

ARTIFICIAL INTELLIGENCE IN THE RECRUITMENT & SELECTION: INNOVATION AND IMPACTS FOR THE HUMAN RESOURCES MANAGEMENT

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ABSTRACT

The objective of the article was to investigate the use of Artificial Intelligence (AI) in recruitment and selection (R&S) and impacts on Human Resource Management (HRM). The study used a survey of scientific papers and conferences materials indexed to the database of Web of Science and Scopus and published between the period 2000 and 2018. In addition, it was decided to make an opinion survey conducted with professionals and managers on the use of the tool as facilitator of the recruitment and selection process and impacts on HRM, contributing to the strategic positioning of the area within the organizations. Data was collected, through survey questionnaires applied between March and May 2019. A total of 150 questionnaires were collected. A quantitative descriptive analysis was performed to analyse the perception of the professionals about AI in HR, as well as the use of this technology in the automation of processes and contributions when used in R&S processes. Of the 150 respondents, 74% are female, 61% are over 36 years old, 67.3% works in the service sector, and about 49% perform functions in the area of Human Resources. It was also observed that around 63% of respondents' companies have never used AI and about 19% use or have already used AI in the area of customer service. The lack of solid research lines in the subject was verified and it was concluded that the practice is still very embryonic, although the view of the respondents, ones is positive about the benefits that the AI can bring to the recruitment and selection of candidates. It is hoped that the questions pointed out in this essay elicit new theoretical and empirical studies that show the interactions between AI and HR.

Keywords: *Artificial Intelligence, Human Resource Management, Recruitment and Selection*

1. INTRODUCTION

Technological advances have contributed to the remodeling of organizational practices. According to Leite and Albuquerque (2013), technological changes, the globalization of the economy, the intensification of competition between organizations and between countries and

the diversity of the workforce are some factors that significantly influence the change in the management of organizations. The context requires the insertion of advanced management technologies, the attraction and retention of skilled labor and increasingly solid production processes, in order to increase efficiency and economic-financial gains. The relationship between technology and human action is recognized as authentic and necessary, as this alliance emerges as a means of supporting and enhancing strategic goals and objectives. Technology is the tool of support and development of management and decision-making systems. To the extent that the talents, which make up the workforce, work in the search for new solutions and in the execution of the processes. Artificial Intelligence (AI), according to Bellman (1978), is the process of activity automation that is associated with human thinking, activities such as decision making, problem solving and learning. The area of Artificial Intelligence is currently widely used in various fields of application, assisting human capacity in projects and the development of new systems and products, and also replacing many repetitive and boring activities of human operators in various productive functions (Lima, Pinheiro, & Santos, 2014). AI allows faster and more effective decisions, contributing to the company's development and to bringing people closer together (De Mendonça, et al., 2018). This raises the belief that, if properly applied, AI practices can be used to streamline and make HRM more effective. Understanding that this area encompasses, in addition to employment policies and practices, the process of recruiting and selecting talents. It is important to note that this area has been greatly impacted by changes and new market trends. According to Van Esch and Mente (2018), in the quest for talent, several organizations begin to adopt different technological platforms as a strategy of attraction and selection of candidates. This has contributed to the use of AI in recruitment and selection (R&S) processes. Recruitment and selection activities are, according to good practices, developed by the Human Resources (HR) area. These activities are associated to the individual-job adequacy paradigm, that is, at the same time that it communicates and disseminates the job opportunity, attracts the candidate to the selection process (Chiavenato, 1999). Thus, the use of AI provides, through its intrinsic values, the accomplishment of tasks in a shortest possible time (Van Esch, Black, & Ferolie, 2019). This need for agility is reinforced by the current scenario, characterized by increased access to the internet and globalization, impelling new technologies to emerge and develop, highlighting the human resources management, which provide greater competitiveness for companies. Organizational managers and HR professionals have been faced with the challenge of transforming their human resources into a source of competitive advantage for the organization (Cintra, Barbosa, Barbosa, & Franco, 2017). And the technologies applied to the HR subsystems function as a decision support information system, giving the HR manager a series of data pertinent to their work in a more precise way. Because it is a relatively new field of research, the importance of this essay is admitted in the search to discuss the implications of AI in the area of Human Resources, specifically in R&S processes. For this, it is pertinent to identify how the AI has been applied in this sector of the administration so important for the good functioning of organizations, as HR, and how has been the practice in companies.

2. ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) is one of the newest branches of computer science that provides computers with ever-increasing levels of intelligence. A very widespread concept for AI is that developed by scientist John McCarthy (1965) at the Massachusetts Institute of Technology (MIT), arguing that it is an area of Computer Science that aims to make computers behave and think like humans (Harasim, 2015). Rich and Knight (1991) argue that AI is the study that gives computers the ability to do things that humans at first do best. Haugeland (1985), conceptualizes AI as an exciting endeavor to get computers to think. Considering machines with minds, in the full and literal sense.

It is no longer strange to understand why Artificial Intelligence relates to science fiction, given the definitions of that term in times whose computers were still seen as participants in a very distant future and far from the everyday application in the life of humanity. These fictional aspects are disappearing as scientists and the public themselves perceive and utilize the advances made by Computer Science in the area of Artificial Intelligence (Harasim, 2015). The evolution of AI, both its importance and its application, should be highlighted for a better scaling of its applicability in the present day. According to Muller (1998), the history of AI begins in the 1940s, after World War I. At that time, when relations between nations were still under intense tension, already triggering the actions of World War II, the technological search was focused on weapon technologies. Already in this period, psychology begins to believe that computers would acquire capacities for thinking and understanding of language. Between the 1970s and 1980s, robotics, in which robots are analyzed to replace the human workforce, takes the lead in Artificial Intelligence studies, such as the Japanese robot Wabot 2¹. From the 1990s, the focus is on the development of applications and models of artificial neural networks (ANN)² - computational models capable of performing machine learning and pattern recognition based on the animal brain. The progress of this scientific field has been significant, accelerated and unpredictable, even sixty years after its origin. The AI currently encompasses a huge variety of subfields, ranging from general (learning and perception) to specific, such as playing chess, proving mathematical theorems, writing poetry, driving a car on a busy street, and diagnosing illnesses. AI is relevant to any intellectual task; is truly a universal field (Russel & Norvig, 2010). Thus, AI encompasses academic study and the generation of technologies with a profound impact on everyday life (Mesquita, 2018). Much attention has been given to the machine learning theme, probably due to the innumerable possibilities of automation brought by recent advances in Artificial Intelligence (Nascimento & Queiroz, 2017). AI has already been used a lot, being part of the daily life of many people who, when using websites or browsing applications, whether to watch movies or to shop online, allow this use to offer future recommendations, map daily routines and, consequently, influence consumption. Naming examples in this branch passes through well-known companies like Google, Facebook, Netflix, Amazon and so many other big corporations that progress having the AI as strategic support. According to Brynjolfsson and McAfee (2015), as the full impact of digital technologies is felt, we will realize immense wealth in the form of personal technologies, advanced infrastructure and almost borderless access to cultural items that enrich our lives.

3. RECRUITMENT & SELECTION (R&S)

Recruitment and selection of people (R&S) is one of the main processes of Human Resources Management (HRM), since its activity involves the choice of individuals, taking into account the identification of their characteristics, competencies, values and motivations, which necessarily should be aligned with the strategic goals of the companies, helping to implement actions that lead organizations to success, through these chosen people. Bitencourt (2005) defines skills as the set of qualifications that the person has to perform a job with a higher level of performance. Before undertaking the recruitment and selection stage, the company must define the profile of the vacancy that will be offered, carrying out the description of the vacancy and informing the minimum requirements that the candidate must have to file a petition. Admission of the position should be elaborated in a simple and clear way so that someone who does not know a certain position can understand it. Chiavenato (2010) adds that the description should identify the tasks and activities performed by the position, the periodicity, the interaction

¹ Wabot 2 - Japanese robot developed to resemble the maximum possible of the human being, developed by Waseda University.

² Artificial Neural Network - Branch of artificial intelligence. These computational systems are inspired by biological neurons and aim to solve complex problems, from a set of independent variables, such as the recognition of patterns and approximations of functions (Principe, Euliano & Lefebvre, 1999).

between people, equipment, materials, data and information. The recruitment of professionals consists of a set of procedures that seeks among a number of candidates, the one who best presents potential qualifiers to fill a position, attracting talents, internally and externally to the organization, in order to provide the people needs for the organization (Marras, 2011). It has the function of informing the candidates about the company and the necessary qualifications for the vacancy available, being the connection between the company and the job market (Bohlander & Snell, 2010). Poorly performed recruitment, ie not meeting the actual needs of the organization, will lead to problems for the entire HRM subsystem. Every recruitment process involves costs, sometimes difficult to measure, but can be calculated by the number of hours, for example, that the recruiter spends to register the job, inform and contact candidates, and solve the many doubts they may have about the vacancy in question at the time of their application. Even today, manual mechanisms are used for this activity, such as having a telephone, e-mail and an exclusive employee to perform this function. This involves costs and requires time from the human workforce, moreover it could be focusing on more strategic activities. According to Marras (2011), the capture of people can be done internally or externally. Internal recruitment is the movement of employees between different positions in the organization (Millkovich & Boudreau, 2000). Marras (2011) adds that Internal Recruitment is one that privileges the company's own human resources, publicizing open positions, recruiting within its own staff. Regarding External Recruitment, this occurs when the company does not have employees with the desired profile for the desired position or when it chooses to bring someone from the market with other knowledge that it judges to add value to the organization, depending on the type of job in question. For Marras (2011), external recruitment is the process of capturing human resources in the market, starting from a decision-making process regarding two variables: cost and time. According to Mazon and Trevisan (2010), the External Recruitment has the advantages of creating new ideas, increases the level of knowledge, renews and enriches the human resources of the company. The decision to carry out internal or external recruitment is pertinent to each company, which must have in its recruitment and personnel management policies all the information that guides its actions and procedures. For this, the organization must have a database containing the number of people necessary to achieve its objectives and offer methods that select the candidates that fit the desired profile (Chiavenato, 2010). After recruitment, the organization needs to select the candidate that best fits the needs of the organization. For Chiavenato (2010), the selection of people is a task of classification and decision, having the central objective to classify the candidates most appropriate to the needs of the position and the company. The author also add that this process can be carried out using different methods, such as preliminary screening of resumes, interview in the selection unit, information of reliable people, technical-professional tests, psychological tests, group dynamics, knowledge tests, personality tests , simulation techniques, as well as interviews conducted by future managers and information on previous jobs, registration information and medical examinations. The important thing is to have as a mission the realization of a recruitment and selection process with seriousness and ethics, since the selection of an individual without the characteristics determined for the position can bring innumerable damages to the company.

4. RECRUITMENT & SELECTION WITH USING THE AI

The HR area should make use of AI as an aggregation tool, which will allow the manager to know the organization, make processes more agile, better known the profile of positions and workers as a means that will enable greater organizational development (Mendonça et al. 2018). In this context of boosting progress, the applied AI in the R&S processes consists in the use of the computer and the learning of the machine, through an organization of information pertinent to the processes of selection of the company, aiming at the automation of tasks commonly done

by people, giving the he has the autonomy to exercise them. Companies have the perception that hiring the best employees produce a competitive advantage that is difficult for their competitors to duplicate (Harris, 2018). According to Nespoli (2004), the use of AI can bring benefits in organizational effectiveness, such as: error reduction, considering the application of multiple calculations under the most diverse data variables; reduction of problem resolution times; greater productivity and flexibility in which the possibility of the preservation of information and better use of human action is considered. Therefore, specifically in HR, the AI allows, in addition to many others, the evolution of postures and pertinence/responsibilities in companies and improvements in their processes and procedures (Mendonça, et al, 2018). Thus, the use of AI in R&S processes can be a strong strategy as a decision support system, helping in the mapping and searching of the most appropriate professional profiles to fill the open position, reducing the average time of completion of the activity , in line with the market scenario, which requires greater agility of all stakeholders. And according to Almeri, Martins and De Paula (2014), the tools developed by information technology professionals have greatly aided human resource management processes, shortening distances, time and costs. In general, AI provides a series of techniques, such as Fuzzy Logic, Artificial Neural Networks, Case-Based Systems, Expert Systems and Genetic Algorithms (Rosa & Luz, 2009). These different forms of machine learning (AI) with different approaches can be applied in the development of a decision support system in R&S and the steps that make it up. The AI makes it possible, for example, for a virtual assistant to answer questions from candidates at the time of their application in the selection process. It can also be used to assess the behaviors and skills of candidates in real situations. In addition to that, artificial intelligence can help in the match³ and union between candidates and companies. This is possible because AI in recruitment and selection allows the cross-referencing of previously profiled company profile information in order to create an ideal candidate model. Thus, the candidates for new vacancies are compared to this model, with respect to the tests, experience, general information of the curriculum, in order to verify the similarity with the ideal profile. It is an analysis of how favorable each candidate is in being the ideal to fill a vacancy in the organization. It was highlight the use of artificial neural network AI, since it "can predict candidates who would be suitable for a job, and those jobs that meet the expectations of a person who is actively seeking work" (Rocabert, 2017, p. 24). This can make recruiters' routines easier and helps the HR department to position itself more and more strategically within their company, channeling effort and time into activities that can not be replaced by the machine. In addition, it facilitates the relationship with candidates of the new generations, accustomed to relate to the machine, as a facilitator of the day to day. Therefore, those companies that wish to stand out and reach competitive differentials, will have to be attentive to the new forms of attraction of talents. GRH technology supports the scenario of social change and market behavior. However, changes such as those brought about by the insertion of new technologies can bring a lot of insecurity and/or demotivation to the employees. It is of the utmost importance that the organization prepare itself for this new moment. And transparent communication is a determining factor in success, guaranteeing commitment and commitment of all in order to advance the company.

5. METHODOLOGY

The present work used the quantitative, descriptive research method, that is, considered a set of variables in the search to identify the correlation with the object of the investigation. Thus, the study conducted an opinion survey to reveal the perception of HR professionals and managers of Brazilian and/or multinational companies about AI in HR, as well as the use of this

³ Match - verb in English that means to live up to; to correspond to something; match; to combine (Linguee, English language dictionary).

technology in the automation of processes and contributions when used in R&S processes. The Google Forms tool was used to apply the data collection and a structured questionnaire was conducted with multiple choice questions about the knowledge of human resources professionals (at all hierarchical levels), as well as managers of companies, that is, people who manage sectors and teams, about Artificial Intelligence. The purpose of the questionnaire was to identify the level of knowledge of the respondents about this area of science, when used in the area of HR applied to R&S; besides the influence of the AI to reduce the time of the R&S process, as well as, a supporter in the strategic repositioning of the human resources sector. The questionnaire was released to the target audience via email and via multiplatform mobile application - whatsapp so they could respond to opinion polls. The random sample, for convenience, that is, participated in the study volunteers who accepted to answer the questionnaire, applied between March and May 2019, totaled 150 people. As criteria of inclusion: human resources professionals, professionals who hold leadership positions, Brazilians, working in Brazilian and/or multinational companies. As exclusion criteria: professionals who do not exercise management positions, except professionals in the area of human resources. The variables studied were of two natures. Table 1 presents the characterization of the respondent's profile. Table 2 elucidates the questions of the questionnaire to assist the analysis and discussion of the object of the study. As a theoretical support for the investigation, the main academic publications (Journals and proceedings) indexed to the Web of Science and Scopus database were published between the years of 2000 and 2018. Regarding the ethical aspects, since it was an opinion survey carried out by electronic means and without the identification of the participants, approval was dispensed with the Research Ethics Committee (REC). As a result of the research, 150 people were interviewed. Of the total, 74% are female, 61% are over 36 years of age, 67% work in the service sector and around 49% perform functions in the Human Resources area, as shown in Table 1.

Table 1: Characterization of the respondent's profile.

Variable	n	%
Gender		
Female	111	74%
Male	39	26%
Total	150	100%
Age		
18 - 29 years old	18	12%
30 - 35 years old	41	27%
36 - 40 years old	49	33%
41 - 50 years old	29	19%
More than 50 years old	13	9%
Total	150	100%
Company branch		
Industry field	19	13%
Trade	30	20%
Services	101	67%
Total	150	100%
Do you work in Human Resources area?		
Yes.	73	49%
No.	54	36%
I acted, but for the moment I am engaged in another activity	23	15%
Total	150	100%

In Table 2, it is possible to verify that: the use of AI in organizations is still very low, since about 63% never used it, leading to the empirical belief that there is little investment in this type of technology and 19% of companies that use or already used the AI is in the area of customer service. The AI applied to the R&S is still inexpressive, since 90% of respondents never had the experience to recruit and/or select people. It is inferred the lack of knowledge of the advantage in using the AI in order to streamline R & S processes, since 80% of the sample does not think it is capable of responding if this use reduces the time spent recruiting and selecting people. The majority of respondents (87%) believe that AI is important for the evolution of the HR area.

Table 2: Support questions for the study object.

Variable	n	%
What is Artificial Intelligence (AI)?		
It is an area of Computer Science that aims to make computers behave and think like humans.	111	74%
It is the use of the computer for intelligent activities	33	22%
It is a computer game designed to simulate situations and problems	5	3%
It is an area that develops software for people with high IQ.	1	1%
Total	150	100%
Does your company use or have already used Artificial Intelligence in any management process?		
Marketing	9	6%
Finance/Administrative	11	7%
Customer service	28	19%
Human Resources	8	5%
Do not use	94	63%
Total	150	100%
Have you had the experience of using Artificial Intelligence in the R&S process?		
Yes	15	10%
No	135	90%
Total	150	100%
If you said yes, do you think the use of Artificial Intelligence in Recruitment & Selection brought gains / benefits in your work?		
Yes	24	16%
No	6	4%
Not applicable	120	80%
Total	150	100%
Do you agree that using Artificial Intelligence helps reduce the time spent on Recruitment & Selection?		
Yes	83	55%
No	4	3%
Perhaps	63	42%
Total	150	100%
Do you think that Artificial Intelligence in Recruitment & Selection is an important tool for the evolution and growth of Human Resources?		
Yes	130	87%
No	20	13%
Total	150	100%
Do you believe that the use of Artificial Intelligence in Recruitment & Selection will help the Human Resources area in your strategic positioning within the company?		
Yes	126	84%
No	24	16%
Total	150	100%

6. CONCLUSION

Thus, the present study shows us the need for continuity in the clarifications about the concepts of AI applied to HRM and the low use of AI in companies, and it is empirically inferred that this is justified by the high cost and necessity of specialized teams, besides cultures organizations are not yet ready for insertion of activities of this nature. It is believed that the application of AI in the R&S is inexpressive and has not promoted a rupture in HR practices, legitimized by the costs involved in the implementation and by the little knowledge of the gains, in terms of organizational competitive advantage. Another empirical proposition is the possible resistance of the professionals in the area, due to the fear of losing jobs, due to the insertion of technology, since about 64% of the sample work or have already worked in the area in question,

but never had experience with AI. In this way, it becomes extremely relevant to understand that the machine will not solve everything alone, that it will function as a support system and that, at the end of the process, there will be the personal interview stage. The machine then acts as an accelerator, increasing the efficiency of the R&S. The research also reinforces that AI applied to HRM, specifically in R&S processes, contributes to the strategic positioning of the area, since teams will be more willing to dedicate themselves to activities of a strategic nature, in order to achieve organizational goals. Instead of interviewing a large number of candidates, the HR technician will only need to focus on those profiles that are in line with the values and principles of the organization. This can even contribute to reducing people turnover. The study also reveals, by surveying the Web of Science and Scopus indexed surveys, the lack of solid lines of research on the subject and concluded that the practice is still very embryonic, although the view of the respondents, positive about the benefits that AI can bring to the recruitment and selection of candidates. Therefore, it is expected that the issues raised in this essay will elicit new theoretical and empirical studies that show the interactions between AI and HR. As limiting factors, it is necessary to increase the size of the sample and the possible segmentation among the respondents belonging to the HR area of the other managers. For future study suggestions, it is possible to include: the extension of the questionnaire to provide more in-depth data treatment on AI linked to HR processes.

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