauged on the ability of the SR to answer each question (Ali et al., 2021). The following research questions were developed for the SR:

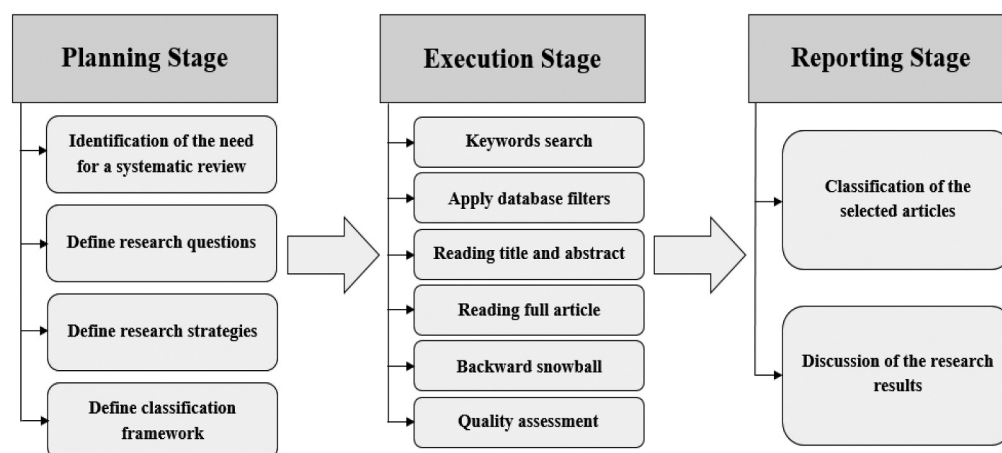
Research Question 1: *What are the outcomes of previous studies and their related themes?*

Research Question 2: *What are the main benefits, challenges, and functionalities of using advanced technologies in the HR function?*

Research Question 3: *What advanced technology strategies are required for future managers and practitioners?*

The *third* phase of the planning stage was to define the article selection strategy. Article selection strategies are designed to find primary articles that provide direct evidence of the research issue. Strategies for article selection should be determined during the protocol formulation to limit the probability of bias; however, they may be modified during the search process

Figure 1. Systematic review stages.



(Dabić et al., 2020). An integrated search approach was used in this phase, which included a comprehensive automated search of several internet databases as well as a manual evaluation of the selected articles. Using the comprehensive automated search approach helped to integrate the most relevant sources online (Golder et al., 2014; Rosado-Serrano et al., 2018). The online resources used for this study included Science Direct, the ACM digital library, Emerald Insight, Taylor & Francis Online, and Wiley online library. Other distinct databases must have been accessed for the current review, but the investigators found that the same results were derived from other databases/repositories; hence, they prudently eliminated the multiplicity of results, by resorting to one comprehensive database, described. Furthermore, suitable filtering methods were used to limit the study findings for each database (McLean & Antony, 2014).

A broad manual review technique was used during the review process. This comprised reading the title and abstract of each research article first (Golder et al., 2014), followed by reading the full text of the articles with elimination of irrelevant ones (Ali et al., 2021). In addition, a backward snowballing approach was used to find articles that were missed by the process. To find new articles, this method used a reference rundown (Wohlin, 2014). The backward snowballing method began with an analysis of the reference list and the removal of publications that did not meet the main research criteria, such as language, publication year, or publishing type. Articles that had previously been investigated that met these criteria were then deleted from the list. The remaining papers were included in the research.

The *fourth* phase of the SR is the planning stage. This phase serves as a foundation for understanding the current theoretical and practical views on a relevant issue, or theme. The review protocol here describes the procedures used in the SR. To eliminate the risk of researcher bias, a pre-determined methodology was required to avoid researcher bias. The current study adapted the Van Oranje et al. (2009) comparative classification system, commonly applied to a social science literature survey. This research classification framework had three categories; which includes the

Table 1. Selection criteria

Criteria	Inclusion	Exclusion	Rationale
Publication Type	Scholarly articles (Conference and Journal)	None: academic resources	To make sure that the research retrieves information from academic sources such as journal articles and conference papers.
Peer-reviewed	Peer-reviewed	None: peer-reviewed	To make sure the quality of the used articles.
Year of publication	Articles published between 2011 to 2021	Articles published before 2011	To make sure about the validity of the content of any article that has been used in this review study. The benefits, challenges, and functionalities of using any type of technology has been changed or modified over the time. So, 10 past years is an appropriate time period when the research authors can observe more solid trends.
Language	English language	Any other language than English language	English is the official language for research articles.

benefit, challenges, and functionalities of using advanced technologies in HR sectors. Each of these categories included sub-categories with their factors. All three categories and sub-categories with their factors quite clearly emerged from the articles reviewed for the SR (Table 1).

4. Execution stage

The primary techniques defined in the planning phase were utilized to identify relevant publications during the execution phase as follows:

- *Identifying search keywords:* Identifying keywords is a continuous process that begins with employing unique search terms from articles in the field of research (Hu & Bai, 2014). The procedure is complete after all of the well-known articles have been identified using the same methods repeatedly. Advanced research tools (database navigation tools) were available in the databases used in our study, allowing for the combination of pertinent search terms. In this review, we identified the following keywords: “information system” OR “information technology” OR “innovation” OR “advanced technologies” OR “cloud computing” OR “internet of things” OR “mobile technologies” OR “social media” AND “benefits” OR “advantages” AND “challenges” OR “issues” OR “barriers” OR “obstacles” AND “adoption” OR “implementation” OR “using” AND “functionalities” AND “human resources” OR “training” OR “development” OR “recruitment” OR “selection”. The main purpose of choosing these keywords for this review study is to help researchers find the best and most relevant articles for the theme in question. Keywords are used to narrow down the search to define the field, sub-field, and research issue; because the chosen keywords have a direct impact on the results of the research.
- *Filtering:* Filtering techniques were used to improve the research findings while searching internet databases (Zhang et al., 2014). The research used a variety of parameters in our review analysis, including research field (ISs and HR), year of publication (2011–2021), document type (journal articles and conference papers), and language (English).
- *Reviewing:* Once the results were obtained, the articles were carefully reviewed for relevance to the study objectives, concentrating on the title and abstract (Pucher et al., 2013).
- *Paper content:* The content of the articles collected and passed the previous phase were extensively analysed using our study objectives (Shea et al., 2007).
- *Backward snowballing:* The backward snowball approach was used to locate items that were not found using the automated research strategy (Spanos & Angelis, 2016).
- *Quality evaluation:* The research used some quality evaluation criteria to ensure that all of the articles in our review met the minimum quality level (Hu & Bai, 2014). To determine if an article should be included, a checklist was created. The checklist questions were adapted from Ali et al. (2021) and Sadoughi et al. (2020). This related to the following criteria: The research objectives discussion was satisfactory. The research questions and research problem were clear. The data used were well described and available. The adopted methodology was well presented and used. The research results were well presented and were designed to answer the research questions.

A quality score was utilized in this review to determine if the outcomes of a selected article met the study quality criteria. The score was used to check whether any of the individual quality variables (such as sample size and validation technique) were linked to the primary research result. To reduce bias and enhance the validity of the SR, the research examined the quality of the relevant articles after they had been chosen. Following this process, 101 articles were pooled for review, based on quality criteria. To guarantee that study principles and methodologies were honored, the research examined the selected studies in terms of scientific diligence, dependability, correctness, and propriety. The research looked at whether the outcomes were focused, unique, relevant, and valuable to future scholars, experts, and businesses. These requirements were necessary to make substantial and useful contributions to the scientific community. Consequently, studies were categorized based on their major study goals, methodological, contributions, and outcomes. We were able to discover, retrieve, categorize, and synthesize data in response to study questions thanks to this classification.

This SR was conducted from January 10th, 2022, to April 11th, 2022, in accordance with the research methodology established during the planning stage. The initial search identified 1246 articles based on the given keywords. Approximately 101 research articles fulfilled the quality evaluation requirements after completing all of the procedures.

5. Summarizing and reporting stage

The final number of articles chosen for the current review research is illustrated in Table 2. Based on the process of the initial search, 1246 unique articles were found. The number of articles decreased to 548 after applying database filters. Subsequently, the researchers completed a manual review to find publications that were irrelevant to the study theme. As a result, 221 articles were eliminated, leaving 327 articles for review. The complete article reading process was then carried out, with the researchers focusing on particular criteria such as aims, research questions, description of the gathered data, the methodology utilized, and analysis technique used to scrutinize the data. Reading the complete articles resulted in the removal of another 211 irrelevant articles, leaving 116 articles. The research then followed the reverse snowball approach, which resulted in the addition of 8 articles, cumulating for a total of 124 articles. Finally, 23 items were eliminated after reviewing the quality evaluation criteria, bringing the total number of articles down to 101. For more details see Figure 2.

Figure 2 illustrates the final number of articles selected for the present review study. Specifically, based on the initial research process (keywords), 1246 unique articles were found. After applying all the strategies described above, the number of articles was narrowed down to 101.

5.1. Article distribution by publication year

The first articles in this review were based on the advanced technologies-enabled HRM sector and were sourced from the year 2011 (Figure 3), with the full range of articles selected, restricted to the years 2011 through to April 2022. The article selection range and longitudinal approach over 10 years reflected the reality that a selection range beyond this period would not be representative of the pace of technological change and more recent technological breakthroughs. Following this process, the largest number of articles (12) were published in (2018, 2020, and 2021), and the least (1), were published in (2022). The majority of articles published between 2018 to 2021 perhaps indicated the increasing relevance and importance of the impact of using advanced technologies in the HR function.

5.2. Distribution of articles by database

Figure 4 demonstrates the databases that were chosen for this review study. It included Science Direct, the ACM Digital Library, Emerald Insight, Taylor & Francis Online, and Wiley Online Library. The researchers found that the highest number of chosen articles were sourced from the Emerald Insight database with 28 articles, followed by 23 articles from Taylor & Francis Online. Another 21 articles were sourced from Science Direct, followed by 15 articles from ACM Digital. The smallest number of chosen articles were sourced from the Wiley Online Library database with 14 articles.

6. Research results

This section now explores the results of the SR and answers each of the research questions. Here, the research questions are restated for discussion and are informed by Tables 3 to 8 which classifies the summarizing and reporting stage by emerging challenges, associated categories, and their sources over the search period.

Research Question 1: *What are the outcomes of previous studies and their related themes?*

The classification of the key technologies nowadays is not unified, and distinct categorizations are found as apparent. One approach defines the following categories of key technologies: Internet-of-Things (IoT), cyber-physical systems, cloud computing, big data analytics, and

Table 2. Review search results

Databases	Automated Search		Manual Search		Backward Snowball	Final Results
	1 st Strategy Keywords Result	2 nd Strategy Apply Filters	3rd Strategy Title and Abstract	4 th Strategy Reading Full Articles	5 th Strategy Backward Snowball	6 th Strategy Quality Assessment
Science Direct	290	128	63	22	25	21
ACM digital	110	64	46	18	19	15
Emerald insight	294	117	62	31	33	28
Taylor & Francis	335	133	84	27	27	23
Wiley library	217	106	72	18	20	14
Total	1246	548	327	116	124	101

Figure 2. Review search results.

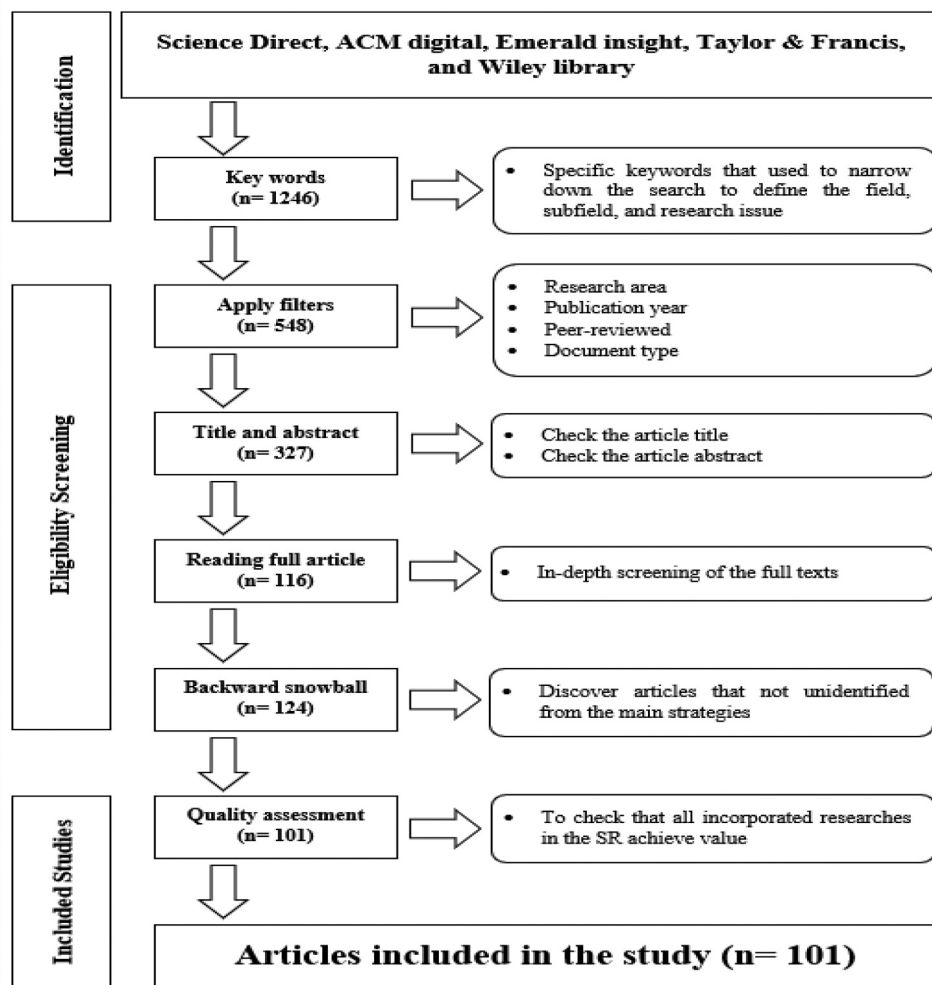
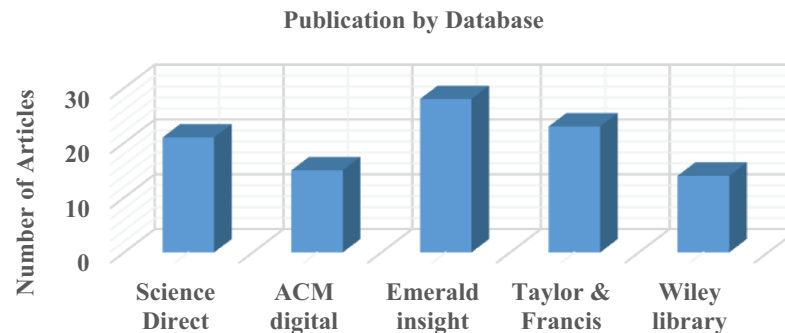


Figure 3. Publications by year.



information and communications technology (ICT) (Zhong et al., 2017). Another approach considers the following key technologies: IoT, sensors, cloud-computing, mobile-computing, and big-data analytics (Channe et al., 2015; Zaidi et al., 2021). The third approach recognizes technology mobile-computing, cloud-computing, big-data analytics, and IoT (Yang, 2017); as the key. The subsequent approach introduces Blockchain, in addition to IoT and cyber-physical systems as critical technologies, especially pertaining to HRIS (Turner et al., 2021). The outcomes of previous studies in our scope are also confirming a vague and dynamic environment; especially, regarding the classification and categorization of technologies. Given the fact that we did not find unified

Figure 4. Publications by database.



cataloguing for the existing technologies, which indicates a need for more complex classification and categorization; at a second or third-level classification; that might concern the tools, platforms, techniques, and so on. Consequently, we considered all the technological and technical themes, which will include and not be limited to tools, concepts, trends, techniques, platforms, software, physiologies, and so on.

In such an approach, we find that the previous studies concerning recruitment and selection show that e-recruitment and social media recruitment appeared among the first technological/technical aspect that offers benefit and challenges; and influence over the functionalities (Dhamija, 2012; Eckhardt et al., 2014; Faliagka et al., 2012; Fisher et al., 2014; N. Sharma, 2014). Other aspects that followed, were big-data and machine learning (ML) techniques (Chalfin et al., 2016; Zang & Ye, 2015) in the same context of offering benefits and better functionalities and challenges. ML evolved swiftly, relative to AI (Upadhyay & Khandelwal, 2018; Ahmed, 2018; Barboza, 2019; Guchait et al., 2014; Johansson & Herranen, 2019; Yawalkar, 2019). Finally, from e-recruitment, the whole discipline progressed to e-HRM (Abdeldayem & Aldulaimi, 2020; Zeebaree et al., 2019), which has included almost all the functions of HRM. In favor to recognize the dynamic environment, robotic process automation (RPA) and algorithmic HRM, have sought attention more recently (Balasundaram & Venkatagiri, 2020; Meijerink et al., 2021).

Furthermore, in congruence with to recruitment and selection, the training, and development function exhibited a similar pathway. During the decade, e-training (N. Sharma, 2014) has accompanied virtual training (Amara & Atia, 2016; Strohmeier & Piazza, 2013), which has led to further progression of the science. And most recently, online training emerged, in addition to the previous two, which we can attribute to the COVID-19 timeline. On the other side, learning is identified as a separate pillar and specific systems are developed for appropriate management (Hirsch & Ng, 2011). Yet another crucible that raises concern is the centrality of learning such as self-oriented, team-oriented or blended learning (Abdeldayem & Aldulaimi, 2020; Ahmed, 2018; Alrubaie et al., 2020)

Research Question 2: *What are the main benefits, challenges, and functionalities of using advanced technologies in the HR sector?*

While the area of study has been existent since, the past century, the turn of the new century has been revolutionary and integral to its progression. Most of the seminal works on this sphere, especially with bespoke customization of technology systems to the HR function, have evolved in the current century.

Categorically, it could be discussed that while technology enablement has aided the aggregation and patterning of the data; the system has largely influenced the reduction of human effort and fatigue. The parameters of efficiency, ease of communication, decision function and the enhanced

Table 3. Benefits related to recruitment and selection

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> • E-Recruitment • Social media recruitment • ML techniques • AI – screening, chat-bots, and automated social media scraping tools • Artificial intelligence (AI) • Big data • e-HRM • Robotic process automation (RPA) • Algorithmic HRM 	Efficiency	Processes	Dhamija (2012); Faliagka et al. (2012); Al-Otaibi and Ykhlef (2012); Sinha and Thaly (2013); Guchait et al. (2014); Nagendra and Deshpande (2014); N. Sharma (2014); Tufts et al. (2015); Tiusanen (2013); Okolie and Irabor (2017); Upadhyay and Khandelwal (2018); Geetha and Bhanu (2018); Leong (2018); Ahmed (2018); Barboza (2019); Yawalkar (2019); Zeebaree et al. (2019); Johansson and Herranen (2019); Gonzalez et al. (2019); Abdeldayem and Aldulaimi (2020); Bannikov and Abzeldinova (2021); Garg et al. (2021).
		Cost reduction	
		Effort related	
		Time reduction	
	Effectiveness	Effectiveness	Nagendra and Deshpande (2014); Okolie and Irabor (2017).
	Experience	Ease of use	Sinha and Thaly (2013); Fisher et al. (2014); Upadhyay and Khandelwal (2018); Yawalkar (2019).
		User-friendly	
		Innovative	
	Employer branding	Image of organization	N. Sharma (2014); Okolie and Irabor (2017).
		Reflecting the organizational culture	
	Communication	Share information	Upadhyay and Khandelwal (2018); Zeebaree et al. (2019).
		Up-to-date details	
	Secure	Secure	Upadhyay and Khandelwal (2018).
	Decision-making	Decision-making	Alam et al. (2016); Barboza (2019); Yawalkar (2019); Zeebaree et al. (2019); Garg et al. (2021).
	Improve the quality of the process	Reduce error	Sinha and Thaly (2013); N. Sharma (2014); Tufts et al. (2015); Tiusanen (2013); Okolie and Irabor (2017); Ahmed (2018); Geetha and Bhanu (2018); Upadhyay and Khandelwal (2018); Gonzalez et al. (2019); Barboza (2019); Yawalkar (2019); Abdeldayem and Aldulaimi (2020); Bannikov and Abzeldinova (2021); Garg et al. (2021).
		Improved matchmaking	
		Elimination of stereotypes	

Table 4. Challenges related to recruitment and selection

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> E-Recruitment Social media recruiting MLtechniques AI - screening chatbots and automated social media scraping tools 	Knowledge based	Understanding the issues, the e-recruitment technology	Dhamija (2012); Fisher et al. (2014); Tufts et al. (2015); Alam et al. (2016); Yawalkar (2019); Charliwood and Guenole 2022; Barnnikov and Abzeldinova 2021.
		New digitalization skills of HR employees	
		IT knowledge and skills	
		The “edge-cases” with no previous knowledge	
		Operation Systems knowledge	
<ul style="list-style-type: none"> Artificial intelligence (AI) Big data e-HRM Robotic process automation (RPA) 	Data input & requirements	Complex recruitment/selection requirements for senior positions	Faliagka et al. (2012); Al-Otaibi and Ykhlef 2012; Gupta (2013); Landers and Schmidt (2016); Gonzalez et al. (2019).
		Applicants’ personality quality input	
		Inappropriate traditional information retrieval techniques	
		Human error	
		Pragmatism of social media data	
Algorithmic HRM	Legally & ethically based	Data quality prediction constrains	Beattie and Johnson 2012; Gupta (2013); Gibbs and Mackay (2015); Tufts et al. (2015); Landers and Schmidt (2016); Ladkin and Buhais 2016; Landers and Schmidt (2016); Stuart and Norvig 2016; Chamberlain (2016); Gelinis et al. (2017); Ahmed (2018); Zeebaree et al. (2019); Deraus and Ryan 2019; Gonzalez et al. (2019); Johansson and Herranen 2019; Charliwood and Guenole 2022.
		Legal usage of information	
		Ethics	
		<ul style="list-style-type: none"> fairness, bias, unconscious discrimination 	
		Stereotyping	
		Vague specific regulation and lack of bioethics literature	

(Continued)

Table 4. (Continued)

Technology and Technical themes	Category	Factors	Sources
	Financially based	<p>Costly technology to:</p> <ul style="list-style-type: none"> • ensure infrastructure compatibility • upgrade & maintain • resolve and prevent malfunction <p>Insufficient HR support applications</p> <p>Costly IS HR specialists' payment</p>	<p>Gupta (2013); Nagendra and Deshpande 2014; Bannikov and Abzeldinova 2021.</p>
		Alignment between ISs, other business functions, the IS strategy and HR strategy	
		Strategic value identification	
		Competitive advantage identification	
		Ensuring adequate vendor agreement	
		Lack of attention by HRIS developers related to talent	
		Quick respond delivered by modern equipment, programs and technologies	
		Ensure job security, and prevent losing jobs due to automation	
		Worker autonomy	
		Ensure appropriate employees' wages	
	Job stability & security		<p>Stuart and Norvi (2016); Charlwood and Guenole 2022.</p>

(Continued)

Table 4. (Continued)

Technology and Technical themes	Category	Factors	Sources
Alignment between Systems, Process & Technology oriented		Well formulated processes to carry out vast number of applications	Fisher et al. (2014); Eckhardt et al. (2014); Tufts et al. (2015); Alam et al. (2016); Landers and Schmidt (2016); Okolie and Irabor 2017; Geetha and Bhanu 2018; Balasundaram and Venkatagiri 2020; Bannikov and Abzeldinova 2021; Zeebaree et al. (2019).
		Transformation & placement of: • infrastructure • tools • systems • communication • workflows	
		Maintaining a consistency among: • social media, • organizational culture, goals, and values • relative advantages • perceived cost • competitive pressure • vendor support Government policy and support	
		Reliability and validity of the tools, systems, processes	
		Website attributes	
		Blurring of boundaries in online information	
		Vague social media inclusion in existing systems	
		Maintaining quality of staffing functions vs e-recruitment	
		HR managers to grasp the strategies, functions, and conditions of organizations	
		Ensure structured, controlled, and professional approach always	
		Ensure optimum number of personnel depending on the work process automation	

(Continued)

Table 4. (Continued)

Technology and Technical themes		Category	Factors	Sources
	Perception based		Brand reputation	Ladkin and Buhalis 2016; Gonzalez et al. (2019); Zeebaree et al. (2019).
			Unfavorable reactions toward AI/ML from: <ul style="list-style-type: none">• job applicants• media	
			General public	
			Organizational politics & culture impact the adoption	
	Global trend oriented		War for Talent	Eckhardt et al. (2014); Zeebaree et al. (2019).
			Increasing number of applications	
			Job market switch	
			Globalization of job market	
			Changing communication behavior	
			Cultural setting	
			Social influence	
	Others		HR employees' decisions restrictions	Gupta (2013); Zeebaree et al. (2019); Yawalkar (2019); Garg et al. (2021).

Table 5. Functionalities related to recruitment and selection

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> E-Recruitment Social media recruiting 	HR Planning	HR Planning	Nagendra and Deshpande 2014; Bannikov and Abzeldinova 2021
<ul style="list-style-type: none"> ML techniques AI - screening chatbots 	Sourcing	Sourcing	Gupta (2013); Onik et al. (2018); Ahmed (2018).
<ul style="list-style-type: none"> and automated social media scraping tools 	Job posting	Job posting	Gupta (2013), Sharma (2014), Balasundaram and Venkatagiri 2020.
<ul style="list-style-type: none"> Artificial intelligence (AI) Big data e-HRM 	(Pre) screening process	(Pre) screening process	Faliagka et al. (2012); Gupta (2013); Ahmed (2018); Geetha and Bhanu 2018; Yawalkar (2019); Balasundaram and Venkatagiri 2020).
<ul style="list-style-type: none"> Robotic process automation (RPA) 	Interviewing	Interviewing	Faliagka et al. (2012); Ahmed (2018); Balasundaram and Venkatagiri 2020.
<ul style="list-style-type: none"> Algorithmic HRM 	Searching for a new career within the organization	Searching for a new career within the organization	Gupta (2013).
	Reporting and indicator measurement	Reporting and indicator measurement	Gupta (2013); Abdeldayem and Aldulaimi 2020.

(Continued)

Table 5. (Continued)

Technology and Technical themes	Category	Factors	Sources
	Candidates / talents prediction & assessment /evaluation	Data Skimming & extracting by social media & CV	Faliagka et al. (2012); Gupta, (2013); Chalfin et al. (2016); Upadhyay and Khandelwal 2018; Ahmed (2018); Onik et al. (2018); Leong (2018); Barboza (2019); Yawalkar (2019); Garg et al. (2021); Mejerink et al. (2021); Charlwood and Guenale 2022.
		Filtering out applications without key	
		Testing	
		Gamification	
		Simulations	
		Analyzing candidates' personalities & pattern exploration	
		Background investigation of applicants	
		Verification of job requirement fulfillments	
		Ranking of the candidates	
		Automated prediction models adjustment.	
	Interaction with applicants	<ul style="list-style-type: none"> • Scheduling • Providing notification, answers and feedback • Re-engagement • Job offer letter mailing • Post-offer acceptance activities 	Ahmed (2018); Leong (2018); Upadhyay and Khandelwal 2018; Yawalkar (2019); Geetha and Bhanu 2018; Balasundaram and Venkatagiri 2020.
	Performing HR transactions (including hiring)	Performing HR transactions	Abdeldayem and Aldulaimi 2020; Bannikov and Abzeldinova 2021.
	Interaction with new employees	<ul style="list-style-type: none"> • On-boarding, • Orientation 	Geetha and Bhanu 2018; (Balasundaram and Venkatagiri 2020.

Table 6. Benefits related to training and development

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> • E-training • Online training • Virtual training • Team learning • Self-learning • Online blended learning • Learning management system 	Mobility (movement of trainees)	Less transportation	Mohsin and Sulaiman (2013). Amara and Atia (2016); Alrubaie et al. (2020); Gekara and Snell (2018); Agrawal et al. (2020).
		Flexibility of time	
	Ease of accessibility	Available Information	Mohsin and Sulaiman (2013); Amara and Atia (2016); Gekara and Snell (2018); Alrubaie et al. (2020).
		Quick retrieve of information	
	Strengthening education	Available media and materials	Chauhan et al. (2011); Mohsin and Sulaiman (2013); Amara and Atia (2016); Alkasasbeh and Omar (2016); Alrubaie et al. (2020).
		Available training for everyone with different level of expertise	
		Large number of trainees Addressed at the same time	
	Evaluation methods	Keep a record and track employee participation	S. Sharma (2012); Amara and Atia (2016); Riebli (2018).
		Multiple assessment methods used	
		Accurate scores	
		Real time feedback	
	Motivation	User satisfaction	Gürol (2011); Yawalkar (2019); Alrubaie et al. (2020); Wiradendi et al. (2020).
		Employee engagement	
	Efficiency	Cost reduction	Chauhan et al. (2011); Mohsin and Sulaiman (2013); Stephens and Dailey (2015); Alkasasbeh and Omar (2016); Makembo and Oluoch (2018); Gekara and Snell (2018); Walichio et al. (2018); Papageorgiou (2018); Sutarto et al. (2019); Alrubaie et al. (2020); Garg and Sharma (2020); Agrawal et al. (2020).
		Effort related	
		Time reduction	
	Communication	Interactive atmosphere	Pena-Sanchez (2012); Amara and Atia (2016); Mohan and Thampi (2017); Alrubaie et al. (2020).
		Encourages cooperation	
		Share of updated information	
	Career development	Build employees career path	Chauhan et al. (2011); Pena-Sanchez (2012); Jokic et al. (2012); Bennett (2014); Ahmed (2018); Abdeldayem and Aldulaimi (2020); Areiqat and Al-Doori (2018); Okumu et al. (2018); Agrawal et al. (2020); Bennett and McWhorter (2021); Kumar and Kumar (2021); Al Rawashdeh et al. (2021); Janna et al. (2021).
		Build knowledgeable employees	
		Higher employee resilience and productivity and performance	

Table 7. Challenges related to training and development

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> • E-training • Online training • Virtual training • Team learning • Self-learning • Online blended Learning • Learning management system 	Internet issues	Network outages	Mohsin and Sulaiman (2013); Amara and Atia (2016); Sutarto et al. (2019); Pratama and Kusuma (2021).
	Not enough experience	Lack of experience in the technical field or using the platforms	Amara and Atia (2016); Jain and Kaur (2017); Gekara and Snell (2018); Pratama and Kusuma (2021).
	Negligence from Software companies	Lack of material support or quality content	Ramayah et al. (2012); Amara and Atia (2016).
	Barriers	Language barrier	Ramayah et al. (2012); Mohsin and Sulaiman (2013); Al-Hila et al. (2017); Asamoah and Avenorgbo 2020.
	Lack of engagement	Isolated from peers	Ramayah et al. (2012); Al-Hila et al. (2017); Asamoah and Avenorgbo 2020.
	computer literacy	Lack of computer knowledge	Granda (2011); Ramayah et al. (2012); Mohsin and Sulaiman (2013); Gekara and Snell (2018); Asamoah and Avenorgbo 2020; Pratama and Kusuma (2021).

Table 8. Functionalities related to training and development

Technology and Technical themes	Category	Factors	Sources
<ul style="list-style-type: none"> • E-training • Online training • Virtual training • Team learning • Self-learning • Online blended learning • Learning management system 	Remote training platforms	Images and animation, video, audio, and presentation	Kelly and Thorn (2013); Sampson and Zervas (2013); Bates (2014); Chiang et al. (2015); Corbi and Burgos (2014); Amrieh et al. (2015); Ferdiana (2015); JISC (2016); Day and Erturk (2017); Miller et al. (2021).
		Scorm platform	
		Xapi	
		Cmi5	
	Testing	Scoring assignments and provide automated tracking	Aggarwal and Kapoor (2012); Chakraborty and Mansor (2013); Amara and Atia (2016); Agrawal et al. (2020); Charlwood and Guenole 2021.

quality of decision-making and eradication of human bias have been one of the integral accomplishments of the function. While the system enjoys these merits; the last merit could be ambivalent; wherein the same merit could dawn the avatar of a drawback. Too much objectivity in the whole recruitment process can eradicate the humane touch in the process; which makes it too monotonous and mechanistic process, which is a deterrent to the progression of the function and the organization, in general. Besides these, the enormous costs and the regulatory sanctions make

the whole process stringent and tardy; which is yet another challenge to the whole institution of the process. Further, agile customization of the technology to specific domain needs is requisite that has been initiated and can be further enhanced as time progresses. Moreover, one of the integral contingents to the timely proliferation of HRIS is the development of complementing technologies; which, on the one hand, is a boon and on the other makes the whole HR gamut dependent on ancillary technologies to bloom and progress. Thus, the overall ambivalence the current system enjoys is the inexistence or partial existence of humane functionalities in the HRIS, which has to be addressed with prudent, poised interventions.

The review found that there were three major categories each with their own embedded associated sub-categories with their related factors and sources.

7. Domain 1: Recruitment and selection

As generally known hiring of employees (sometimes referred to as staffing) includes recruitment and selection of job candidates and their transformation from job candidates to new employees. The process of hiring employees starts with recruitment and the important outcome of the recruitment is the selection of candidates that are qualified for the specific posted job (N. Sharma, 2014). Recruitment and selection fall under the staffing sub-function of HR management. These are the key steps through which an organization attracts incumbents; and potential employees. While recruitment entails attracting and inviting applicants, the selection focuses on building and deploying a set of tools to ascertain if the applicants, demonstrate the potential to succeed in the relevant roles, if selected. In conjunction with the technology, we identified the benefits, challenges, and functionalities as presented below.

7.1. Benefits related to recruitment and selection

Recruitment is a process that is crucial for companies, given the challenging labour market conditions, and the revolution of the Internet (Okolie & Irabor, 2017). Internet websites and online work boards are common practices for companies (N. Sharma, 2014). The announcement of the job opportunities and enabling the applicants' internet submissions in a variety of electronic formats and correspondence, all this implies e-recruitment (Dhamija, 2012; Okolie & Irabor, 2017). More specifically, social media recruitment denotes advertised job posts and received applications from a specific network such as Facebook, LinkedIn, or similar (Fisher et al., 2014). Besides e-recruitment and social media recruiting, many other technological deployment modalities have advanced such as AI, ML, algorithmic HRM, RPA, specific hiring applications and entire e-HRM solutions (as referenced in the table above). It's evident that the traditional methods of recruitment have changed broadly regardless of the size of the companies (Okolie & Irabor, 2017); and this trend continues until the present. Supplementary, some social media tools went beyond, and they stipulate data for candidates that are available on their social media profiles (Ahmed, 2018). Fortunately, AI and ML support the large quantities of data collected through CVs, social media, interviews, routine questions related to employment, and so on, to be properly utilized (Dyachenko et al., 2017; Gonzalez et al., 2019). As a result of the adopted changes and developments in the last decade, many benefits, challenges, and functionalities have emerged.

The benefits are immense and have demonstrated improvements in efficiency, effectiveness, and communication, augmented experience for the users, enhanced employer branding, improved decision-making and quality of the process; and lastly, those new methods are secure to use. However, we find that the main contribution is in the improved efficiency and the quality of the process. The efficiency is enhanced by improved processes, cost reduction, less human effort, and the time to complete the tasks has decreased. The quality of the processes is achieved by the reduction of errors, improved matchmaking, and elimination of stereotypes concerning. To summarize, we have identified 17 factors that are classified into 8 categories. These categories are targeting improvements on both user-end (employee) and the company-end; such as ensuring better effectiveness, efficiency, and 24/7 security and information flow; better quality, which entails relevant and informed decision-making; and benefits for establishing the employer brand.

Algorithmic HRM is the use of software algorithms that operate on the basis of digital data, to augment HR-related decisions and/or to automate HRM activities (Meijerink et al., 2021). AI is a system's ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation. AI, sometimes called machine intelligence; is intelligence demonstrated by machines (Ahmed, 2018). RPA is an attempt to mimic the steps carried out by humans, carrying out routine tasks or duties associated with business process management role (Balasundaram & Venkatagiri, 2020).

7.2. Challenges related to recruitment and selection

In parallel with the changes in recruitment and selection methods and technologies, challenges have soared and diversified. With reference to the table below, the identified challenges and/or disadvantages concern the knowledge, data input and definition of requirements, law and ethics, finances, job stability and security, alignment between systems, process, and technology, perception, the global trend and others. More specifically, with reference to the table above, we find that the main challenges and disadvantages are legally and ethically based, and they occur due to the need for alignment between systems, processes and technology.

Apropos the challenges and disadvantages that are legally and ethically based the attention is on information and its usage. It's crucial to ensure the collected information adheres to the applicable and positive laws and regulations, and privacy is secured. Furthermore, the challenge that is related to the ethical issues is addressing fairness, bias, unconscious discrimination, and stereotyping, and finally, attention is on the lack of specific regulation and bioethics literature. Vis-à-vis the alignment between systems, processes and technology is to clearly formulate the processes, to ensure smooth transformation of tools, systems, workflows, tasks and communication, and to ensure compatibility and appropriate IT infrastructure. Moreover, other related challenges are consistency among social media and website attributes, ensuring validity and reliability; and alignment of organizational culture, strategy, goals, values and functions. Associated challenges tackle the condition of an existing organization, its centralization and perception related to the cost and determination of the optimum number of employees depending on the specific automation. Lastly, related to alignment between systems, process and technology, the challenge is to ensure a structured, controlled and professional approach in all of the phases, to preserve the quality of functions for the recruitment vs the overall trends in e-recruitment, and to cope with the competitive pressure, technology vendor support, and government policy and support.

7.3. Functionalities related to recruitment and selection

In parallel to the changes in the recruitment methods and technologies, besides the benefits and challenges, functionalities have altered too. Given the table above, the functionalities impacted by the IT development and related to recruitment and selection are HR planning, sourcing, job posting, pre-screening process, interviewing, internal search for a new career within the organization, reporting (including assessment of various indicators, prediction, and evaluation of the suitability of candidates and talents), interaction with applicants (such as scheduling, informing, answering and feedback), re-engagement, mailing the job offer, post-offer acceptance, and so on, 24/7 support (via chat, text message, etc.), then performing HR transactions (such as hiring), interaction with new employees (including on-boarding, orientation and introduction to the policies, procedures, and culture of the organization). Though, it is interesting and important to denote, how the operationalization of intermediate AI applications in the form of games provides information for candidates' memory, risk, ability to read signs and focus (Ahmed, 2018) (Table 5).

8. Domain 2: Training and development

As generally known Training and Development is a sub-function of HRM and plays a key role in enabling employees to perform better in their current and future tasks. Upadhyay and Khandelwal (2022) demonstrated that the future potential for training using more advanced technologies promises a wide range of benefits for both employers and employees. Hence, we anticipate the benefits.

8.1. Benefits related to training and development

The development of information technology has contributed to the phenomenal growth in organizations' e-learning (e-training), in recent years. E-training is similar to e-learning in many ways in terms of the methods of delivery and technology used, except that has a short time frame for learning and for specific skills. For the purpose of this paper, e-training refers to provided training by organizations through electronic media, which includes self-adult learning from Intranet, learning online, team training, blended learning, and virtual training provided by instructors available to the employee (Ramayah et al., 2012; Asamoah & Avenorgbo, 2020). The benefits of e-learning have been extensively covered to include a reduction in trainee movement and commutation (Alrubaie et al., 2020), ease of accessibility of training content, strengthening employees' knowledge (Amara & Atia, 2016), and making evaluation accurate and easy scoring. In addition to encouraging employees' engagement and motivation by asking questions (Alrubaie et al., 2020; Gürol, 2011; Yawalkar, 2019). Moreover, e-training increases efficiency in terms of cost, time, and effort (Abdeldayem & Aldulaimi, 2020; Agrawal et al., 2020; Ahmed, 2018; Al Rawashdeh et al., 2021; Bennett, 2014). Janna et al. (2021) have stated specifically that eLearning provides career development, and advancement, which, in turn, affects productivity and performance. Comprehensively, twenty-two factors were finalized in eight categories of benefits. These categories are targeting improvements on both user-end (employee) and the company-end such as ensuring flexible mobility and efficiency, 24/7 information and communication, advancement of education that entails various evaluation methods, and supporting the employees' motivation and career strategies. Moreover, another clause to spot is the challenges (Table 6).

8.2. Challenges related to training and development

Despite all the benefits mentioned above of e-learning, research reveals that many are not satisfied with the experience. In addition to a lack of experience in the technical field of using the platforms (Pratama & Kusuma, 2021); another study by Ramayah et al. (2012) has found that material support or quality content is a challenge facing training functions. The language barrier is a very important factor that inhibits the training process, as well as employees are alienated and isolated from peers, which affects their engagement level (Asamoah & Avenorgbo, 2020); complementary to the above contention is the fact that computer literacy is a crucial step to develop the learning activity. With attention to the table associated with the challenges in Training and Development, several sub-categories of challenges have been identified varying from internet, experience, negligence, identified barriers, and engagement up to computer literacy. More specifically, the challenges are reflected by network outages, ranges of shortages, such as experience in the technical field or platforms, material support or quality content, language skills, and computer knowledge, and lastly isolation from peers. Given the information above, it is reasonable to conclude that the challenges might be classified into the following categories: challenges for the HRs to obtain and maintain the necessary knowledge, then the challenge due to technical resources, and the social component of employees. Nevertheless, the most exploited challenges are shedding light on computer literacy and particularly addressing the need for relevant computer know-how. Moreover, another dimension to focus on is the functionalities (Table 7).

8.3. Functionalities related to training and development

In parallel to the changes in the training methods and technologies, the benefits and challenges, and functionalities have altered too. Given the table above, the functionalities affected by the IT development and training are different training platforms, such as audio, video, presentations, and SCORM, Xapi, and cmi 5 platforms (Miller et al., 2021). SCORM is the sharable content object reference model standard, which is a tool that facilitates learners' orderly online training and for organizations that are content creators to distribute their courseware to a variety of learning management systems. Xapi is the experience programming application interface, which is an open-source data interface that aids the learning process by permitting software applications to share data. cmi5 is designed to share components of SCORM and Xapi and combine the benefits (Miller et al., 2021). Moreover, another functionality that is important for the learning process to take place is the function of testing, which included scoring assignments and providing automated tracking. Though due to the best knowledge of the authors, the functionalities evolved around the

remote approach and automated (related to testing) features, and as such, they contribute towards the facilitation of HR function (Table 8).

Research Question 3: *What advanced technology strategies are required for future managers and practitioners?*

The future cult of HR managers belongs to Generation Z; which is technology-driven and believes in human abilities and artificial systems; thus, it shall be integral for the consolidated efforts of theorists, practitioners, and technology enablers to devise ways and means to enable intelligence to artificial architectures. For the future genre of users, system architects can initiate the usage of newer technologies like blockchain, growth, and re-generative technologies that can customize human intellect in artificial systems. The detailed review develops an understanding, the architecture should be able to tweak and customize functionalities; besides empowering the users for a more enhanced experience and expedited output. Time-central and data security shall be pivotal for the future genre of users and hence requisite functionalities have to be harnessed in this case. Finally, the review informs that organizations shall be required to embark on bringing newer domains into the ambit of IS so that intra-functional disparity could be curtailed and coaxed, as and when needed.

The effectiveness and the values of HR management practices have been under literature attention for a longer period (Becker & Smidt, 2016). To entail broader relevant further attention, we present below several robust implications for the theory, practice, and policy.

8.4. Implication for theory

According to this paper, in the last decade, the development of recruitment and selection has shifted from only the collection of wider amounts of data by various internet sources, which are associated with the job candidates' profiles in the recruitment phase, to a more sophisticated prediction and decision-making for the successful candidate in the selection process. Thus, theory and science aim and invest in the development of AI, as according to Geetha and Bhanu (2018) in various situations AI is proven to be smart as the human brain. At present, some cognitive activities in HRM are already being executed by computer-enabled systems (Meijerink et al., 2021; Strohmeier & Piazza, 2013; Tambe et al., 2019). Yet, the systematical observation that will particularly spot the biases is highly recommended, as according to Chamberlain (2016) biases vary from bias in favor of something to bias against something. Biases are still a significant concern nowadays and required proper attention.

In the last few years, the software industry has produced several products that organize the various HRs systems into integrated software referred to HRISs or Software (S. Sharma, 2012). Thus, the theory and science aim to invest in integrated software for training purposes. The reason is that e- training infrastructure affects the performance of employees and productivity levels. Therefore, it's important to continue to invest in setting up e-training software (Asamoah & Avenorgbo, 2021). In general, the different e-training system programs have a positive impact on building skills and having knowledgeable employees. However, the outlined challenges should be taken into consideration in order to improve the efficiency and effectiveness of the training function and achieve its training objectives and the required results.

8.5. Implication for practice

The paper implies a shift in HR function in the last decade, which is associated with Tiusanen (2013) interpretation that the HR function from an administrative function evolved to a strategic function and thus HR professionals switched from implementer to facilitator roles. Moreover, our paper is harmonized with the practical suggestion of Bendick and Nunes (2012) that to control the biases during the process of recruitment companies set a variety of procedures, and training. Additionally, we support Tufts et al. (2015) that the decision-makers need processes and assessment tools that will ensure proper hiring. In addition, we align with Onik et al. (2018) that to

mitigate the biased systems in HRM (including recruitment) Blockchain is recommended as key future smart technology. We concur that the partial or full automation of HRM-related decision-making is one of the key features of algorithmic HRM, as stated by Meijerink et al. (2021).

Lastly, we propose that General managers, HR and IT managers and experts, and Human psychology experts utilize the tables of this paper, and identify which benefits, functionality and challenges are in their attention point concerning their specific needs and cases respectfully, and eventually to enrich their comprehension of the contemporary management issues.

8.6. Implication for policy

The paper implies a shift in training function in the last decade, the use of electronic systems software enhanced training and learning process. Our paper findings are in harmony with Mabad et al., (2021) and we contend that challenges should be resolved by strengthening the learning process and the development of the e-training systems. Additionally, we support the study of Ramayah et al. (2012) that the e-training content should be administered well to achieve enhanced information retrieval and ease of use of the software systems. The training program might alternately be carried out fully online, with proper network connectivity and relevant material. Hence, the need for adequate policies and standards for online training implementation by the organization is crucial, in order to achieve and maintain successful training delivery, and outcomes.

In sum, the above review emphasizes the tectonic shift that the HR processes have witnessed in the 21st century, and more so in the past decade. What is significant is the catalysed inclusion of various functions in the ambit of the IS in general, AI, and other technology-enabled systems. With the incessant progression of relevant research; and commensurate practice from the industry; HRIS has come to the fore and focal of extensive research endeavors. While there has been a considerable progression in the adoption of technology in the gamut of recruitment; yet precision has to be ensured to eradicate bias and regressive human forces to influence the function; which is in sync with the earlier research precedents (Bendick & Nunes, 2012). The review has indicated the need for complementary industry and business lines (like the Information Technology industry) to flourish, in order to catalyse the evolution of HRIS. A specific mention is to be made of flourishing technologies like blockchain, AI, growth models, IoT; and other aggregate and generative tech support for initiating the rapid genesis of HRIS for multiple domains. The flourishing role of the HR gamut from a functional area to a strategic function makes it integral to have technology support. So, the nature and magnitude of existent literature on the theme propels us to expand the ambits of technology intervention in HR domain; besides constructing bespoke architectures that interface human intelligence with efficient and mechanical technology properties.

9. Conclusion

Considering the research studies in our perimeter for a complete decade; we concluded that to the best of our knowledge, there is no unified categorization/classification for technologies; particularly for HRs recruitment, selection, training, and development. On the other hand, many terminologies are used for various technological; and technical aspects and themes related to the advancement of recruitment and selection; as well as for training and development. However, there is significant progress in benefits, and functionalities accompanied by challenges, as concluded in more detail below.

Considering the observed inputs on benefits, challenges, and functionalities, we conclude that the recruitment and selection process can be one step closer to greater automated decision-making, where the biases are mitigated, the future of the HR professionals' jobs be secured and gain more meaningfulness and significance rather than administrative congestion. Our conclusion is complementary to the promise of AI to cover the overall process starting from job postings by sophisticated algorithms to analyse all the available data (including tests and interviews executed by robots), and automatically select job-relevant candidates whose skills & other traits are paired

to the top employees (Charlwood & Guenole, 2022). Lastly, the utilization of science-backed technologies is in favour of work-life balance, work content, and ethics as required by the millennial workforce (Abdeldayem & Aldulaimi, 2020).

Considering the observed inputs on benefits, challenges, and functionalities, we conclude that this study sheds light on the training and development process, which can be an addition to automated decision-making, where the biases are resolved and the functionalities are adopted. However, there are important factors to be considered by organizations. In most cases, the focus of the e-training system is on the contents of the training and the ease of using the system. Organizations should consider ways to simplify the training processes and make them easy to understand. Taking into consideration the human aspect of employees being alienated from each other in the e-training and this needs to be addressed. The significance of both management support and organizational support is necessary for the success of the training program. Their involvement is crucial for the overall learning process. This study offers valuable advice to the top management and IT managers relating to factors affecting e-training effectiveness. While organizations are aware of the benefits of e-training; such as cost, effort, time effectiveness, mobility, and consistency of content among everyone; many do not recognize the critical factors that influence the success of the implementation. Challenges such as lack of language skills, computer literacy, poor quality content, and isolation of peers from their colleagues need to be tackled. Therefore, e-learning benefits gained by the employees will help the organization achieve its return on investments.

Apart from ease of use in an e-training environment, the contents and quality of the training are important for the success of any training program. The content has to be updated, related, recent, reliable, and accurate, as the employees apply the skills learned to their real work. This study proposes that the training software systems should be further improved so that managers can spot talented employees and career development opportunities; which can be done by involving the managers in the establishment of the e-training software systems. The study recommends facing the challenges and obstacles stated and resolving it to ensure the efficiency of the training program. Lastly, the review recommends that the training should be conducted frequently throughout the year to ensure that the program is updated.

10. Limitations and future directions

In our SR, we could not include all the previous research carried out in the past decade. As for the future, further research is needed to expand and strengthen the comprehension of the challenges that impede the adoption of HRIS; since according to Alam et al. (2016) there is a significant difference between the adopters and the laggards with respect to all the variables they considered. Particularly, we suggest an empirical study coping with the return on experience for the companies. Differing from the above, Gibbs et al. (2015) claimed that social media is more utilized in marketing and communications rather than in hiring; therefore, we recommend future investigations to identify what and how the HRM professionals can utilize the experiences of their marketing & communication peers regarding their social media practices. Lastly, this study advocates Charlwood and Guenole (2022) suggestion of the future development of AI that requires the involvement of HR professionals, to prevent adverse development of the occupations in HR function.

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