Examining the use of artificial intelligence in recruitment processes

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ABSTRACT

The recruitment process is more of an issue for many businesses. The process of determining the appropriate candidate to hire is often a costly, time-consuming process. Besides, due to incorrect decision-making or lack of objectivity in hiring processes, recruitment processes may not proceed effectively. Businesses are trying to use technology in their recruitment processes to avoid these problems. Currently, many businesses use internet and software technologies to receive applications and evaluate candidates. But despite these technologies, it takes time and additional personnel costs for people to coordinate all processes. Due to these and similar situations, there has been an increase in the use of artificial intelligence technologies in recruitment processes in the world recently. The use of artificial intelligence in recruitment processes has the effect of reducing costs and decision-making errors and appears to be beneficial in saving time. In this study, the use of artificial intelligence in the recruitment processes of businesses in Turkey was examined. In this context, interviews were conducted with the human resources managers of 22 businesses. According to research results, it was understood that artificial intelligence was benefited only as an auxiliary element in recruitment processes. It has been found that businesses do not rely much on artificial intelligence in their recruitment processes, so they do not use it or partially use it.

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Introduction

One of the most important goals of businesses is to be successful in the activities they perform. For this purpose, the process of selecting an employee who has the necessary qualifications to perform a job successfully is called employee selection. The recruitment process is of great importance because the business needs to select employees who will ensure the continuity of the institution's functioning. Finding employees who will contribute to achieving the business's goals is currently seen as a stand-alone business line. By realizing that the most important element of all activities is human beings, determining the need for effective, qualified, and expert personnel in their field and hiring suitable people has become a much more decisive process. It is challenging to find personnel who internalize the business's goals and carry the specified work characteristics. This process, which constitutes an important field of work of the human resources department, includes identifying existing personnel needs, announcing these needs by appropriate means and channels, collecting applications, conducting interviews, and accepting suitable candidates for work (Findıkcı, 2009: 167).

Human resources management aims to harmonize the work and human factors in the company and develop the human factor to increase efficiency, productivity, and the added value of the business (Vardarlier, 2014: 4). Based on this, it is important to take the necessary measures and carry out studies to increase human resources productivity. One of the innovations being implemented in the field of human resources is the use of artificial intelligence. The field of artificial intelligence strives to understand and build intelligent beings. In short, artificial intelligence can be defined as a computer or computer program capable of performing intelligent functions. A more precise definition of artificial intelligence is difficult because it can be related to any task and covers a wide range

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of subfields (Russel & Norvig, 2016: 1). Artificial intelligence, which has started to show itself in all areas of the developing business world, has begun to manage the recruitment processes in the human resources departments of businesses today. With the adoption of new technologies in the age of technology, business structures must adapt to new designs and, as a result, improve the performance of business processes (Vardarlier & Zafer, 2020: 355).

It is expected that artificial intelligence, which continues to develop today, will show much more progress in the future. With the greater use of artificial intelligence in production processes, production processes will be fully automated, and the cost of acquiring products will be reduced. This can also reduce product prices. In addition, artificial intelligence is expected to be used more in everyday life in the future. The use of more advanced artificial intelligence modules, especially in human resources, will also make a significant contribution to employee life.

Literature Review

Theoretical and Conceptual Background

Recruitment Process

One of the essential activities of human resources is the employee selection. Personnel search activities are also the basis of employee selection. The quality of human resources in an organization is often associated with success in the recruitment process. Failure to reach a sufficient number of candidates with appropriate qualifications during the employee selection process may lead to the inability to fill some vacancies or hire employees who do not have the qualifications required for the vacancy at a sufficient level. Failure of the hired employee to adequately carry the characteristics for the job leads to low productivity and undesirable situations such as increased costs of education and wage, labor turnover, work accidents, decreased motivation and job satisfaction and increased audit costs of the business. If the person's qualifications and qualifications required for the job are not compatible, then it is possible to say that the wrong employee selection has been made (Barutçugil, 2004: 257).

In another definition, the recruitment process is expressed as selecting the right employee for the right job by carefully determining the workforce and qualifications that the business will need today and in the future. In the process of selecting employees, it is not enough to select candidates with high qualifications. Attention should be paid to the employee's adaptation to the work and organizational culture. This shows why organizational cohesion is important in employee selection. Therefore, businesses must have the competence to deal with the procurement and selection process of the employees they will need today, and in the future (Talay, 1997: 51).

It is crucial that businesses create an impression of a positive staff policy against existing personnel and outside. Having solid foundations and acting on principles in the employee selection process makes it easier for the business to choose the best candidate (Göktaş, 2009: 76). In this context, the employee selection function should be systematically processed and designed according to the business's structure.

The process of employee selection begins with the receipt and acceptance of applications and ends with the decision to hire. The following stages of the employee selection process are as follows (Çetinkol, 2016: 45):

- (i) Examination of candidate applications and conducting the first interview,
- (ii) Having the application form filled out,
- (iii) Implementation of tests,
- (iv) Conducting a recruitment interview,
- (v) Examination of candidate's past experiences and references,
- (vi) Making a recruitment decision and making an offer to the candidate,
- (vii) Conducting a medical examination of the candidate and other procedures,
- (viii) Job placement.

An employee who is selected inaccurately in the recruitment process often leaves the job after a while because the job characteristics do not match him. In such a case, the business endures the second loss of cost and time to find and select employees. As a problem-solving and decision-making activity, the recruitment and selection process of employees is carried out in the form of diagnosing and describing the problem (determining the need for personnel), determining the options (researching and finding personnel), selecting the appropriate options (personnel selection). At this stage, the goal is to make the correct decision, that is, to select the personnel with the most appropriate qualifications for the job. For this reason, care must be taken at all stages of the personnel procurement process. The recruitment function aims to employ the workforce with the qualifications and quantity required for the institution's work and specified in the forward-looking planning and regulations in the appropriate positions (Kaynak et. al., 1998: 113).

According to another definition, the recruitment process is expressed as a human resource management process performed after the recruitment process and in which the potential of candidate personnel is evaluated according to the criteria of job requirements, and it is decided whether the candidates will be hired. The employee selection process is the opposite of the personnel procurement process. On the other hand, the recruitment process attempts to increase the number of candidate personnel who can meet the job requirements. In contrast, the selection process focuses on selecting the most suitable employee by reducing the number of candidates.

This selection process takes place in two ways. In this process, both the business that will hire the employee candidate and the candidate need to make mutual decisions. But in some cases, the selection method is one-way. For example, in an economy where job offers are deficient, many candidates can apply for every vacancy. The business tries to hire the person it deems most appropriate by making various qualifiers. Similarly, if the candidate is a specialized manager or professional, the election is again one-way. This is because the candidate is equipped to be requested by many businesses (Kızıloğlu, 2012: 41).

The personnel procurement process covers the activities of determination of candidate personnel requirements according to the titles and hierarchical level in short-and long-term based on personnel planning and collaboration with other department managers, the acquisition of data on the labor market, the creation of effective tools for personnel procurement, the determination and recording of qualified employee candidates, maintaining relationships with those people even they were eliminated in the employee selection process, the examination of the effectiveness of the recruitment process (Can, et.al., 2001: 106). In the traditional selection process, the person who is authorized to choose is related to the applicants' professional and educational level but pays attention to documents such as diplomas and certificates received and primarily examines their technical abilities. For this purpose, the candidate is tested and put into the trial process. But in this trial process, it is seen that candidates are often involved in work accidents and use tools poorly. However, as the technical specifications are given importance, the selection process is seen as a self-enclosed, outdated, and internal resources-oriented model of practice has lost its significance, seeking the technical skills between the employee and the job, but a solid understanding not providing continuous success in this direction as the technical specifications of the job tend to increase. Currently, businesses that have adopted a modern understanding of management have moved to employee selection management by using a more scientific and objective approach. Although the stages followed in the developed and implemented selection process do not adapt to each other between businesses, it is possible to generalize about the structure and functioning of the modern selection process in general terms (Sabuncuoğlu, 2005: 98).

Employee selection is of great importance to businesses. Employee selection is a process that involves deciding from whom to create a candidate group and which to hire after candidate research and discovery activities (Özlü, 2006: 201). In the process of hiring employees, many businesses resort to common ways. Differences in the process vary according to the size and the characteristics of the business, the number of employees to be selected, and external pressures. In light of this information, the employee selection process stages are listed as follows (Önder, 2000: 26).

- (i) Having the candidate application forms filled out,
- (ii) Applying tests for candidate selection,
- (iii) Conducting an interview,
- (iv) Evaluation of references,
- (v) And making the job offer.

The task of finding personnel of the human resources department refers to the process of collecting, examining, and deciding on job applications required to eliminate the labor deficit, which occurs in the human resources planning of the organization and has obvious qualifications and individual qualifications depending on the needs of the organization. Human resources determine the number and nature of the labor force required by the business and involves the source and method to which job candidates will be provided at the procurement stage, and how the data obtained will be evaluated and decided (Dereli & Uzunçarşılı, 1990: 16).

Artificial Intelligence

Artificial intelligence is a computer science field that emphasizes the creation of intelligent machines that work and react like humans. Some computers with artificial intelligence are designed for speech recognition, learning, planning, and problem-solving. Advances in deep learning, machine learning, computer programming, and medicine are examined within the scope of artificial intelligence (Lu, et.al., 2018: 369). Deep learning has made possible many practical applications of machine learning and, accordingly, the general field of artificial intelligence. Driverless cars, better preventive health services are powered by artificial intelligence. Artificial intelligence covers both the present and the future. With the help of deep learning, artificial intelligence is expected to reach the state of science fiction we imagine (Hassabis, et.al., 2017: 246). Machine learning is basically the practice of using algorithms to decompose data, learn it, and then make predictions about a situation in the world(Hacıoglu, 2020; Hacıoglu, 2019). Therefore, instead of manually coding software that contains a specific set of instructions to perform a specific task, the machine is trained using a large amount of data and algorithms, giving the machine the ability to learn how to perform the task (Habeeb, 2017: 4)

John McCarthy coined the term "Artificial Intelligence" in 1956. McCarthy has defined artificial intelligence as the science and engineering of producing intelligent machines (McCarthy, 2019). Artificial intelligence is a branch of computer science that deals with the research and design of intelligent agents that perceive their environment and engage in actions that maximize their chances of success. Artificial intelligence's scientific goal is to understand intelligence by creating computer programs that exhibit intelligent behavior using symbolic inference or by executing logic inside the machine. The definition of artificial intelligence is not time-independent; it makes the decision of any system considering the time (Winfield, 2020: 97).

It is known that there is no widely accepted definition of artificial intelligence (Kirsh, 1991; Allen, 1998; Brachman, 2006). As a result, the term "artificial intelligence" has been used with many different senses, both in and outside the field. A lot of people don't think that it is a big problem. After all, many scientific concepts receive good definitions only after the research matures, rather than at the beginning of the study. Given the complexity of intelligence, it is unrealistic to expect a widely accepted definition of artificial intelligence at the current research stage. Rather than spending time discussing definitions, many researchers prefer to pursue any purpose that is fruitful in theory or practice, whether labeled as artificial intelligence or not (Wang, 2019: 1). The opinions mentioned are acceptable to some extent. Research cannot be suspended until the community accepts a definition, or consensus can be expected to reach only by theoretical analysis. However, there are still several reasons to pay attention to this issue at the moment (Wang, 2019: 2).

With recent deep learning achievements (LeCun et al., 2015; Silver et al., 2016), artificial intelligence has become a hot topic of public attention. The business community is developing strategies to deal with this opportunity and challenge. There are even proposed legal and political regulations and policies to deal with artificial intelligence. However, without a clear definition of the term, it is difficult for policymakers to assess what artificial intelligence systems can do in the near future and how the field can get there. There is no common framework for determining which artificial intelligence systems are desirable (Bhatnagar et al., 2018: 118).

Artificial intelligence adapts with progressive learning algorithms to allow data to do the programming. Artificial intelligence finds structures and layouts in data to obtain a skill in the algorithm. The algorithm is a classifier. Accordingly, if the algorithm can teach how to play chess, it can also teach which product to recommend online. Models are adapted when new data is entered. Backscatter is an artificial intelligence technique that allows adjusting the model by adding training and data when the first answer is not exactly correct (Tang, 2013: 14). Artificial intelligence analyzes more and deeper data using neural networks with many hidden layers. Five years ago, it was almost impossible to set up a fraud detection system with five hidden layers. All these have changed with incredible computing power and big data. A lot of data is needed to train deep learning models because they learn directly from the data. The more data is fed, the more accurate it is (Dietterich, 2017: 4). Artificial intelligence adds intelligence to existing products. In most cases, artificial intelligence is not sold as an individual application. Instead, the products you already use, such as the addition of Siri as a feature to next-generation Apple products, have been enhanced with artificial intelligence capabilities. Automation, speech platforms, bots, and intelligent machines can be combined with large amounts of data to enhance many technologies from security intelligence to investment analysis at home and in the workplace (Varela, et. al., 2016: 11; Hacioglu & Sevgilioglu, 2019).

Artificial intelligence represents a new production factor that can increase business profitability, revolutionizing the way different companies around the world compete and grow. To turn artificial intelligence into an opportunity, most companies worldwide are already actively working on various artificial intelligence strategies. There is also a focus on developing responsible artificial intelligence systems compatible with ethical and moral values that lead to positive feedback. With the introduction of successfully implemented artificial intelligence solutions, many industries around the world can benefit from increased profitability and continue to grow economically. The construction of intelligent machines in various industries assumes the existence of symbolic structures, the ability to demand, and knowledge (raw materials). When artificial intelligence has intelligence equal to or greater than human, inevitably, artificial intelligence will have all the advantages of winning if it realizes that it does not need humans to colonize the universe (Ghahramani, 2015: 455)

Artificial Intelligence in the Recruitment Process

According to Upadhyay and Khandelwal (2018), applying artificial intelligence to human resources has been one of the most notable trends among recruitment professionals. Russel and Norvig (2016) define information extraction as a process by which information can be collected by scanning. In particular, when hiring new employees, artificial intelligence can be used with information extraction techniques that can automate the process of scanning continuing and automatically extracting relevant information (Kaczmarek, et. al., 2005).

In other words, when using artificial intelligence, it is important to note that people approach it with different goals in their minds. Based on different approaches to artificial intelligence, Russel and Norvig (2016: 29) propose considering whether they are interested in thinking or behavior and whether they want to model people or work from an ideal standard. Human behavior can be described as rational to some extent. But perfect rational decision-making is not possible for humans because human consciousness limits make it impossible to gather all the necessary information to find the optimal solution for each problem (Simon, 1965; Omohundro, 2008, 488). Intuition, even if it is unnoticed, is always involved in recruitment and often plays an important role in decision-making. Artificial intelligence aims to avoid being irrational. So it tries to eliminate the remaining irrationality (Omohundro, 2012; Omohundro, 2008: 487-488).

As with most things, artificial intelligence is affected by benefits and risks (Nadimpalli, 2017). Artificial intelligence is predicted to improve human capabilities in various ways in the future. Today, remembering, understanding, recognizing patterns, making choices, adapting to change, and learning from understanding are the skills belonging to artificial intelligence. With the support of artificial intelligence, technologies have become smarter and created a way to achieve significant benefits. Most likely, artificial intelligence will retain its position or play an increasingly important role in technology. The risk may arise when artificial intelligence begins to make machines smarter than humans (Mozumder, 2018: 138).

Artificial intelligence techniques can be applied in hiring employees using information extraction techniques that automate the process of identifying the subject and extracting relevant information in hiring (Kaczmarek, et al., 2005, 4). Information extraction refers to the process by which information and knowledge are obtained by reviewing a text (Stuart & Norvig, 2016: 873). Artificial intelligence is also able to recognize personality by observing text and speech with language cues. Personality traits consist of overall job performance, the ability to sell (Furnham et al., 1999), academic ability, and motivation (Komarraju & Karau, 2005). Therefore, artificial intelligence is able to interpret the applicant's personality and convenience for work from an application letter. Naturally, it is possible to ask directly about one's personality traits, but Mairesse et al. (2007, 491) predict that the personality observed from text and speech will outperform the personality models they evaluate. Personality imitation can also derive moods and emotions by applying linguistic analysis to the text (Faliagka, et al., 2012: 217).

Communication in recruitment represents one of the main activities. It is important to understand how communication contributes to the success of recruitment (Allen, et al., 2014, 143). There are two main reasons why artificial intelligence is successful in processing natural languages. The first is to communicate with people, and the second is to obtain information from written language (Stuart & Norvig, 2016: 860). Communication can be defined as a deliberate exchange of information. Because humans are the most communicative species, artificial intelligence must learn to speak and participate in speech (Stuart & Norvig, 2016: 888). Communication is natural to humans, but they don't have to be capable of natural communication when it comes to algorithms. Algorithms can be created by imitating people and communicating. Concepts such as human values can also be included in artificial intelligence (Heiss, 2017:10).

Also, automated candidate sorting systems have been proposed to speed up the recruitment process, as submitted resumes and job applications can be challenging. Applicant ranking models can be created with the help of artificial intelligence. Candidate ranking is based on artificial intelligence algorithms that learn the scoring function based on human recruiters' training data (Faliagka et al., 2012a: 216–220). New recruitment tools, such as job matching tools, have been created to facilitate employers' work and sort resumes related to job offer requirements. Computer-aided job matching can be applied in various ways using learning-based techniques and genetic algorithms (Montuschi et al., 2014: 41).

As the number of job applications has increased and may even exceed human resources departments, automated systems that rank job candidates have been introduced to speed up the recruitment process. The human resources department usually conducts a manual evaluation of job applications received. Thus, applicant sorting systems that can be created using artificial intelligence can make the evaluation task of recruiters more efficient (Faliagka, et al., 2012a).

The candidate ranking system works on the power of artificial intelligence algorithms and recruiters who provide training data of artificial intelligence recruitment algorithms, from which they learn the scoring function of applicants (Faliagka et al., 2012b). Upadhyay and Khandelwal (2018) introduced chatbots, artificial intelligence-driven recruitment assistants that provide personal and up-to-date connectivity with candidates via emails, text messages, or a dialog box. There are computer-aided job matching techniques improved to ease employers' workload. These techniques include software that sorts resumes and can be implemented using learning-based techniques and algorithms (Montuschi, et al., 2014).

An interesting feature of artificial intelligence-based ranking systems is that candidates are likely to gather information about personality traits that are extremely important when fulfilling job positions. However, these characteristics are often observed during a job interview. Preliminary data can be obtained through web searches. It is possible to collect information about applicants' personality traces, mood, and emotions by analyzing candidates' blog posts or LinkedIn pages (Faliagka et al., 2012b).

Job interviews as video interviews have become a popular recruitment tool among companies. HireVue developed an application for video calls using artificial intelligence. Artificial intelligence can analyze the applicant's body language by interpreting their facial expressions or tone of voice in this application. The app compares the interviewed candidates with the best-talented employees in the company and thus recommends the best candidates to the recruiters (HireVue, 2018). Hilton, the global hotel chain, has seen many benefits of conducting video interviews. The most notable result has been the reduction in time spent in the recruitment process. While the recruitment process took an average of 42 days at the Hilton Hotel, it was decreased to an average of 5 days due to the use of artificial intelligence-based video interviews.

As can be seen from all these studies, studies on the use of artificial intelligence in recruitment are generally related to the impact of artificial intelligence on recruitment processes. Studies emphasize that artificial intelligence speeds up recruitment processes, saves costs, and can rank candidates in a more qualified way. Based on the above, it is possible to summarize the role of artificial intelligence in recruitment as follows (Whalen, 2009: 2) in Table 1.

Table 1: Role of artificial intelligence in recruitment as follows

<i>The first scan of candidates</i>
Chat box and artificial intelligence tools are used by human resources managers to make the first scan of candidates. These tools and chat boxes are used to ask candidates questions, and human resources experts analyze the answers to understand the various characteristics of candidates.
Participation of candidates: Most of the candidates applying for this job cannot receive an answer from the employer. The artificial intelligence tool helps send personalized information and message.
<i>Re-participation of candidates</i>
Most of the candidate records are lost when a vacancy requirement is met. But with artificial intelligence, the candidate's record is updated in real-time when used. Additional qualifications or duties of the candidate are also updated.
<i>Customized training and development</i>
Training and development are implemented to improve the trainee's performance and efficiency. Each employee needs separate training to develop specific skills that need updating. The artificial intelligence tool helps provide customized training and development to employees to improve their performance and help career growth and development.
<i>After accepting the offer</i>
After a candidate is selected, he/she enters the notification period. During this notification period, if the employee does not have any communication with the employer, he/she may leave the organization and move on to another. Artificial intelligence helps overcome this problem. It helps maintain relationships with employees through regular communication. This ensures that employees are engaged. Otherwise, there is a lot of time and money to be wasted in hiring new employees.
<i>The orientation of new employees</i>
Orientation is important for new employees to be familiar with the organization's culture. It also helps employees recognize the company's policies and processes. But employers do not like to waste time on orientation. Employees also clarify their doubts in the process.
<i>Employee relationships</i>
Most employees have any doubts, from simple questions to complex questions. Artificial intelligence helps provide answers to simple and routine questions. But sometimes, the human resources manager intervenes for the human touch, especially when the questions are too complicated.

It is possible to summarize the benefits of artificial intelligence in recruitment as follows (Issa & Vasarhelyi, 2016: 3) in Table 2.

Table 2: Benefits of artificial intelligence

<i>Saves time</i>
Time is saved by using artificial intelligence tools in repetitive tasks. Employers should allow enough time to scan candidate's resumes. This screening is also a repetitive task. Artificial intelligence helps employers save time.
<i>Ability mapping</i>
Artificial intelligence helps to understand the requirements and competencies of candidates. This helps employers plan their careers and place them in the right job.
<i>Cost reduction</i>
Because artificial intelligence helps in qualitative recruitment, the third party's role in recruitment is reduced. This helps reducing the costs.
<i>Quality hiring</i>
Artificial intelligence provides recruiters with big data and unbiased screening and selection, improving recruits' quality.
<i>Reducing turnover</i>
Employees receive answers to their questions with updated information. This satisfies employees and results in employee engagement. It helps reduce turnover as employees continue to provide their services to the organization.
<i>Efficient workforce</i>
Artificial intelligence results in qualitative hiring. It also helps the training and development of employees. This leads to improved productivity and a productive workforce.
<i>No bias in recruitment</i>
Just as people are not involved in recruitment, artificial intelligence does not have any bias in recruitment, screening, or selection.
<i>Qualified candidates</i>
Artificial intelligence not only increases the number of candidates but also the quality. Artificial intelligence helps to understand the candidate's qualifications and competencies, skills, and knowledge. Talented candidates are recruited.

It is possible to summarize the difficulties risen by artificial intelligence in recruitment as follows (Lam and Oshodi, 2016: 4):

- (i) A lot of data is required: Dealing with people is like dealing with infinite variables. A lot of data is needed to understand the psychology of very complex people.
- (ii) The challenge in dealing with humans: Artificial intelligence is artificial and just a tool to get the job done with less time and money. But when it comes to taking care of people, people come into play. Artificial intelligence is intelligent, but it has no emotions to control and manage people.
- (iii) Lack of human touch: Artificial intelligence as a tool lacks human resources without empathy. Without empathy, this tool can not fix people how a human resources professional can with a human touch.

The future of artificial intelligence has become more fascinating than ever. People have been debating this issue for years (Wilson & Daugherty, 2018). Some say that robots are the future and will completely replicate humans (Jarrahi, 2018: 578). Another view is that human dependence on this sector will increase multifaceted. However, one thing is certain that artificial intelligence is advancing faster than ever, and no one knows what will happen next (Müller and Bostrom, 2016: 555).

Among all the controversies, some predictions that may be considered are listed below (Floridi, 2020: 127):

- (i) Artificial intelligence has already become part of various daily activities. It is expected to make future people completely dependent on this technology. Self-driving cars, for example, are being developed with artificial intelligence. There is no limit to this technology if it wants to facilitate the human experience.
- (ii) Many predict that by applying this technology to robots, more than one new invention can be created. This can have many effects on people.

Unlike other predictions, this says artificial intelligence will only improve your working environment. By making boring tasks simpler, people will be able to focus on key tasks. This helps human resources reach their best potential

Research and Methodology

This study aims to identify the use of artificial intelligence in recruitment processes. Also, in businesses that use artificial intelligence technologies in recruitment processes, exploring the level at which artificial intelligence is used in recruitment processes is also among the research's sub-objectives. In addition, how the use of artificial intelligence in recruitment processes supports candidate selection, interview, orientation, and recruitment stages, which are recruitment processes, was also discussed within the research scope.

Yıldırım and Şimşek (2006: 119) states that the most commonly used method in qualitative research is the interview. As part of the research, this method was preferred, as it was to get information from target companies about the use of artificial intelligence in recruitment processes. In this context, interviews made with 22 companies, and 11 questions were asked about artificial intelligence technologies. In the interview, the researcher asks the questions previously created to the participants within a certain order. In the interview, the researcher's goal is to get answers by asking questions where he/she will get the desired information. In other words, the researcher tries to determine the experience of the target audience about the subject being investigated. During the evaluation of the data obtained in the study, the program named NVIVO was used. The program named NVIVO facilitates the evaluation process for qualitative research in terms of providing the opportunity to edit data. With NVIVO, researchers can group the data obtained in phenomenological research and combine it according to their similar characteristics (Baş & Akturan, 2008:27). The NVIVO package program was used to group interview data according to similar characteristics and transfer them to the outside in the form of a graph.

The universe of the research consists of 20 medium and large-sized enterprises interviewed. Interviews were conducted with representatives of the human resources or recruitment department in these enterprises. The names of the companies participating in the research were not given. As part of the research, the companies were coded from COMPANY-1 to COMPANY-20. Data was collected through previously created interview forms. The questions to be asked in the interviews were adapted from the relevant literature and prepared by the researcher (Gür,et.al., 2019; Johansson & Herranen, 2019). As part of the research, answers to the following questions were sought.

- (i) *Information about the person interviewed (sex, age, years of experience, position, educational background, department graduated)*
- (ii) *Company information (sector, number of employees, number of monthly recruited employees, number of employees in human resources)*
- (iii) *What do you think are the benefits of artificial intelligence in recruitment processes?*
- (iv) *At what stages of recruitment do you think artificial intelligence can be used?*
- (v) *Can artificial intelligence replace people in recruitment processes?*
- (vi) *How does the use of artificial intelligence in recruitment processes affect candidate evaluation processes?*
- (vii) *What do you think about leaving the decision-making stage in recruitment processes to artificial intelligence?*
- (viii) *What are the downsides of artificial intelligence regarding recruitment processes?*
- (ix) *What do you expect from artificial intelligence technologies in recruitment processes?*
- (x) *What are your thoughts on the future of artificial intelligence technologies in recruitment processes?*
- (xi) *Which artificial intelligence technologies would you like to use in recruitment processes if you had the opportunity?*
- (xii) *Do you benefit from artificial intelligence technologies in your company's recruitment processes? (If yes) Which artificial intelligence technologies do you use in your recruitment processes?*

Answers to the questions asked within the scope of the research were recorded in previously prepared forms. Since the study is qualitative, it is important that all the information provided by the participants is recorded and transmitted without modification. Therefore, as part of the research's security, all data is written exactly as stated, without correction, including grammatical errors.

Implications

A total of 22 employees in the recruitment department or human resources department participated in the interview. When the sex of the supervisors of the human resources and recruitment units is examined, it is seen that 82 percent are male, and 18 percent are female. The average age of the supervisors of human resources and/or recruitment units is 37.2 years. The youngest age is 29, while the oldest is 48. The average working time of the supervisors of human resources and/or recruitment units is 12 years and 9 months. In other words, it is possible to say that the experience of the responsible persons interviewed in the sector is high. 77 percent of participants in the research were managers in human resources and recruitment units. The remaining 23 percent is made up of supervisors and experts. Although the universities from where the supervisors of human resources and/or recruitment units graduated are diverse, it mostly consists of Anadolu University, Boğaziçi University, Marmara University, and Istanbul University. Although the departments graduated by the responsible persons of human resources and/or recruitment units who participated in the research are diverse, the Departments of Business Administration, Economics, and Public Administration graduates are more intensive than other departments' graduates.

It is seen that the sectors of the companies participating in the interview are very diverse. The intensity appears to be in industries such as aviation, finance, telecommunications, and ground operations. The number of employees in the companies participating in the interview varies between 80 and 33 thousand. The interviewees employ an average of 42 personnel each month. Some companies do not hire anyone for some months, while some companies may increase this number to 300. An average of 28 people works in the human resources departments of the companies participating in the interview. In some businesses, this ratio is around 1-2; in others, it is up to 85-90.

In the following sections, answers to questions of human resources about the use of artificial intelligence in the recruitment processes of companies are presented:

Question 1: What do you think are the benefits of artificial intelligence in recruitment processes?

Figure 1: Grouping of answers to the question: "What do you think are the benefits of artificial intelligence to recruitment processes?"

When the answers to the question about the benefits of artificial intelligence to the recruitment process are examined, it is seen that participants are focused on saving time. As time management is an important and priority issue for businesses, it is possible to say that they prefer technological innovations in terms of making time management better. In addition, equal treatment of candidates, rapid process progress, and healthy interpretation of candidates have also been counted among the benefits that artificial intelligence provides to the recruitment process.

Question 2: In what stages of recruitment do you think artificial intelligence can be used?

Figure 2: Grouping of answers to the question: "In what stages of recruitment do you think artificial intelligence can be used?"

When the answers to the question of which recruitment process artificial intelligence can be used in are examined, it is seen that the participants believe that artificial intelligence will be an advantage in cv selection and interview issues (Figure 2). It is also possible to say that participants believe that artificial intelligence will be useful in the orientation process, personality tests process, and performance evaluation process.

Question 3: Can Artificial Intelligence replace people in recruitment processes?

Figure 3: Grouping of answers to the question: "Can artificial intelligence replace people in recruitment processes?"

Asked about the possibility that artificial intelligence can replace people in the recruitment process, some of the participants argued that in no way can artificial intelligence replace people in the recruitment process. In contrast, others argued that it could replace people in certain recruitment areas (Figure 3). Those who argue that artificial intelligence cannot replace the human factor in the recruitment process have underlined the importance of the human factor:

- (i) "No, a secondary and humane assessment is required."
- (ii) "It may not give a fruitful result that it takes the entire task."
- (iii) "At all point, no."
- (iv) "As with any technology, the human factor will never leave it to technology by 100%."
- (v) But some participants also believe that artificial intelligence can partially eliminate the human factor in the recruitment process.
- (vi) "The use of artificial intelligence technologies in human resources is only possible by constantly informing and adapting employees about new technologies through training. So, without human resources professionals, some of the parts will remain incomplete. In addition, since artificial intelligence work in the field of human resources is still at an initial level, it will take time to reach full equipment in the recruitment process. As studies on artificial intelligence increase, there will continue to be improvements in the management of recruitment processes."

- (vii) "Artificial intelligence can be used functionally in some part of recruitment processes, in the final decision-making step, human resources personnel decide according to the analysis results."
- (viii) "Those who will set recruitment criteria; those who will report what they are looking for in people will again be people. It can reduce the number of staff, but it will not replace them completely."

Question 4: How does the use of artificial intelligence in recruitment processes affect candidate evaluation processes?

Figure 4: Grouping of answers to the question: "How does the use of artificial intelligence in recruitment processes affect candidate evaluation processes?"

When the answers to the question about the impact of using artificial intelligence in recruitment processes on the candidate evaluation process are examined, most of their participants believe that using artificial intelligence in the recruitment process will positively affect the evaluation process (Figure 4). Those who respond positively emphasize that artificial intelligence will provide objective decision-making, a fair assessment environment, and a quick return to candidates:

- (i) "First, advanced versions of artificial intelligence will have an objective evaluation angle to recruitment processes. For example, full-blown artificial intelligence applications or robotic applications can detect whether a candidate is lying about a particular subject during an interview, based on the fact that the person's pupils are growing and shrinking or a movement they are making at that moment. At the same time, with such analyses, it aims to get rid of the prejudices that may occur in interviews."
- (ii) "It allows for a multifaceted assessment in which competence is questioned more in candidate evaluation processes and usually minimizes the errors of the less-equipped evaluator who makes the initial assessment."
- (iii) "The firm that uses such technology can create very different positive thoughts in the eyes of the candidate. The process can be completed with faster, transparent, and analytical analysis results of these processes."
- (iv) Some participants also argue that using artificial intelligence in the recruitment process will negatively affect the candidate evaluation process.
- (v) "It is also obvious that artificial intelligence will be missing on the emotion management side of hires. For example, the social purpose of recruitment, choosing the needy among equals, is not an orientation that can be possible with artificial intelligence."

Question 5: What do you think about leaving the decision-making stage to artificial intelligence in recruitment processes?

Figure 5: Grouping of answers to the question: "What do you think about leaving the decision-making stage in recruitment processes to artificial intelligence?"

- (i) In Participants exhibit negative thoughts about leaving the decision-making stage to artificial intelligence in recruitment processes (figure 5). Many participants argue that it is not yet possible to use artificial intelligence in such a process fully. Besides, in some areas, some think that the recruitment process can be left to artificial intelligence:
- (ii) "We believe that decision-making processes should not belong to artificial intelligence. The process management and the process up to the decision stage will be sufficient to be managed by artificial intelligence. If the employer side makes the final decision about the person, it must be the real representatives of the employer."
- (iii) "After certain tests and after teaching the necessary data to the machine, the decision to hire can be left to artificial intelligence. But there will always be manual interventions. It's like a manual pilot intervention on a plane that can go on autopilot."
- (iv) "I do not find that right. Artificial intelligence should be supported by a person alone in evaluating the person who will work with humans, their behavior during contact with a person, their energy, whether they are friendly or not, and the way they talk."
- (v) "Final decision-making must be made by human resources personnel."
- (vi) "I think there should be a recruitment manager who recognizes the corporate culture at the final stage and the decision-making stage."
- (vii) Some participants also argue that the decision-making mechanism in the hiring process can be left to artificial intelligence. These participants especially emphasize the area of objectivity and impartiality of artificial intelligence:
- (viii) "After a certain sample, why not?"
- (ix) "It can be a plus benefit in terms of being objective and impartial."

Question 6: What are the downsides of artificial intelligence regarding recruitment processes?

Figure 6: Grouping of answers to the question: "What are the downsides of artificial intelligence regarding recruitment processes?"

As for the downsides of artificial intelligence related to the recruitment process, participants emphasized making wrong decisions and making objective judgments. Also, reducing intimacy in the recruitment process, not capturing details about the candidate to be hired, unemployment in the recruitment sector due to artificial intelligence to replace the recruitment personnel, and the possibility that the candidate can manipulate artificial intelligence are shown among the downsides of using artificial intelligence in the recruitment process (Figure 6).

Question 7: What do you expect from artificial intelligence technologies in recruitment processes?

Figure 7: Grouping of answers to the question: "What do you expect from artificial intelligence technologies in recruitment processes?"

In When participants' expectations from artificial intelligence in recruitment processes are examined, it is possible to group the expectations as follows:

- (i) Ensuring access to the right candidates (CVs),
- (ii) Ensuring equal evaluation of candidates,
- (iii) Time savings,
- (iv) Accelerating the recruitment process,
- (v) Supporting the recruitment decision made by the recruitment personnel regarding the candidates.

Question 8: What are your thoughts on the future of artificial intelligence technologies in recruitment processes?

Figure 8: Grouping of answers to the question: "What are your thoughts on the future of artificial intelligence technologies in recruitment processes?"

When the answers to the question about the future of artificial intelligence technologies used in the recruitment process are analyzed, it seems that participants think that artificial intelligence will be used more in future recruitment processes (Figure 4.8). Besides, thoughts of recruitment unit experts on the future of artificial intelligence are as follows:

- (i) More efficient results can be obtained.
- (ii) It will enable effective decision-making.
- (iii) It will replace man.
- (iv) It will ease the workload.

In addition, it is possible to summarize the remarkable opinions on the subject as follows:

- (i) "The active use of artificial intelligence in recruitment may occur soon. Some large-scale firms began to use artificial intelligence-based software when recruiting. For example, a communication center in Europe used artificial intelligence algorithms instead of using language experts in a recruitment process where the use of seven different languages had to be tested. A phone call was made with candidates using artificial intelligence. The language fluency and communication skills of the candidates during the speech were evaluated by artificial intelligence. The results were efficient and quality. Therefore, as countries and companies, before artificial intelligence is exported to us, we must implement artificial intelligence algorithms with national resources and prepare employers/professionals for this process."
- (ii) "It is necessary to ensure that the secondary effects of artificial intelligence removing people from life can be negative, that it is essential to do planning on the impacts of wasting or pushing people into the background on human life as well as the effect on business processes. In other words, first, a new area of interest/influence/benefit should be created for the field that wastes the labor force; in this process, they should experience the manpower-supported part of artificial intelligence with its good and bad sides, develop it, and then the move should be made."
- (iii) "I believe that this process will add more power to the human resources structure; I do not think that artificial intelligence will replace human resources personnel by 100%. But I believe that a combination of these two elements will lead to a more efficient business."
- (iv) "Like every technological development, artificial intelligence will be rapidly placed in the human resources sector over the next 10 years."

Question 9: Which artificial intelligence technologies would you like to use in recruitment processes if you had the opportunity?

Figure 9: Grouping of answers to the question: "If you had the opportunity, which artificial intelligence technologies would you like to use in recruitment processes?"

When artificial intelligence technologies intended to be used in recruitment processes are examined, it is understood that artificial intelligence is most often wanted to be used in CV screening (candidate determination) and interview processes. In particular, in the process of selecting and eliminating candidates and conducting online interviews with candidates, human resources experts note that artificial intelligence can be used.

Question 10: Do you use artificial intelligence technologies in your company's recruitment processes?

Figure 10: Grouping of answers to the question: "Do you use artificial intelligence technologies in your company's recruitment processes?"

The companies in which participants worked often did not benefit from artificial intelligence in their recruitment processes. In addition, certain companies also partially use artificial intelligence:

- (i) "Not quite. We do various modeling."
- (ii) "If the personality inventory test is an artificial intelligence test, we use the personality inventory test."

Question 11: (if yes) Which artificial intelligence technologies do you use in your recruitment processes?

Figure 11: Grouping of answers to the question: "(if yes) Which artificial intelligence technologies do you use in your recruitment processes?"

In the previous question, some firms indicated they use artificial intelligence technologies in the recruitment process. When examining which artificial intelligence technology these firms use in which processes, it is possible to make a classification as four groups (Figure 11):

- In the recruitment (CV elimination, candidate determination) processes,
- Candidate database scanning processes,
- Processes of conducting personality tests,
- Preliminary interview processes.

Businesses have been analyzing candidates and conducting the recruitment process using similar methods. These methods were usually in the form of posting ads on the internet, finding candidates through career sites, or finding candidates from an existing pool of candidates. During the evaluation process of candidates, methods such as personal meetings, interviews, and personality tests were used to determine their suitability. But since these processes are both costly and take a long time, innovations have begun to occur in the light of technological advances in recruitment processes. One of them, artificial intelligence, means advancing the recruitment process through machines. It is possible to say that artificial intelligence is the most appropriate innovative technology that significantly impacts recruitment processes, facilitating the better recruitment process when applied strategically. Businesses benefit from these technologies in the recruitment process, candidate database screening processes, personality tests, and pre-interview stages.

Conclusion

In this study, the use of artificial intelligence in the recruitment processes of businesses was examined. In the light of the information obtained from all the analyses of artificial intelligence, it is seen that despite the many benefits it provides such as saving time, accelerating the hiring process, and the benefits in CV selection and the interview process which are expressed by the human resources managers, many companies do not prefer using artificial intelligence in the recruitment process yet. The most important reason for this is that artificial intelligence can lead to the wrong decision to evaluate candidates. In other words, it is not yet thought that artificial intelligence can replace humans in recruitment processes. Despite this, many businesses believe that artificial intelligence will develop and eliminate these problems in the future.

It is possible to summarize the results of the research as follows:

- (i) *Artificial intelligence is thought to benefit hiring managers and units in saving the most time and moving quickly in the recruitment process.*

- (ii) It is believed that artificial intelligence can be used mostly in cv selection (candidate determination) and interview processes in the recruitment process. It is also dominated by the view that artificial intelligence can be used in the orientation process, the implementation of personality tests, and performance evaluation.
- (iii) It is thought that artificial intelligence cannot replace human beings in the recruitment process. The most important reason for this is that artificial intelligence is not sufficiently trusted. It is thought that human control is necessary at some point in the recruitment process.
- (iv) It is believed that the use of artificial intelligence in the recruitment process will positively affect the candidate evaluation process in terms of providing a fair evaluation environment, saving time, and allowing objectivity.
- (v) It is thought that artificial intelligence cannot make decisions alone in the recruitment process, and human control is necessary. Many participants argue that it is not yet possible to use artificial intelligence in such a process fully.
- (vi) The idea that artificial intelligence in the recruitment process can cause wrong decisions, diminish intimacy, and fail to capture details about the candidate to be hired prevails. Also, human resources personnel believe that artificial intelligence can create the unemployment problem in human resources.
- (vii) The expectations of human resources managers and responsible people in the recruitment process from artificial intelligence are to provide access to the right candidates, ensure equal evaluation of candidates, save time, and create a fast recruitment process.
- (viii) It is believed that artificial intelligence technologies will be used more in the future in the recruitment process. Besides, it is believed that in the future, it will be possible to make effective decisions and achieve efficient results by integrating artificial intelligence into recruitment processes.
- (ix) Companies that want to use artificial intelligence in recruitment processes are most likely to want to use artificial intelligence in cv screening and interview processes.

According to the interview results, it is understood that businesses have not yet adequately used artificial intelligence in their recruitment processes. In businesses using artificial intelligence, artificial intelligence is seen to be used as an auxiliary element. But despite this, recruiters and managers believe that artificial intelligence will be used more in recruitment processes in the future. A very small number of companies have been found to benefit from artificial intelligence in their recruitment processes. On the other hand, these companies only used artificial intelligence in the process of pre-hiring interviews and personality Inventory tests. In other words, businesses use artificial intelligence as a complementary or supportive element in their recruitment processes and do not completely transfer the recruitment process to artificial intelligence.

The data obtained through this research reflects the results of the interviewed companies. Therefore, interviews with different companies can have different results. In addition, it has not been determined whether the hiring managers interviewed to know about artificial intelligence. These two conditions constitute the limitations of the research. The research is of great importance in highlighting the current trend of using artificial intelligence in the recruitment process. As a study involving many sectors and companies of many sizes, companies need to provide information about the use of artificial intelligence in recruitment processes and create a starting point for future uses. Future studies in this area can be reduced to certain sectors and determine the overall trend of that sector. Also, companies that do not yet use artificial intelligence in recruitment processes can be identified, and special studies can be done for these companies.

References

- Allen, D. G., Van Scotter, J. R., & Otondo, R. F. (2004). Recruitment communication media: Impact on prehire outcomes. *Personnel Psychology*, 57, 143–171.
- Allen, J. F. (1998). AI growing up: The changes and opportunities. *AI magazine*, 19(4), 13-13.
- Barutçugil, İ. (2004). Stratejik İnsan Kaynakları Yönetimi, Kariyer Yayıncılık İletişim, Eğitim Hiz. Ltd. Şti., *Kariyer Yayınları*, 59.
- Baş, T., & Akturan, U. (2008). *Nitel araştırma yöntemleri: NVivo 7.0 ile nitel veri analizi*. Seçkin Yayıncılık.
- Bhatnagar, S., Alexandrova, A., Avin, S., Cave, S., Cheke, L., Crosby, M., ... & Price, H. (2017). Mapping intelligence: Requirements and possibilities. In *3rd Conference on "Philosophy and Theory of Artificial Intelligence"* (pp. 117-135). Springer, Cham.
- Brachman, R. J. (2006). AI more than the sum of its parts. *AI Magazine*, 27(4), 19-19.
- Can, H., Akgün, A., & Kavuncubaşı, Ş. (2001). Kamu ve Özel Kesimde İnsan Kaynakları Yönetimi, 4. Baskı, *Siyasal Kitapevi, Ankara*.
- Çetinkol, D. (2016). İnsan Kaynakları Yönetimi Seçme ve Yerleştirme Süreci ve bir örnek olay. *Gazi Üniversitesi, Bilişim Enstitüsü Yönetim Bilişim Sistemleri Yüksek Lisans Bitirme Projesi*.
- Dereli, T., & Uzunçarşılı, Ü. (1990). İşletmelerde Personel Tedariki ve Seçimi. *MESS Yayını, İstanbul*.
- Dietterich, T. G. (2017). Steps toward robust artificial intelligence. *AI Magazine*, 38(3), 3-24.
- Faliagka, E., Ramantas, K., Tsakalidis, A., & Tzimas, G. (2012a). Application of machine learning algorithms to an online recruitment system. In *Proc. International Conference on Internet and Web Applications and Services*.

- Faliagka, E., Tsakalidis, A., & Tzimas, G. (2012b). An integrated e-recruitment system for automated personality mining and applicant ranking. *Internet Research*, 22(5), 551–568.
- Fındıkcı, İ. (2009). *İnsan kaynakları yönetimi*. Alfa Basım Yayım Dağıtım.
- Floridi, L. (2020). What the near future of artificial intelligence could be. In *The 2019 Yearbook of the Digital Ethics Lab* (pp. 127–142). Springer, Cham.
- Furnham, A., Jackson, C. J., & Miller, T. (1999). Personality, learning style and work performance. *Personality and individual differences*, 27(6), 1113–1122.
- Ghahramani, Z. (2015). Probabilistic machine learning and artificial intelligence. *Nature*, 521(7553), 452–459.
- Göktaş, S. (2009). İşe alım süreci ve bir uygulama. *Yıldız Teknik Üniversitesi Sosyal Bilimler Enstitüsü İşletme Ana Bilim Dalı Yüksek Lisans Tezi*, İstanbul.
- Gür, Y. E., Ayden, C., & Yücel, (2019). A. Yapay Zekâ Alanındaki Gelişmelerin İnsan Kaynakları Yönetimine Etkisi. *Fırat Üniversitesi Uluslararası İktisadi ve İdari Bilimler Dergisi*, 3(2), 137–158.
- Habeeb, A. (2017). *Artificial intelligence*. University of Mansoura.
- Hacioglu, U. (2020). Digital Business Strategies in Blockchain Ecosystems. Springer International Publishing, <https://doi.org/10.1007/978-3-030-29739-8>.
- Hacioglu, U. (Ed.). (2019). Handbook of research on strategic fit and design in business ecosystems. IGI Global. <https://doi.org/0.4018/978-1-7998-1125-1>
- Hacioglu, U., & Sevgilioglu, G. (2019). The evolving role of automated systems and its cyber-security issue for global business operations in Industry 4.0. *International Journal of Business Ecosystem & Strategy* (2687-2293), 1(1), 01–11. <https://doi.org/10.36096/ijbes.v1i1.105>
- Hassabis, D., Kumaran, D., Summerfield, C., & Botvinick, M. (2017). Neuroscience-inspired artificial intelligence. *Neuron*, 95(2), 245–258.
- Heiss, J. L. (2017). Cooperating AI Making artificial intelligence more human.
- HireVue. (2018). HireVue on Demand. Haettu 3.5.2018 osoitteesta: <https://www.hirevue.com/products/video-interviewing/ondemand>
- Issa, H., Sun, T., & Vasarhelyi, M. A. (2016). Research ideas for artificial intelligence in auditing: The formalization of audit and workforce supplementation. *Journal of Emerging Technologies in Accounting*, 13(2), 1–20.
- Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons*, 61(4), 577–586.
- Johansson, J., & Herranen, S. (2019). *The application of Artificial Intelligence (AI) in Human Resource Management: Current state of AI and its impact on the traditional recruitment process*. Jönköping University, Bachelor Thesis, Jönköping.
- Kaczmarek, T., Kowalkiewicz, M., & Piskorski, J. (2005). Information extraction from CV. In *Proceedings of the 8th International Conference on Business Information Systems* (pp. 3–7).
- Kaynak, T., Adal, Z., Ataay, İ., Uyargil, C., Sadullah, Ö., Acar, A. C., ... & Uluhan, R. (1998). İnsan kaynakları yönetimi. *İstanbul: Dönence Basım ve Yayın Hizmetleri*.
- Kızıloğlu, S. D. (2012). *İnsan kaynakları yönetiminde işe alım*. Bahçeşehir Üniversitesi, Doktora Tezi, İstanbul.
- Kirsh, D. (1991). Foundations of AI: the big issues. *Artificial intelligence*, 47(1-3), 3–30.
- Komaraju, M., & Karau, S. J. (2005). The relationship between the big five personality traits and academic motivation. *Personality and individual differences*, 39(3), 557–567.
- Lam, K. C., & Oshodi, O. S. (2016). Using univariate models for construction output forecasting: Comparing artificial intelligence and econometric techniques. *Journal of Management in Engineering*, 32(6), 04016021.
- Learning, D., LeCun, Y., & Bengio, Y. och Hinton, G. 2015. *Nature*, 521, 436–444.
- LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *nature*, 521(7553), 436–444.
- Liu, R., Yang, B., Zio, E., & Chen, X. (2018). Artificial intelligence for fault diagnosis of rotating machinery: A review. *Mechanical Systems and Signal Processing*, 108, 33–47.
- Lu, H., Li, Y., Chen, M., Kim, H., & Serikawa, S. (2018). Brain intelligence: go beyond artificial intelligence. *Mobile Networks and Applications*, 23(2), 368–375.
- Mairesse, F., Walker, M. A., Mehl, M. R., & Moore, R. K. (2007). Using linguistic cues for the automatic recognition of personality in conversation and text. *Journal of artificial intelligence research*, 30, 457–500.
- McCarthy, J. (2019). What is artificial intelligence (2007). URL <http://www-formal.stanford.edu/jmc/whatisai/whatisai.html>.
- Montuschi, P., Gatteschi, V., Lamberti, F., Sanna, A., & Demartini, C. (2013). Job recruitment and job seeking processes: how technology can help. *It professional*, 16(5), 41–49.
- Mozumder, R. A., Laskar, A. I., & Hussain, M. (2018). Penetrability prediction of microfine cement grout in granular soil using Artificial Intelligence techniques. *Tunnelling and Underground Space Technology*, 72, 131–144.
- Müller, V. C., & Bostrom, N. (2016). Future progress in artificial intelligence: A survey of expert opinion. In *Fundamental issues of artificial intelligence* (pp. 555–572). Springer, Cham.
- Nadimpalli, M. (2017). Artificial intelligence risks and benefits. *International Journal of Innovative Research in Science, Engineering and Technology*, 6(6).
- Omohundro, S. M. (2008). The basic AI drives. In Wang, Goertzel, & Franklin 2008, 483–492.

- Omohundro, S. (2012). Rational artificial intelligence for the greater good. In *Singularity hypotheses* (pp. 161-179). Springer, Berlin, Heidelberg.
- Önder, B., (2000), Kamu Kurumlarında Personel Yönetimi, 1.Basım.
- Özlü, P.G., (2006), “Hazır Giyim Sektöründe Personel Seçim Sürecine İlişkin Bir Araştırma”, *Tekstil ve Konfeksiyon Dergisi* S:3, ss.200-205.
- Russell, S. J., & Norvig, P. (2016). Artificial intelligence: a modern approach. Malaysia.
- Sabuncuoğlu, Z. (2005). İnsan Kaynakları Yönetimi, Alfa Yayınları.
- Silver, D., Huang, A., Maddison, C. J., Guez, A., Sifre, L., Van Den Driessche, G., ... & Dieleman, S. (2016). Mastering the game of Go with deep neural networks and tree search. *nature*, 529(7587), 484.
- Simon, H. A. (1965). The shape of automation for men and management. New York: Harper & Row.
- Stuart, R., & Norvig, P. (2016). Artificial intelligence: A modern approach (Global edition). Harlow: Pearson.
- Talay, C. B. (1997). Personel seçiminde uzman sistemlerin kullanılabilirliği ve bir uzman sistem modeli.
- Upadhyay, A. K., & Khandelwal, K. (2018). Applying artificial intelligence: implications for recruitment. *Strategic HR Review*.
- Vardarlier, P. (2014). İnsan Kaynakları Yönetiminde Sosyal Medyanın Rolü, İstanbul Beykent Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı İşletme Yönetimi Bilim Dalı (Yayınlanmış Doktora Tezi).
- Vardarlier, P., & Zafer, C. (2020). Use of Artificial Intelligence as Business Strategy in Recruitment Process and Social Perspective. In *Digital Business Strategies in Blockchain Ecosystems* (pp. 355-373). Springer, Cham.
- Varela, F. J., Thompson, E., & Rosch, E. (2016). *The embodied mind: Cognitive science and human experience*. MIT press.
- Wang, P. (2019). On Defining Artificial Intelligence. *On Defining Artificial Intelligence*, 10(2), 1-37.
- Whalen, T. (2009). Economic value of intelligence. In *NAFIPS 2009-2009 Annual Meeting of the North American Fuzzy Information Processing Society* (pp. 1-4). IEEE.
- Wilson, H. J., & Daugherty, P. R. (2018). Collaborative intelligence: humans and AI are joining forces. *Harvard Business Review*, 96(4), 114-123.
- Winfield, A. (2020). Intelligence is not one thing. *Journal of Artificial General Intelligence*, 11(2), 97-100.
- Yildirim, A., & Simsek, H. (2008). Sosyal bilimlerde nitel araştırma yöntemleri. Ankara: SeckinYayıncılık.

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