

Review article

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AI AND PREDICTIVE ANALYSIS IN HUMAN RESOURCES

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Abstract

Based on an extensive review of the literature, this paper explores current and future potentials of using artificial intelligence in human resource management, including reflections on the possibility of artificial intelligence fundamentally changing the way companies motivate, recognize and reward their employees. Very rapid advances in the development of deep neural networks and self-learning algorithms, along with integration with augmented reality, indicate very important developments in the field of human resource management technology. Human resource managers, who understand advanced analytics and artificial intelligence, will welcome the new age ready and act immediately to prepare themselves and organizations for this near (or maybe already present) future. The primary goal of this paper is to encourage reflection on how artificial intelligence and machine learning could affect human resource function in the years to come.

Keywords: human resources, artificial intelligence, machine learning.

INTRODUCTION

The modern business environment is increasingly marked by the need for creativity, innovation and the ability to take risks and initiative in business (Smoljić et al, 2015). Human resource management today stands at the crossroads, given that present dynamic business environment is strongly influenced by the trend of digitalization of business processes, ie the application of artificial intelligence and machine learning and networking of various data sources to create a huge "cloud" databases (cloud computing and big data) through the application of the concept of the Internet of Things. Information and communication technology is an important foundation for gaining sustainable competitive advantage of entrepreneurial subjects in the global competitive environment (Smoljić et al, 2016). In its beginnings, human resources were mainly focused on rewarding quality employees with money, travel, or various physical items and merchandise. In the years that followed, the focus of human resources was on creating incentive rewards and career coaching, while today human resources deal with the knowledge and application of motivational theories, ie employee motivation and their engagement, retention and performance. This evolution came at a crucial moment in economic history, so today the most famous and reputable companies focus on people, ie employees and users.

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For those who create employee reward programs, those who are responsible for creating and implementing incentive, recognition, and reward programs, this is both an opportunity and a risk. When leaders look at the practices of the most successful companies of this era, including Google, Tesla, Amazon and the like, they see a paradigm emerge according to which the work itself represents a new reward (Charan et al, 2018).

In order for companies to thrive in a modern business environment, they must design work places and work environments as to provide the very essence of motivation needed for any employee to "shine". These are universal drivers, such as autonomy, learning, purpose, inclusion, and appreciation. Organizations should also need to better understand the unique motivators for each and every employee. General incentives, intended for large groups of employees, are no longer sufficient to attract, retain and engage employees.

1. ARTIFICIAL INTELLIGENCE AND HUMAN RESOURCES – AN INTIMATE RELATIONSHIP?

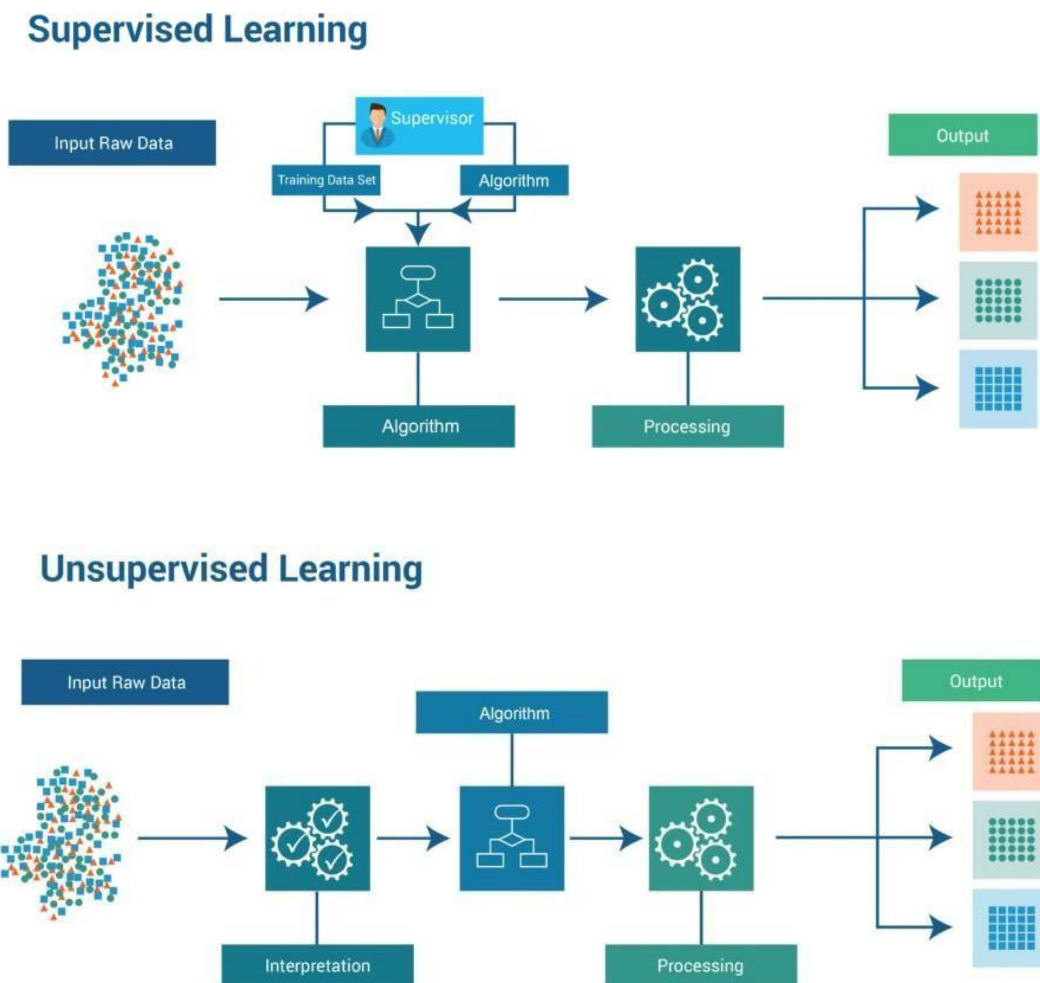
The concept of using artificial intelligence to gain information about employees, so that the information can be analyzed and produce powerful insight about the best possible ways to attract, recruit and retain employees, can be also connected to knowledge management, "which requires a systematic approach to knowledge in order to create added value for the organization, both at the strategic as well as tactical and operational level" (Stipanovic et al, 2014). The future of the development and application of artificial intelligence in relation to incentives, awards and recognition to employees is partly related to the future of artificial intelligence in related fields. It is first necessary to define the concept of artificial intelligence, and then briefly present its history in a related field, ie in the field where its application is already somewhat advanced, before the discussion of artificial intelligence in human resources context.

1.1. What is Artificial Intelligence (AI)?

Modern terms, such as big data, the Internet of Things, machine learning, or artificial intelligence, are so often used that we sometimes wonder what their meaning is. Generally speaking, artificial intelligence can be defined as anything created by the "human hand", which learns from experience and mimics human intelligence (Young, 2018). It should be noted that machine learning and predictive analytics are components of artificial intelligence. "Big data provides the fuel (huge amounts, fast-flowing and diverse data) needed for predictive analytics and, increasingly, machine learning" (Marr, 2016). The term machine learning refers to the latest methods in statistical analysis, pattern recognition, and predictive analytics (Theodoridis, 2015). Machine learning uses a variety of algorithms to find patterns in the data based on which it makes various predictions (Young, 2018). Generally speaking, machine learning manifests itself in three variants:

- Supervised - the analyst supplies the algorithms with a large amount of tagged data from which the "machine learns"
- Unsupervised - algorithms learn on their own by finding patterns in untagged (raw) data
- Semi-supervised - a combination of the above techniques.

Figure 1. Difference between supervised and unsupervised learning models



Source: Young, M. (2018). Discovering the children of AI: Machine learning & deep learning. Retrieved January 27, 2021. from: <https://www.functionize.com/blog/discovering-the-children-of-ai-machine-learning-deep-learning/>

In the present times, we are witnesses of the application of advanced machine learning techniques that use neural networks (multilayer machine learning that mimics the human brain) in predictive analytics and artificial intelligence (Paskin, 2018).

The latest achievements related to the concept of artificial intelligence, whether it is a victory of machine vs man in chess or any complex game, predicting cancer or fully autonomous cars, are most often related to the use of cutting-edge machine learning

techniques. In the future, both the most modern and most advanced models of machine learning will be overshadowed by some completely new forms of artificial intelligence that will be able to read, react and simulate human emotions or even become aware of their own existence (Hintze, 2016). However, if we stay in the present and focus on the very near future, machine learning “will certainly represent the leading artificial intelligence” (Manyika, 2017).

Although artificial intelligence has been the focus of the public in cycles, today the situation is somewhat different. Today's organizations not only create huge amounts of data, but the vast majority of them have the capacity to store it. Also, the power of today's computers is incomparably greater than in the 1950s, when the first experiments with artificial intelligence were conducted. This large amount of computing power allows the analysis of large amount of unstructured big data. In addition, extensive and clear coding was previously required to teach computers what to do (which was an expensive and time-consuming process), while today's machine learning algorithms have the ability to learn independently, often with only minimal human input (Brynjolfsson & McAfee, 2017). Unlike previous “hard-coded” programs, algorithms that learn from the input (data entered into them) have the ability to adapt to a dynamic environment and exponential growth (Paskin, 2018).

1.1. Application of artificial intelligence in the workplace

Charan and Barton (2018), two highly distinguished authors point out that "quality information about talents that is interpreted in a professional way can be the most important competitive advantage." Also, they argue that low costs and easy access make financial capital a commodity, and human resources then represent a key difference in most organizations today (Charan, Barton and Carey, 2018).

Although only approximately 10% HR organizations have the capacity and ability to use predictive analytics (Bersin, 2017), trends suggest that this percentage will increase in the following years. According to a research conducted in 2015, 86% of HR organizations stated that they plan to improve the ability of people analytics in the coming years (McGregor, 2016). Today, HR organizations seek to hire professional analysts and data scientists to enhance the skills of predictive analytics, machine learning, and artificial intelligence. Mastering the dimensions of data analysis can help organizations "move from a guessing game to real insights that can suggest the next steps to dramatically improve their outcomes" (Dearborn, 2015).

1.2. Application of artificial intelligence in people management

Lohr (2013) states that today “every email, message, phone call, line of code, and mouse click leaves a digital signal”. Today, this data can be easily collected and analyzed to gain insight into how people work and communicate with each other. Most organizations today possess the information and necessary power needed for analysis and processing for advanced people analytics (Bersin, 2013). Large companies

generate enormous amounts of data on a daily basis, that are mostly generated by employees.

This primarily refers to employee surveys, performance reviews, analysis of organizational networks, employee activities on corporate social networks, learning management systems and the like, thus achieving a continuous flow of structured data. If you count in a large amount of "fast" data, such as emails, text messages, website visits, pressing certain keys on keyboards, social media activities, sensor data on mobile phones or employee badges, then it becomes clear that the amount of data collected by even smaller organizations becomes extremely significant. With the already mentioned available power of data processing using modern information technologies, which are available to the vast majority of organizations, then it is clear that these data can be analyzed along with other business and financial data to obtain powerful insight (Segal et al, 2014).

Given the insight into the possibilities of artificial intelligence, leaders tend to move away from traditional descriptive analytics that is often looking backwards. In other words, today leaders research and study the means to attract and hire better talent and find hidden talents within the organization to professionally deploy them, provide real-time feedback and confirmation, gather optimal teams for individual tasks, to conduct performance management analysis in real time and to provide managers with insight into how to best engage, inspire and educate their team members. To make this possible, advanced analytics capabilities (artificial intelligence) are needed.

1.3. Application of artificial intelligence in recruitment and employment

The application of artificial intelligence in employment is very often in focus today. With the help of predictive tools, such as programmatic recruitment advertising, algorithms simultaneously search for and attract qualified, ie potential candidates. Once a person applies for a particular job, the algorithm automatically sorts and screens them using machine learning techniques. There is an opinion that this to be a positive shift in talent acquisition as identifying people using algorithms is faster, more accurate, and more fair because it reduces the possibility of bias.

One example of the use of artificial intelligence in the recruitment process is Unilever, where job applicants first need to play a series of online games that have been developed in compliance with the principles of cognitive neuroscience. These games are used by machine learning to generate and analyze large amounts of data from the attributes, behaviors, and characteristics of employees. Those candidates who were successful at this stage then participate in a fully automated online interview (using artificial intelligence) that assesses the emotions, truthfulness, and content of the candidate's responses in relation to job requirements. After that, qualified candidates are assisted by an AI chatbot that answers all their questions, informs them about the status of the job application and arranges a further interview. Only after the candidates have successfully passed the above stages of recruitment, and in which artificial

intelligence and machine learning are used, the candidate will meet the real "living" person for further interview. The company states that the time needed to hire new employees has been reduced from four months to four weeks, and the time needed to screen the candidates has been reduced by 75% (Daugherty and Wilson, 2018).

Algorithms that use a large amount of data collected during the hiring process can begin to predict employee "compatibility" with the team and eventual professional development needs even before the employee's first day at the new job (Sathe, 2017).

1.4. Application of artificial intelligence in employee retention

Predictive employee retention analysis is one of the more mature, simple and widely represented solutions in the field of predictive analytics in human resources (Westfall, 2017). Today, the algorithms used by a large number of organizations can predict which employees are at risk of leaving the organization. In certain cases, machine learning algorithms can even identify individual employees even before they develop an intention to leave the organization. Through the performance of daily work obligations and through behavior in the workplace, employees give numerous signals about their possible intentions and thus enable organizations to create and improve predictive statistical models that can be very accurate in predicting such events. Using this information, managers (or even artificial intelligence itself) can intervene to prevent talent from leaving the organization, including using customized incentive, reward, and recognition programs.

One example is Joberate, a predictive analytics platform that uses machine learning to monitor employee behavior on publicly available online services (e.g., Facebook, Twitter, LinkedIn) to assess the behavior patterns of people looking for work. If, for example, an employee has a publicly available profile and updates information about their education, employment history, or joins one of the various specialist groups, and is consistent with that over time, the Joberate platform will gradually increase the employee's J-Score. J-Score not only measures job-related activities, but also measures other activities that correlate with job search activities. Once a person reaches or exceeds certain J-Score, the likelihood that an employee will leave the organization in the next 4 months becomes higher if something is not done to prevent this event.

1.5. Application of artificial intelligence in employee performance management

Example of the use of artificial intelligence to manage employee performance is the use of artificial intelligence used to gather information about sales staff, including employee sales patterns, their styles, and how long they have been employed by the company. Artificial intelligence can estimate how much sales will be made as well as what and how much an individual employee will sell in a given period of time.

When this assessment is integrated with correlations and patterns from the learning management system related to sales and performance data, then, for example, it can predict what else a particular employee might sell if certain actions are taken (e.g.,

collaboration with specific colleagues, attending certain courses etc). Also, artificial intelligence can suggest the sales manager the optimal way to encourage and reward each individual employee in the sales team.

Company called Rapportboost.AI has developed algorithms that analyzes conversations that sales staff have with their customers. The focus is on the analysis of interpersonal interaction, and the algorithm recognizes when a sales conversation is good and when it is not, given the hundreds of variables that are taken into account (e.g., empathy, responsiveness, formality). Once this process is complete, Rapportboost.AI provides support to sales managers in terms of advising employees on what they should fix in communicating with customers.

However, it should be mentioned that artificial intelligence provides many benefits in terms of motivating employees. Particularly, the recommendation engines that advise employees regarding career choices that lead to high levels of satisfaction, high job performance, and employee retention within the organization.

For example, if a person with a degree in engineering wants to run his or her own department one day, the algorithm can search the data for specific patterns and suggest the optimal combination of additional professional training, work experience as well as soft skills that an employee should acquire, and even the order by which they should acquire them (Wellers et al, 2017).

CONCLUSION

Human resources departments today are beginning to look up to companies like Google or Tesla because such companies already use big data, predictive analytics, and machine learning techniques to continuously track and analyze employees.

This may sound terrifying at first, and privacy is certainly the main concern in the technological age, but the author was focused on the premise that the technology can be used as intended, without abuse or misuse of ethical principles. The use of modern technologies enables companies to make better decisions regarding the ways of recruiting, hiring, retaining, developing and motivating their employees. In addition to the above, new information technologies enable better decision-making process on strategic initiatives related to motivating efficiency. Of course, author would like to point out that modern information technology should be used with respect for the privacy of employees, ie new methods of human resource management imply the use of technology to prevent possible misuse of such information solutions.

Today, organizations are entering a new era in which the possibility of applying advanced analytical processes is limited only by one`s imagination. We are witnessing rapid research into the application and analysis of the potential use of artificial intelligence in business, human resource management and, to some extent, in the creation of reward programs. So, this paper will be finished with a quote from Waber

(2015) who states that “the power of analytics provides an almost superhuman ability to understand and change the world around us”.

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