Ulakbilge
Sosyal Bilimler Dergisi

BEYOND TRADITIONAL: HOW ARTIFICIAL INTELLIGENCE TRANSFORMS HUMAN RESOURCES MANAGEMENT?[1]

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Bal, Yasemin, Mert Bal, Ayşe Demirhan and Esin Ertemsir."Beyond Traditional: How Artificial Intelligence Transforms Hunan Resources Management?". ulakbilge, 70 (2022 Mart): s. 189–200. doi: 10.7816/ulakbilge-10-70-01

ABSTRACT

In today's intense competitive environment, the most important power for businesses to gain competitive advantage is to have information and to manage it. The ability to process the data and transform it into information has increased considerably in the last decades. Finding the right data that can provide useful information to the organization can support to make future predictions, determine strategies and take advantage of opportunities. Analyzing this data, identifying the connections and patterns between the data and make decisions in the light of these are seen as the most valuable elements for all organizations today. Today, the HR function is not limited to just historical reporting, and HR professionals actively use data for predictive analytics to understand what might be asked and needed in the future. With the use of artificial intelligence methods in the field of HRM, efficiency and productivity are provided in many functions.The most important benefit that artificial intelligence methods have brought to the field of HRM is that it provides an advantage in terms of time costs and allows processes to be carried out more effectively and objectively. This study will examine the development of artificial intelligence and how it gained importance and found application in the field of HRM. It will be explained in which processes and functions artificial intelligence methods are used in HRM, what value it creates and how it benefits the business. Although there are studies on the use of artificial intelligence in different fields, there are gaps in the literature on studies on its use and benefits, especially in the field of HRM. This study contributes to the literature in closing the gap in this field.

Keywords: Artificial intelligence, human resources management, HR analytics, machine learning, deep learning

Article History:
Received: January 11, 2022 Revised: February 19, 2022 Accepted: February 27, 2022

[1] "This research was supported by Research Fund of Yildiz Technical University, Project number SBA-2021-4540.

Introduction

Artificial intelligence was born with Alan Turing's groundbreaking work "Computing Machinery and Intelligence" published in 1950. Turing asked "Can machines think?" in his study and presented a test known as the "Turing Test" in which he would try to distinguish between a computer and human text response. While this test has come under a lot of scrutiny since its publication, it has been an important part of the history of artificial intelligence and remains an ongoing concept in philosophy, as it uses ideas around linguistics. Artificial intelligence (AI) is a science that uses computers and machines to mimic the problem-solving and decision-making abilities of the human mind. According to Minsky (1974), artificial intelligence is the science about the creation of a machine that can do things it can do using human intelligence. Although a number of definitions of AI have emerged in the last few decades, McCarthy (2004) describes artificial intelligence in his article as; "intelligent machines are defined as the science and engineering of making intelligent computer programs". Artificial intelligence relates to the similar task of using computers to understand human intelligence, but need not limit itself to biologically observable methods. Another definition of AI is "the ability of a digital computer or computer-controlled robot to perform tasks usually associated with intelligent beings". The term is often applied to the project of developing systems equipped with human intellectual processes such as reasoning, discovering meaning, making generalizations, or learning from past experiences.

The field of AI seeks not only to understand, but also to create intelligent beings. AI currently encompasses a huge variety of subfields, ranging from the general to the specific, such as playing chess, proving mathematical theorems, writing poetry, driving a car on a crowded street, and diagnosing diseases. AI is relevant to any intellectual task and it is truly a universal field (Russell and Norvig, 2010). Today, it is possible to see the effects of AI in all areas of life. Artificial intelligence assists in various business functions in the workplace where it can help reduce the workload and work pressure on employees (Yawalkar, 2019). AI applications are seen in many areas from robots to autonomous vehicles, from movie suggestions presented to us on digital channels, to medical decision support systems, from pattern recognition systems to analysis of facial expressions. Artificial intelligence has applications in many fields such as emotion recognition, customer service, recommendation engines, medical diagnostics, gaming, speech and voice recognition, handwriting recognition, natural language processing, computer vision, expert systems, heuristic classification, etc. Although the reflections of AI applications are increasingly seen in the field of business, the field of HRM still lags behind in benefiting from the advantages and conveniences offered by AI. HR departments were insufficient in demonstrating the value they created to the organization and expressing their contribution. However, today with HRM taking a more proactive role and gaining importance as a strategic partner, HR departments are now able to make sense of the data and present the power and value they create to the senior management especially thanks to new applications such as artificial intelligence. As the role of human resources management as a strategic partner has gained importance in recent years, HR managers are also involved in strategy determination processes and the importance of human resources information systems in decision-making processes has gradually increased. As the rapid changes in the competitive business environment require fast actions, businesses have also realized the necessity of using new technologies in their HR systems. Realizing the effectiveness of data-driven decision making, HR departments have started to benefit more from AI methods, which is a data-driven technology. All functions in HRM like candidate screening, recruitment, alignment of HR activates and performance management can be carried with the support of AI methods (Yawalkar, 2019).

AI methods can predict trends and offer suggestions by using historical data, analyze large volumes of data and make meaningful inferences from these data (Merlin and Jayam, 2018). Before using AI methods in HRM processes, HR practitioners struggled to manage data manually and semi-automatically and was unable to do this effectively in a short time. In order to create analytics, it is necessary to collect, store, process and do all these operations in a short time because the data needs to be updated as the conditions change and the data can quickly become irrelevant (Matyunina, 2020). In this process, AI tools save time and effectively solve the time-consuming processes for practitioners in HR functions, thus enable the workforce to work more productive. AI will also guide HR managers in determining HR strategies and processes in accordance with corporate goals and strategies. In this process, AI based tools and methods can provide important insights to HR departments at the point of determining future applications, especially by providing the opportunity to benefit from retrospective data (Murgai, 2018). AI applications provide to unlock deep, actionable insights and predictions about human resources (Margherita, 2020).

HR professionals are not able to find solutions to many HR problems with traditional methods. AI methods can find solutions to many questions that will add strategic value to the organization and thus develop effective strategies

(Hamilton and Sodeman, 2020). For example, which training programs lead to greater productivity or innovation? Which compensation and benefits packages attract and retain employees? Which motivational programs increase employee productivity? Why has the number of turnovers increased in the last two years? Which employee may show the highest performance in two years or which may intend to leave the job in the first year? With this kind of information, an organization can redesign its entire recruiting process and optimize its entire HR process to be more effective. Thus, HR managers can both manage costs more effectively and provide employee motivation. However, it is controversial to what extent HR departments can answer these questions with traditional methods. To answer these questions, HR must capture the data needed and, after analyzing it, generate useful insights from the data analytics. It is frequently observed that HR collects data and in some cases analyzes historical data and sees what has happened in the past, but they do not try to predict what will happen in the future based on historical data (Levenson and Fink, 2017). By using AI methods, predictive analytics allows the organization to make predictions based on historical data. Continuously capturing data from different sources and processing this high volume of data enables to make predictive analytics (Hamilton and Sodeman, 2020). This predictive analytics captures patterns and connections between data so HR managers can understand what actions to take and what resources to allocate for future actions (Gurusinghe, 2021). This creates a significant cost and time advantage to HR managers and enables effective management of the workforce.

How Do We Benefit From AI Methods in HRM?

There are many benefits that AI methods have brought to the field of HRM. One of the most important and challenging processes of HRM is recruitment. A mistake made in this process, a wrong decision, a biased approach or a candidate selection that is not suitable for the job requirements create a serious cost to the organization. As a result, the organization is faced with both time and efficiency loss and significant financial costs are incurred. Recruitment processes are one of the areas where artificial intelligence is most commonly used and come to the fore. AI-based methods help to match the right candidate with the right position. Organizations receive a large number of job applications that must be screened for open positions. Sometimes, examining hundreds or thousands of resumes manually, comparing them with job requirements, and making eliminations require a great deal of effort and time. Streaming resumes from a large pool of applicants to find the right candidate in a limited time is a challenge for any HR practitioner. AI will facilitate or automate monotonous and high-volume tasks in the recruiting process. AI software will scan, evaluate and reject 75% of unqualified resumes (Merlin and Jayam, 2018). AI-based systems used in the recruitment process eliminate subjective decisions and prejudices and enable to make more fair and objective selection decisions in a shorter time. Predictive analytics can be used to identify the qualifications required for high job performance, thereby screening candidates for a variety of job positions. Each job application is evaluated using predictive analytics, but only the best candidates for the job are identified and interviewed. This provides significant time savings for HR practitioners. For example, simulation models can evaluate the supply and demand of employees with certain skills to have the right number of employees in the right position at the right time. Models can be redesigned and run to update recruitment and retention plans as conditions change, such as workload or organization goals (Narula, 2015). Recruitment managers can easily get feedback and quick response by using AI methods in their HR processes (Amla and Malhotra, 2017). HR in many international organizations is increasingly reliant on the recruitment process to attract qualified staff using AI. Talent acquisition software can scan, read and evaluate applicants and quickly eliminate in the hiring process. This is a huge advantage as it allows the recruiter to spend more time analyzing and evaluating only a smaller group of suitable candidates (Abdeldayem and Abdulaimi, 2020).

AI also helps to identify the rate of employee retention in the work place and identify the reasons of not being satisfied from the organization. In addition, it supports taking forward-looking actions and developing strategies by determining the employee turnover rate and determining the reasons for employees leaving the job (Buzko et al., 2016; Yawalkar, 2019; Mathur, 2019; Nagar and Saxena, 2020). With the help of AI-based recruitment systems, HR practitioners can save time for decision making process and organizations can get more accurate results and make estimations for their future strategies. It can provide important insights to HR practitioners in developing recommendations and systems that improve employee commitment and engagement. Having knowledge of all strategic issues guides practitioners when designing processes and making decisions in the field of HRM.

Additionally, as individuals are characterized by different learning styles, HR managers can use AI to personalize corporate training for each job officer as it stores valuable data regarding the learning and development needs of potential employees and the type of training needed (Lamson and Redwitz, 2018). AI can successfully plan, organize, and coordinate training programs for all employees. Online courses and digital classrooms are the most common alternatives in training (Abdeldayem and Abdulaimi, 2020). Also, AI systems can recommend videos and learning programs related with the expertise of the employee. AI software automatically provides micro-learning

programs (Sangivikumar and Thamodaran, 2020). AI-based systems can collect data on employee engagement or failures within the program and ultimately test new varieties to try (Merlin and Jayam, 2018). In this way, AI can help predict organizational return on investment, increased or decreased levels of employee engagement, complications associated with project completion, and other unexpected issues that will take years to emerge (Jauhari, 2017). AI-based learning systems can help not only to match up learners and mentors but also to capture informal learning possibilities that traditional methods cannot (Achchab and Temsamani, 2021). Thus, training can become a continuous process in the organization.

Performance appraisal has always been a function that is open to subjectivity and prejudices and prone to error in HRM. AI is very effective in overcoming possible mistakes and biases in this process. Performance appraisal is done with the help of software or a database that automatically scans for well-performing and underperforming employees. In this way, it directs managers to make decisions about promotion and career planning (Team, 2018; Merlin and Jayam, 2018). Advanced AI software and data analytics help to assess the employee performance on daily basis and appraisal can be a continuous process (Garg et al., 2018). AI systems enable to extract insights from gathered information in real-time and eliminate all the common psychological biases by monitoring the real time progress (Sangivikumar and Thamodaran, 2020). In addition to the performance evaluations of current employees, predicting the future performance of the candidates to be recruited is also very important for the effectiveness of the recruitment process. Employers are interested in evaluating the performance of their current employees, but it is difficult to know the performance of new candidates before hiring them. During the hiring process, finding an approximate estimate of new candidate performance will assist recruiters in their hiring decisions. Tools such as interviews, cognitive tests, and personality tests used for this purpose may not always provide very accurate estimates. Artificial intelligence methods used in recruitment can make this estimation by using historical performance data (Mahmoud et al., 2019).

Career management is one of the areas where artificial intelligence applications benefit. Tracking employees' progression journey on various metrics and then feeding those metrics to AI applications to develop customized career management plans for employees give an important advantage to HR practitioners for making appropriate career planning decisions (Nagar and Saxena, 2020). Thus, these applications also enable talent management to be done more successfully. In addition, AI provides recommendations to leverage historical records to suggest the best solutions to solve anticipated problems that can help HR leaders in the organization develop intelligent data-driven human resource management programs.

Some of the AI methods that are frequently used in the field of HRM will be discussed below along with their usage areas and advantages.

The Use of Machine Learning in HRM

As businesses grow and become more complex, machine learning, one of the methods of artificial intelligence, has become a useful tool for managing the change in expectations from HR departments. HRM should be in a strategic position to support the objectives of the organization to identify suitable candidates, recruit and retain employees. In order to manage HR processes effectively, it is necessary to collect data in many areas such as understanding the attitudes and feelings of employees, creating employee behavior towards corporate goals and policies, compensation and dealing with related external environmental factors. This is where machine learning comes into play. Machine learning can effectively accept, store, process and manage this enormous amount of data, helping HR practitioners properly implement HR functions and make effective decisions. Statistical analysis, pattern recognition and predictive analytics represent the latest technique in machine learning. It uses algorithms to find patterns in data and make predictions for the future (Theodoridis, 2015). A global survey conducted by KPMG, which represents 1,201 senior HR executives from 64 countries, reveals that 20% of companies have invested in AI so far; and investors focus on machine learning and analytics (Garg et al., 2021). With the advantages of using artificial intelligence in the field of HRM, it is predicted that the investment made in this field will increase much more in the coming years. When machine learning applications in the field of HRM are examined, it is seen that one of the prominent areas is smarter candidate identification and candidate tracking. Machine learning can be used to identify and define recruitment patterns. Machine learning can also help predict fundamental movements and their effects. Through machine learning, HR teams can set clear parameters that identify possible scenarios and assess how ready an employee is to leave the organization. Machine learning guides HR teams by predicting such situations and helps employees reduce the likelihood of leaving with a proactive approach.

Recruitment process; posting, searching for candidates, interviewing candidates, tests, evaluations, starting time and orientation etc. includes many costs. These costs can sometimes be as high as one to four times the annual salary of

the employee. However, when the wrong person is hired, the cost of a wrong recruitment can be up to five times the annual salary of the employee (VanVulpen, 2019). When someone applies for a job, algorithms automatically sort them and scan them using machine learning techniques (Schweyer, 2018). Thanks to the artificial intelligence methods used in the recruitment process, the work of HR specialists becomes easier and allows them to make more accurate matches in determining the candidates who are suitable for the job requirements. These systems, in which the final decision maker is still human, guide the makers and help to make effective decisions by saving time. HR professionals, who spend most of their time selecting and interviewing candidates, can identify potential candidates more efficiently in a short time with the help of artificial intelligence systems (Murgai, 2018). Considering that sometimes tens or hundreds of candidates can apply to the opened positions, serious time and effort must be spent even for the examination of the CVs, which is the first stage of the recruitment process. At this stage, artificial intelligence facilitates routine and time-consuming tasks in the recruitment process. Intelligent scanning software supported by artificial intelligence examines the experience and skills of the employees, determines the suitability of the position for the job requirements and gives a list of the candidates who seem most suitable (Ahmed, 2018). Systems that can scan hundreds of resumes in seconds save practitioners a significant amount of time and can identify suitable candidates in a very short time by matching job requirements and candidate qualifications in the most appropriate way. Businesses today use selection methods such as high-budget evaluations, tests and simulations in order to identify and recruit the right candidates in their recruitment processes, but most businesses still state that most of their candidates are the wrong decision (Pağda, 2018; Ahmed, 2018). Despite such high expenditures, many of the managers make the final decision on evaluation based on their own intuition or prejudices. Research shows that most hiring managers make a decision about a candidate the first minute they meet, usually based on features such as looks, handshakes, dress code, and speech (Murgai, 2018).

Recruitment interviews can sometimes be adversely affected by the mistakes of the interviewers or other subjective factors, and decision makers can make biased choices from time to time in this process. The study of Faliagka et al. (2014) mentions the use of machine learning algorithms in artificial intelligence to solve problems related to candidate applications. The proposed system extracts a set of objective criteria from the LinkedIn profile of applicants through HR analytics and compares them semantically with the job requirements of the position. In addition, it analyzes the statements of the candidates in their applications with linguistic analysis and determines a profile regarding their personality traits. Thus, HR practitioners can target suitable candidates from a large pool of candidates at a low cost and by saving time (Faliagka et al., 2014). With the use of HR analytics in the recruitment process, hundreds or thousands of resumes can be scanned quickly to identify the most suitable candidate, the potential performance of the candidate can be predicted in case of recruitment, and the need for HR specialists to communicate directly with candidates is eliminated (Matyunina, 2020). LinkedIn also uses HR analytics and machine learning methods to limit candidate searches during the hiring process and search for candidates with the help of intelligent algorithms. Machine learning tools developed by Google can analyze the characteristics of potential candidates and then offer them positions that match their skills, experience and personality. Thanks to this method, it is possible to find talented candidates who are especially suitable for the goals and strategies of the institution. Machine learning also provides HR staff with mobile-friendly tools that can collect and share feedback instantly. Applying machine learning to identify prominent issues and recurring issues in employee surveys can help improve the quality of feedback and guidelines in setting HR policies (Matyunina, 2020).

Unilever uses AI systems that leverage machine learning in the recruitment process. Job applicants at Unilever are invited to play a series of online games that use machine learning to generate and analyze data on candidates' behavior, qualifications, and job-related characteristics. Successful applicants participate in an AI-powered online interview that evaluates their feelings, accuracy, and content of their answers comparing with the requirements of the job. Then, qualified candidates are supported by an AI chatbot that answers their questions, enlightens them on their candidacy status, and schedules a face-to-face interview for them. Only the candidates successfully passing the "machines" meet with a live interviewer. Unilever has decreased candidate screening time by 75 percent, while reducing onboarding time from four months to nearly four weeks (Daugherty and Wilson, 2018). It is worth noting how significant this saves time and cost for large enterprises. In the recruitment process, machine learning can be used to analyze blog and social media profiles and identify candidate characteristics that are not visible in the resume (Matyunina, 2020). Another application of machine learning in HR is to predict employee success. Data about a candidate's credentials, attitudes, memberships and performance can often effectively point to his potential success in a position. Machine learning can assist the HR team at this stage when given access to historical data on the most successful employees in the organization. When the HR team determines the top 10 most successful employees in the organization and transfers their information and historical data to the system, the system can identify different parameters that may be related to the success of these employees through machine learning. These parameters can be the educational qualifications, general attitudes, sensitivity to the learning and development program of the institution,

and employees' progress on the career path. Then, the machine learning-enabled program can match this data with the current parameters of potential candidates for the institution and reveal in which position the recruited personnel can be successful with predictive abilities. Therefore, HR analytics obtained through machine learning can be a very important help in developing recruitment strategies and guiding recruitment decisions (Writer, 2018). Another use of machine learning in the field of HR is the evaluation of interviews with candidates. Some of companies today prefer their first round of candidate interaction as video interviews. These videos are then analyzed by AI to gauge the effectiveness of employees along various parameters (Nagar and Saxena, 2020). Video-based interview analyzed by machine learning can help determine whether the candidate is telling the truth and the mood of the interviewee. The conversation is recorded and recorded and recorded, such as muscle contractions, tone of voice, etc. are given to the neural network for analysis with criteria. For example, a candidate's frown when talking about their previous job can be a sign of negativity. The tone of voice, on the other hand, can show the candidate's willingness to work in this institution, his enthusiasm or indifference in his responsibilities. Machine learning does not care about, judge or criticize a candidate's gender or age, do not have a bad day and reflect his negative attitude on the candidate. It evaluates the candidate completely impartially and without prejudice (Matyunina, 2020). Digital interview AI software evaluates the candidate's speech, word choice and body language through video and audio. The system analyzes personality traits that will be suitable for the job. AI also helps improve the candidate experience through chatbots by ensuring that requirements, feedback, and recommendations are updated consistently (Merlin and Jayam, 2018).

Identifying employees who intend to leave, especially when it comes to talented and key employees, gives managers the opportunity to meet with these people and solve the problem in advance. While in traditional HR processes, interviews with employees when they leave the job offer the opportunity to identify and solve the problem after the employee is lost, thanks to artificial intelligence, this situation can be predicted and the possibility of resignation of the candidate can be prevented. Retaining particularly talented employees is one of the most critical challenges facing many organizations. By increasing employee satisfaction and maintaining a desirable work environment, HR departments can certainly significantly reduce this problem (Patel et al., 2020). There are many factors that affect employees' decision to quit their job. There may be many reasons such as finding a higher-paying job abroad, not getting along with the manager, being dissatisfied with the working environment or job, lack of career development opportunities, and high workload. These reasons first cause the employee retention and then make the decision to leave the job. Patel et al. (2020) used machine learning methods in order to predict employee attrition. The system is able to predict the reasons of why employees leave the organization and provide insights to HR managers to take actions for future. Yuan (2021) analyzed the factors leading to employee turnover and mined the influence degree of relevant factors by using machine learning. The AI system recently launched and patented by IBM as the "Predictive Attrition Program," can predict when and why an employee will leave. The accuracy of this AI system is claimed to be 95%. The AI program helped IBM to save nearly $300 million in cost of ownership. The AI program also has the ability to predict what is the right time to reach an employee before they decide to leave (Mathur, 2019). Yang and Islam (2020) analyzed the "IBM Employee Attrition" dataset to find the main reasons why employees choose to resign and used variables such as age, marital status, position level, etc. They created clusters based on a set of employee variables (attributes) in order to better understand the many attributes that can be associated with turnover, and whether there are different sets of employees who are more susceptible to turnover. This final insight can be used to determine whether current HR policies serve the clusters of employees identified in the analysis, rather than using a one-size-fits-all approach, and the broader impact of employee experience. Artificial intelligence methods used in HR analytics give important results in identifying employees who intend to quit. The system, which examines the data on the commitment levels, working hours, performance data and reasons behind the quitting of the employees who has resigned before, and finds the connections between them, can easily predict an employee who intends to leave the job. Employees provide many signals about their intentions in their daily work and behavior, allowing organizations to build predictive statistical models that understand and predict turnover. Managers (or the AI itself) can use this information to intervene to stop the talent gap, including special incentives, rewards, and recognition (Schweyer, 2018). Thus, the workforce turnover rate is reduced and talented employees can be prevented from leaving the company. Machine learning is divided into three methods: supervised learning, unsupervised learning and reinforcement learning. Supervised learning methods in machine learning are methods that investigate the relationship between input attributes and target attributes. The discovered relationship is represented in a structure called a model. Typically, models identify events hidden in the dataset that can be used to estimate the value of the target attribute by knowing the values of the input attributes. There are two types of supervised learning. One of them is classification models (classifiers), and the other is regression models. There are many alternatives used to represent classifiers such as decision trees, support vector machines, algebraic functions, probabilistic methods, etc. These methods can be applied in various areas of the business world, such as HRM, production, finance and marketing (Maimon and Rokach, 2010). With the supervised learning method, it is possible to predict a result such as whether an employee will leave the institution and what the ideal starting salary of

a new employee should be. Different input variables (properties) are needed to make predictions. Input properties; It is limited to situations that are considered to be important, what data can be used or what data can be created. Unlike supervised learning, where a person tries to predict an outcome, unsupervised learning (also known as unsupervised machine learning) analyzes many variables simultaneously to identify similarities, differences, hidden patterns, datasets, or relationships in the data. Unsupervised learning is about using machine learning algorithms to analyze and cluster unlabeled datasets and understanding what is in the data. These algorithms can perform operations without human intervention. The ability to discover similarities and differences in information makes unsupervised learning the ideal solution for exploratory data analysis, cross-selling strategies, customer segmentation and image recognition. The two most common uses of unsupervised learning are clustering and association rule mining. Clustering is a data mining technique that automatically groups unlabeled data based on their similarities or differences. Clustering algorithms are used to process raw, unclassified data objects into groups represented by structures or patterns within the information. Clustering algorithms can be divided into several types, in particular overlapping, hierarchical, and probabilistic. The most widely used algorithm in clustering is the K clustering algorithm. This algorithm is an iterative algorithm that continuously renews the clusters and continues until the optimal solution is reached. In the HR applications of clustering, understanding the employee segments (clusters) of the organization and determining whether HR policies are suitable for these segments come to the fore. Another goal to be achieved in cluster analysis used in the field of HRM is to understand the factors related to employee turnover from the data of the organization. It is very important to determine the factors that may cause the human resources to wear out and leave the organization. Thus, HR managers can make the necessary plans and take action to correct these problems.

The reinforcement learning method addresses the question of how an autonomous agent, sensing and acting on its environment, can learn to choose the most appropriate actions to achieve its goals. This type of learning is a method that allows an algorithm to learn by trial and error using feedback from its own actions and experiences. This method covers a fairly general problem and tasks such as learning to control a mobile robot, learning to optimize operations in factories, and learning to play board games. When the agent performs an action in its environment, a trainer can give a reward or punishment to indicate that the resulting state is desired, ultimately making this algorithm smarter in the process. For example, when training an agent to play a game, the trainer may provide a positive reward for winning the game, a negative reward for losing, and zero reward in all other cases. The agent's task is to learn from this indirect delayed reward, to choose the sequences of action that produce the greatest cumulative reward. Reinforcement learning algorithms are related to dynamic programming algorithms that are frequently used to solve optimization problems (Mitchell, 1997). Although the use of reinforcement learning methods in the field of HR is at a lower level, it is used to apply content according to the performance increase and progress of the employee. Karimi et al. (2017) address a combined problem of human resource planning and production inventory control for a high-tech industry where human resource plays a critical role. In their study, they proposed a reinforcement learning model to obtain the most appropriate decision to hire workers under demand uncertainty. They also included some managerial issues such as layoffs and overtime hours in their proposed model. Cheng (2020) created a multi-layered perceptron prediction model of employee turnover rate. They proposed a model based on Sarsa, a type of reinforcement learning algorithm, to automatically generate a set of strategies to reduce employee turnover. These strategies are the set of strategies that can reduce the labor turnover rate at the highest level and the cost less in terms of the enterprise, and can be used as a reference plan for the enterprise to optimize the employee system. Experimental results show that the algorithm can actually improve the efficiency and accuracy of the particular strategy.

Artificial neural networks are widely used in the field of HR as one of the machine learning methods. The concept of artificial neural networks emerged with the idea of imitating the working principles of the human brain in digital computers, and the first studies focused on the mathematical modeling of neurons (i.e. biological cells) that make up the brain. The findings of these studies were that each neuron receives some information from neighboring neurons and this information is translated into an output as predicted by biological neuron dynamics. The field called artificial neural networks is a branch of science that seeks answers to structural as well as mathematical and philosophical problems on the realization of a function by combining many neurons in certain ways. The problem space that the artificial neural networks can solve is a very restricted subset of the problem space that the human brain can solve (Efe and Kaynak, 2000). Retaining talented and key employees is essential for the organization to achieve its goals. If high-performing talented employees resign, it becomes more difficult for the organization to survive and maintain its competitive advantage (Sooraksa, 2021). Estimating the employees who are likely to leave the company is also of great importance in terms of developing strategies for retaining high-performing employees. Artificial neural networks used in artificial intelligence systems can reveal unknown factors affecting workforce turnover, as well as showing which employees are likely to leave (Strohmeier and Piazza, 2015). Campdesuner et al. (2018) investigated the

factors related with turnover. By applying neural networks, authors found a significant relationship between variables such as average income, school level and age. Zhu (2021) also designed and implemented wage forecasting model by using neural networks and the model proposed almost 90% accuracy. Since the recruitment and retention of personnel plays an important role in ensuring the performance conditions of the employees, it is essential to evaluate the individual and ensure his commitment to the organization in order to determine how well the organization is performing. HR analytics and artificial intelligence methods provide guidance to HR practitioners in this regard (Sooraksa, 2021). Thus, HR practitioners can benefit from this information while developing strategies for ensuring employee engagement and retaining talented employees.

The Use of Deep Learning in HRM

Deep learning is a subfield of machine learning and consists of neural networks. In deep learning, "deep" refers to a neural network consisting of more than three layers with input and output and can be considered a deep learning algorithm. The difference between deep learning and machine learning has to do with how each algorithm learns. Deep learning automates much of the feature extraction part of the process, removing some of the necessary manual human intervention and enabling the use of larger datasets. Deep learning can be thought of as "scalable machine learning". Machine learning relies more on human intervention to learn. Human experts define hierarchy of features to understand the differences between data inputs and often require more structured data to learn.
"Deep" machine learning can leverage labeled datasets, also known as supervised learning, to inform its algorithm, but it doesn't necessarily require a labeled dataset. It can retrieve unstructured data in its raw form (image or text, for example) and automatically identify the hierarchy of features that separates different data categories. Deep learning, unlike machine learning, does not require human intervention to process data, allowing us to scale machine learning. Deep learning is a branch of machine learning that trains a computer to learn from large amounts of data through neural network architecture and splits the data into layers of abstraction. Deep learning allows computational models consisting of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods are significantly advanced in speech recognition, visual object recognition, object detection and many other areas such as drug discovery and genomics. Deep learning explores complexity in large data sets using the back propagation algorithm to determine how a machine should change its internal parameters used to calculate the representation in each layer from the representation in the previous layer. Deep convolutional networks revolutionized image, video, speech, and audio processing, while recurrent networks shed light on sequential data such as text and speech (LeCun et al., 2015). Deep learning paves the way for many innovations in the field of HRM. First of all, it is an essential tool for speech recognition. Basically, any virtual assistant and chatbot makes extensive use of these algorithms to process the human voice and respond accordingly. This allows companies to automate various HR-related processes and services, making them faster and available around the clock (HR and AI, 2021). Another usage area of deep learning in the field of HRM is Chatbot applications (Jurafsky and Martin, 2020). Chatbot is a service where people interact through a chat interface. The simplest types of dialog systems are chatbots that can hold long conversations to mimic unstructured conversations or conversations that are characteristic of informal human-human interaction. Natural language processing trains chatbots and similar systems to understand human language, tone, and context. As businesses continue to automate HR service delivery with chatbots, it will emerge as a crucial capability for natural language processing and AI systems. Chatbots have become quite popular lately as they provide an intuitive and easy to use natural language human-computer interface. Deep learning is also widely used in speech and image recognition fields. Speech Recognition (Automatic Speech Recognition (ASR) or computer speech recognition) is the process of converting a speech signal into a series of words through an algorithm implemented as a computer program. In speech recognition, deep learning algorithms can be designed to recognize and respond to human voice inputs. Virtual assistants use speech recognition algorithms to process the human voice and respond accordingly. Image or video recognition is an important application area of image processing for machine learning without any human support at any step. Deep learning algorithms in image and video recognition are widely used in object classification and outperform humans. Deep learning systems, which are provided with videos and photographs of thousands of applicants, can identify and classify candidates according to objective data. Another application of deep learning is in behavioral analysis and image recognition to determine employee mood and detect signs of discomfort. A deep learning machine connected to sensors and cameras is able to study the usual behavior of staff and recognize some repetitive patterns. If these patterns are disrupted, the system can sense that something is wrong. A recommendation engine is a type of information filtering tool that uses machine learning algorithms to recommend the most relevant items to a particular user or customer. Digital learning experiences often include personalized learning recommendations related to skill levels and professional interests. Learning experience platforms can use deep learning and big data to identify

learning paths that may be of interest to individual employees. Recommendation engines work on the principle of finding patterns in individual behavior data that can be collected implicitly or explicitly (Sushman, 2021).

Artificial intelligence methods used in HR analytics give important results in identifying employees who intend to quit. The system, which examines the data on the commitment levels, working hours, performance data and reasons behind the quitting of the employees who have resigned before, and finds the connections between them, can easily predict an employee who intends to leave the job. Identifying employees who intend to leave, especially when it comes to talented and key employees, gives managers the opportunity to meet with these people and solve the problem in advance. While in traditional HR processes, interviews with employees when they leave the job offer the opportunity to identify and solve the problem after the employee is lost, thanks to artificial intelligence, this situation can be predicted and the possibility of resignation of the candidate can be prevented.

Organizations are increasingly using algorithms to monitor employee morale. Social analytics and constant "social listening" reveal what people are talking about on internal and external social media to "analyze emotions" (Schweyer, 2018). In recent years, sentiment analysis techniques have been used to reveal the positive and negative feelings and prejudices of employees against everything from social media use such as Twitter and Instagram. As many entrepreneurs begin to use these technologies, we will see the applications of sentiment analysis in the human resources industry rise to a broader level in the coming years to measure employee sentiment, engagement and role (Abdeldayem and Aldulaimi, 2020). In this way, HR managers will be able to understand the feelings of their employees about the work, business environment and the organization. If there is a negative situation, they can take actions to eliminate at the appropriate time.

Conclusion

Today, the use of artificial intelligence methods in the field of human resources management, as in many other fields, has transformed this field. With traditional HR practices, it has become very difficult to make decisions and effectively manage employees in today's competitive business life. With the use of artificial intelligence methods in many processes and functions in the field of HR, it is possible for HR practitioners to make more effective decisions and it is possible to take forward-looking actions by making use of historical data. These methods not only provide significant cost and time savings to businesses, but also enable more effective management of human resources. Thus, organizations with loyal, highly satisfied and motivated employees can achieve greater efficiency and productivity.

The fact that artificial intelligence is so involved in the field of HR and increasingly finding its place in this field sometimes confronts practitioners with the question of whether there will be a need for humans in the future. AI can never really replace human beings because of one major factor called "Emotional Intelligence". These machines, no matter how smart, can read faces, analyze moods, provide solutions, yet are unable to respond and deal reliably with human emotions (Mathur, 2019). AI is likely to challenge some white-collar tasks, but is unlikely to pose a fundamental threat to modern management's uniquely human aspects, such as social interactions with workers, as well as the emotional intelligence of managers and employees (Arslan et al., 2021).

It is predicted that the usage areas of artificial intelligence will increase even more in the coming years. As businesses see the benefits, they will tend to invest more in this area. As many large and corporate enterprises in the field of HRM start to benefit from AI techniques, it is indisputable that the investment volume in this field will reach even higher levels. In future studies, empirical studies that show how organizations use AI and what benefits they provide will be more effective in revealing and concretizing the advantages of artificial intelligence.

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Ulakbilge
Sosyal Bilimler Dergisi

GELENEKSELİN ÖTESİNDE: YAPAY ZEKA İNSAN KAYNAKLARI YÖNETİMİNİ NASIL DÖNÜŞTÜRDÜ?

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Öz

Günümüzün yoğun rekabet ortamında işletmelerin rekabet avantajı elde edebilmesi için en önemli güç, bilgiye sahip olmak ve onu yönetmektir. Verileri işleme ve bilgiye dönüştürme yeteneği son on yılda önemli ölçüde artmıştır. Kuruma faydalı bilgiler sağlayabilecek doğru verilerin bulunması, geleceğe yönelik tahminler yapılmasına, stratejilerin belirlenmesine ve fırsatlardan yararlanılmasına destek olabilir. Bu verileri analiz etmek, veriler arasındaki bağlantıları ve kalıpları belirlemek ve bunlar ışığında karar vermek günümüzde tüm organizasyonlar için en değerli unsurlar olarak görülmektedir. Bugün, İK işlevi yalnızca geçmiş verileri raporlamak ile sınırlı değildir. İK uzmanları, gelecekte ne şekilde strateji oluşturulabileceğini ve neye ihtiyaç duyulabileceğini anlamak için tahmine dayalı analitik için verileri aktif olarak kullanmaktadır. Yapay zeka yöntemlerinin İKY alanında kullanılması ile birçok fonksiyonda etkinlik ve verimlilik sağlanmaktadır. Yapay zeka yöntemlerinin İKY alanına kazandırdığı en önemli fayda, zaman maliyetleri açısından avantaj sağlaması ve süreçlerin daha etkin ve objektif bir şekilde yürütülmesine izin vermesidir. Bu çalışmada yapay zekanın gelişimi, İKY alanında nasıl önem kazandığı ve uygulama alanı bulduğu incelenmektedir. Yapay zeka yöntemlerinin İKY'de hangi süreç ve fonksiyonlarda kullanıldığı, nasıl bir değer yarattığı ve işletmeye nasıl fayda sağladığı üzerinde durulmaktadır. Yapay zekanın farklı alanlarda kullanımına yönelik çalışmalar olsa da özellikle İKY alanında kullanımı ve faydaları konusunda literatürde boşluklar bulunmaktadır. Bu çalışma, bu alandaki boşluğu kapatmada literatüre katkı sağlamayı amaçlamaktadır.

Anahtar Kelimeler: Yapay zeka, insan kaynakları yönetimi, İK analitiği, makina öğrenmesi, derin öğrenme