Pros and Cons of using Algorithmic Management in Human Resource

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Abstract. **The opportunities that Artificial Intelligence and the principles of Algorithmic management provide to modern managers bring undeniable advantages for the development of a competitive business in today's extremely difficult business environment. At the same time, however, the effect of their use should be carefully analysed from the point of view of the compliance of the employees opinion in the enterprise - mainly in line with the observance and guarantee of basic rights of the employees. In this regard, the European Parliament and the European Council launched a legislative initiative to define harmonized rules within the Community on the use of artificial intelligence. Concepts such as "algorithmic discrimination" were introduced quite purposefully at the regulation level, given the risk of possible abuses associated with the use of AI. This report aims to ascertain the views of employers and employees on the use of artificial intelligence in Human Resource Management. The report presents and analyses data from an empirical study conducted among managers and employees in leading ICT enterprises in Bulgaria. According to our responders, one of the biggest advantages of using AI in Human Resources Management is related to the elimination of subjectivity in performance evaluation and the possibility of fair play in the procedures of internal selection of employees. At the same time, employees with more experience (over 10 years) are more sceptical of the idea of their work performance being evaluated solely by AI, while younger workers show more trust in AI solutions. However, both managers and workers recognize that it is best for the final decision in determining career development to be made by a person, but justified by the analyses made by AI. The report draws conclusions and recommendations that can serve both researchers and business managers. Certainly, AI is yet to undergo a very large development and application, including in the Human Resource Management, but at the same time it should not be at the expense of affected rights.**

Keywords: Algorithmic management, Artificial Intelligence, Human Resource Management, ICT companies.

I. INTRODUCTION

The opportunities that Artificial Intelligence (AI) and the principles of algorithmic management provide to modern managers bring undeniable advantages for the development of a competitive business in today's extremely difficult business environment. At the same time, however, the effect of their use should be carefully analysed from the point of view of the compliance of the employees` opinion in the enterprise - mainly in line with the observance and guarantee of basic rights of the employees. In this regard, the European Parliament and the European Council launched a legislative initiative to define harmonized rules within the Community on the use of artificial intelligence. Concepts such as "algorithmic discrimination" were introduced quite purposefully at the regulation level, given the risk of possible abuses associated with the use of AI. This report aims to ascertain the views of employers and employees on the use of artificial intelligence in Human Resource Management. The report presents and analyses data from an empirical study conducted among managers and employees in leading ICT enterprises in Bulgaria.

The empirical study and results, presented in this paper, are part of an overall project, financed by the University of National and World Economy, dedicated to the Developing Strategies for Digital Human Resource Management in Innovative Business Organizations. The idea of developing and focusing specific research especially for ICT companies as supportive results for the preparation of the biggest empirical research (covering different companies in all sectors of economy), came as a logical next step for the project activities and achieving project results.

II. Materials and Methods

A. Literature review

Although the Algorithmic management (AM) has its origin back to the 20th century, it could be argued that it's a relatively new concept that has become a very important topic among both practitioners and scholars, respectively, due to the fast development of Artificial Intelligence (AI) and its implementation in various aspects of business activities. Yu Zhou, Lijun Wang, Wansi Chen [1] explore the potential negative effects using AM. They delve into the negative impacts of AI-enabled HRM by focusing on three key algorithmic features: comprehensiveness, instantaneity, and opacity. Langer and König [2] also warn that opacity is one of the biggest problems and at the same time – key characteristic of algorithm-based HRM. They proposed a specific strategy based on complex measures combining technical solutions, set of training and education and regulations in this field. For Ötting and Maier [3] the most important thing in decision making process is to guarantee the procedural justice, no matter who has made the decision – human or some kind of intelligence system. They admit that the type of agent responsible for decision does not moderate justice effects. Lukács and Váradi [4] explore the European framework in data protection and the AI based automated decision-making in the employment process. Authors claim that despite its limitations, the AI Act represents a significant step forward in establishing a framework for regulating AI and fostering the development of trustworthy AI systems. They also admit that this Act provides a foundation for shaping global norms and standards surrounding AI usage. By promoting AI systems that align, to some extent, with human values and interests, it aims to enhance accountability, transparency, and ethical considerations in AI deployment. In essence, the AI Act serves as a crucial starting point in addressing the complexities and challenges associated with AI governance, ultimately contributing to the advancement of responsible and beneficial AI technologies.

Manroop, Malik and Milner [5] pay attention on the ethic features of using big data in HRM, especially analyzing personal data for pure corporate purposes. Andrieux, Johnson, Sarabadani and Slyke [6] also explore the ethical aspects of generative AI in HRM and propose a set of recommendations for practitioners, where the continuous learning is a key understanding of the overall process of securing the ethic standards in generative AI based HRM. A comprehensive analyse on the use of generative AI in HRM is provided by Lukaszewski and Stone [7], also considering the ethical and moral principles of management. They admit that it is not necessary to have specific legislation in this field, but the organizations should act proactively and to develop and adopt special strategy and procedures securing their potential employees, present staff and the entire company in general.

When we consider the use of AI in HRM, one of the serious questions is the decision for career development (respectively decisions for promotion and punishments, including the most severe – for job termination). Interesting findings in this aspect are proposed by Bartosiak and Modlinski [8], Kong, Yin, Baruch and Yuan [9]; Gryncewicz, Zygała and Pilch [10]; Dimcheva and Stoyanov [11].

The use of AI in strategic HRM and securing high quality standards is presented by Aguinis, Beltran and Cope [12]. They provide examples how generative AI could be used successfully as an assistant in different HRM procedures. Marler [13] studies the possibilities of using AI and algorithms to develop and apply a compensation strategy of a business company, recognizing that they could improve the ability of organization to attract, retain and motivate employees. Compensation is one of the six workable areas of using algorithms and AI in HRM, outlined by Parent-Rocheleau and Parker [14], the rest are the following: monitoring, goal settings, performance management, scheduling and job termination. Specifics of the minimum wage formation for long period in Bulgarian context is comprehensively analyzed by Mancheva and Stamatev [15]. ICT and more specifically AI and algorithms are profoundly studied by Anguelov [16], who admits that it is impossible to imagine today a competitive and progressive business company without using AI in HRM in its everyday routines, despite a lot of difficulties and new challenges. Interesting observations in terms of HRM digitization activities are presented by Mihova, Ivanova, Anguelov in [17].

In summary of the literature review it could be concluded that the discussion on the usage of algorithms and AI in HRM is a complex problem combining different aspects: from legislation ones through ethical and moral questions, to the securing sustainability and competitiveness of the company and level of employees` motivation and satisfaction.

B. Methodology of the research

The current research has for the main objective to understand the opinion of employees, employers and managers on the use of Algorithmic Management (AM) and Artificial Intelligence (AI) in Human Resource Management (HRM). We purposefully chose to study the specified target groups from the field of ICT companies operating in Bulgaria. The reasons for this choice are as follows: First, ICT is an extremely dynamic sector of the economy, which is characterized by a high level of innovation, which means that companies in this sector have to by default embrace new trends in order to survive in the competitive market. Second, given the high dynamics of work and the level of stress, the people working in these companies are mostly young and motivated (especially comparing to the staff in business organization from a traditional sector), ready to prove themselves, but also ready to accept changes. Thirdly, in Bulgaria in the field of ICT there is a wide variety of companies both in terms of their size (micro, small, medium and large), but also in terms of the way in which they are created - with Bulgarian financing, with a help of a foreign investor, a subsidiary of an international company, etc., which could give a valuable information on the practice. And finally: this choice is conditioned by the fact that the ICT sector in Bulgaria can be perceived as an indicator of the future development of the other, not so rich in innovation and change sectors of the economy.

In order to achieve the main objective of the study, I chose to conduct an empirical study using a specially designed questionnaire. The questionnaire consists of 14 questions, most of them are closed and only 2 are open. All closed-ended questions were mandatory for respondents to answer, while open-ended questions were left to the discretion of the respondents in case they had something to share. The predominant choice of closed questions is in line with the fact that the survey is distributed among actively working people in one of the most dynamic sectors of the economy, and in order to get more responses, the completion of the survey should not be time-consuming while not requiring to make unnecessary efforts on the part of the respondents. In order to protect personal data, sensitive information, such as names, social security numbers, etc., is not collected from respondents. The survey was distributed in an electronic environment among those working in leading ICT companies in Bulgaria, by sending a link from Google Firms. It was explicitly explained to everyone that the survey was anonymous and voluntary, and that the collected information would be used solely and exclusively for scientific purposes.

The research goes through the main three phases:

Preparatory Phase - held in November 2023. Activities carried out:

– Formulation of the questionnaire.

– Testing of the questionnaire, in order to establish the effectiveness of the choice of questions, their content, sequence, level of understanding by the respondents and comprehensiveness of the expected answers.

– After testing the questionnaire and making corrections for its improvement, its final version is reached, which allows the actual conduct of the research.

Main Phase - held in the period December2023 – January 2024. Activities performed during the stage:

– Designing the questionnaire and preparing it to be completed by respondents in an online environment.

– Preliminary testing of the functionalities of the questionnaire, in order to limit gaps.

– Achieving questionnaire visibility across different devices used by respondents.

– Defining the number of companies and collecting e-mail addresses for potential responders

– Conducting various activities securing the spread of the information for the survey and questionnaire among working people in ICT sector: different special meetings with managers, phone calls etc.

– Distribution of the questionnaire in an online environment.

– Completion of the questionnaire by the respondents.

Final Phase: February 2024

– processing and analysis of the obtained results

– on the basis of the received data and their analysis - conclusions and recommendations made

III. RESULTS AND DISCUSSION

As a result of efforts to distribute the questionnaire to the widest possible range of ICT companies in Bulgaria, and given the time constraints, we received a total of 135 responses, of which 74 were from men and the remaining 61 were from women. The rest components from the responders` profile are presented on table 1.

TABLE 1 PROFILE OF THE RESPONDERS

Component	Possible options for answers	Number of answers received	Answers in %
Age	From 18 to 30	72	53
	From 31 to 40	52	39
	Over 50	11	8
Work position	Employee	79	59
	Manager	41	30
	Owner	15	11
Place of work	Sofia	83	61
	Big city	42	31
	Small town	10	7

As it can be seen from the Table 1, the major part pf our responders (53%) are between 18 and 30 years old. This fact could be easily explained due to the traditional profile of employees in ICT company from one side, and from the other – young people usually are more willing to participate in such type of studies than their older colleagues. The group between 31 and 40 years old represent 39% of our responders. The rest people (8%) are over 50 years old. In terms of work position, it is not surprising the finding that 59% of responders are employees, another 41 people (or 30%) claim that are manager, which also could be analysed in the line that in our questionnaire we do not justify the different managers positions within one ICT company. Therefore, the achieved result on this question is understandable. The smallest group are people who admit that they are owners of the business. We attribute this relatively high response rate from people in such a position to the efforts we made to meet face-to-face with the top management of a number of companies. The majority of our responders work in Sofia (61%) which findings is relevant to the situation in Bulgaria from one side and for the efforts for personal meeting in the preparational phase of the study, from the other side. The cumulative profile of the company is presented on Table 2.

TABLE 2 PROFILE OF THE RESPONDERS` COMPANIES

Component	Possible options for answers	Number of answers received	Answers in %
Major financial resource of the company	Only Bulgarian	33	24
	Both Bulgarian and foreign	39	29
	Only Foreign investments	57	42
	I am not sure	6	4
Company Size	Micro	18	13
	Small	86	64
	Big	31	23
Location of the Headquarters of the company	In Bulgaria	38	28
	In another European country	65	48
	Outside Europe	32	24

For the purpose of the study it is interesting to understand where the main funding of the companies comes from. According to the received answers, the biggest group of the responders work in the company with only foreign investments (42%), while another 29% claim that the company they work for is financed both by Bulgarian and foreign resources. Only 24% of our responders work in company with only Bulgarian investments. A very small percentage of respondents (4%) are not sure about the basic funding of the company, which is also possible if we consider the newly appointed employees in the organizations with small experience.

The major part of responders admit that their organization is small (64%), followed by people working in big companies (23%) and finally – responders in micro companies are 13%. This result again is not surprising for the ICT sector, considering the fact that we have serious foreign investments and divisions of multinational ICT companies in Bulgaria. This observation is only deepened considering the response in the next question – for the headquarter of the company of our responders. Here the picture is even clearer – only 28% of the companies of our responders are in Bulgaria, versus 48% - from country in Europe (excluding Bulgaria) and another 24% who claim that the headquarter of their companies is outside Europe.

The next question explores the level of experience of our responders in the field of ICT. The answers are presented on fig. 1.
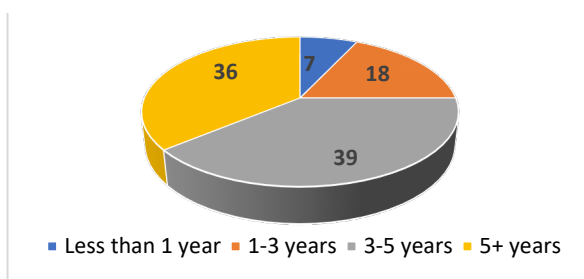

Fig. 1. Level of experience of the responders in the ICT field, in %

As it can be seen from the figure, the majority of responders is distributed among two almost equal groups - 39% of people claim that their experience is between 3-5 years, while 36% have 5+ years of experience in ICT. Only 7% of responders have less than 1 years in ICT. The

result of this question is not very difficult to understand, having in mind that serious companies in ICT have their own specific policy of attracting young people and usually have different programmes with universities for scholarship or other forms of partnership.

The next question is the following "How familiar are you with the concepts of algorithmic management and AI in Human Resource Management (HRM)?". (fig. 2). Here in the two super opposite answers we have relatively modest accumulation of answers. Only 5 % admit that they are not familiar at all, while another 12% claim that extremely familiar. The majority of the responders again is allocated in two general, almost equal groups – 37% of our responders assured that they are very familiar with the concept and another 35% consider themselves as moderately familiar.
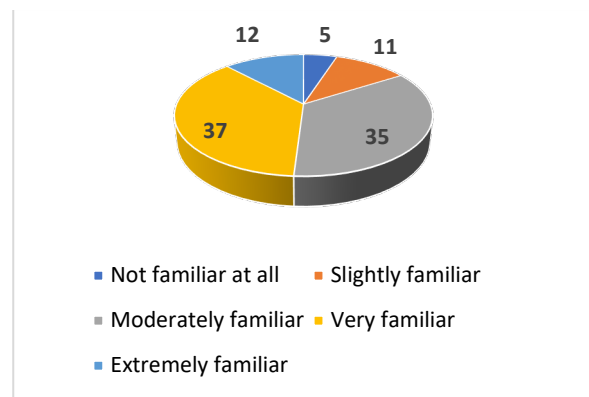

Fig. 2. Level of self-evaluation on the concept of AM and AI in HRM, in %

The next question assesses the personal opinion of responders in different predefined areas of advantages of using AI and AM in HRM. The question is "What, in your opinion, are the main advantages of using algorithmic management and AI in HRM in ICT companies?". Responders have to select between 5 scale where 1 is the weakest rating and 5 is the strongest. Results are cumulative presented in fig. 3.

The next question is similar to the previous, but this time responders are asked to assess the disadvantages of the AM and AI in ICT, (using the same scale from 1 to 5 where 1 where 1 is the weakest rating and 5 is the strongest). Results are cumulative presented in fig. 4.

As it can be seen from the fig. 5, respondents are relatively reserved about the disadvantages of using AI and MA in HRM, especially compering to the results, achieved in the previous question. Here the first three serious disadvantages, according to the results are the following: Privacy Concerns (regarding the collection and analysis of sensitive personal data for purposes such as performance evaluation, workforce planning, and talent management), with highest score of 4,6 (in maximum 5). The second disadvantage is defined the potential for Data Breaches and Security Risk, with score of 4,3. Storing and processing large volumes of employee data for algorithmic management and AI in HRM poses security risks such as data breaches, unauthorized access, and misuse of personal information, especially in ICT companies with valuable intellectual property and sensitive client information. On the third place comes the Loss of Human Judgment and Creativity with score of 3,

6. Over-reliance on algorithmic decision-making may diminish the role of human judgment, intuition, and creativity in HRM, potentially stifling innovation and problem-solving in ICT companies that thrive on ingenuity and out-of-the-box thinking. At the bottom of this ranking are Lack of Human Touch (with score of 1,7), Resistance to Change (1,3) and Loss of Organizational Engagement (1,1).
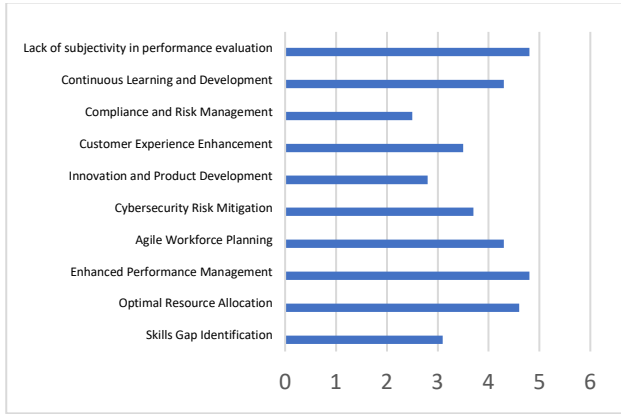

Fig. 3. Evaluation on the benefits of using AI and AM in HRM

The next question follows the same logic of the previous two, but this time the responders are asked to assess the interaction between AM and AI in the context of the employee-manager relationship. The question is "How do you evaluate the level of impact that AM and AI could have on the employee-manager relationship in ICT company?". Responders use the same scale from 1 to 5, where 1 is the weakest impact rating and 5 is the strongest impact rating). Results are cumulative presented in fig. 5.
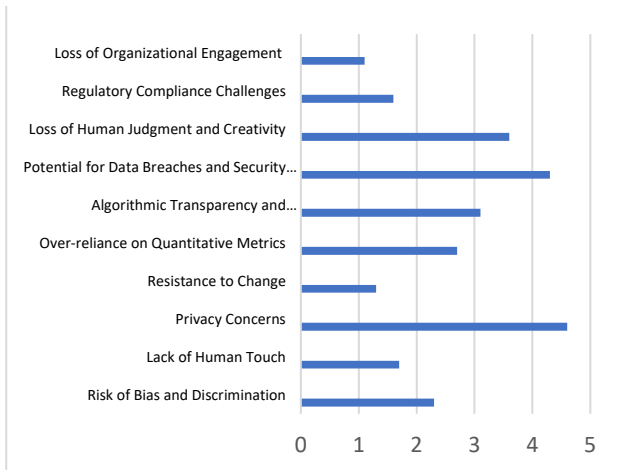

Fig. 4. Evaluation on the disadvantages of using AI and AM in HRM

The main three strongest impact, according to the obtained results are Efficient Project Management (with 4,7 score), alignment with Technical Goals and Objectives (4,5 score) and Enhanced Technical Support and Guidance (with 4,2). The weakest impact our responders defined for the Identification of skills gaps and Development needs.
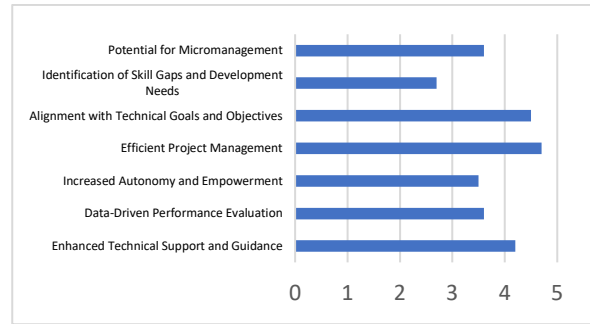

Fig. 5. Interaction between AM and AI in the context of the employee-manager relationship

The last two questions are open in order to collect opinion for the two important field. The first one open question is the following: How do you perceive the role of human judgment and intervention in HR processes that utilize algorithmic management and AI?

According to our responders, one of the biggest advantages of using AI in Human Resources Management is related to the elimination of subjectivity in performance evaluation and the possibility of fair play in the procedures of internal selection of employees. At the same time, employees with more experience (over 10 years) are more sceptical of the idea of their work performance being evaluated solely by AI, while younger workers show more trust in AI solutions. However, both managers and workers recognize that it is best for the final decision in determining career development to be made by a person, but justified by the analyses made by AI. At the same time some people admit that human judgment is important including in terms of adaptation in rapid changing environments and addressing unforeseen situations.

The very last question of the questionnaire is "How do you envision the future of HRM in ICT companies with the increasing integration of algorithmic management and AI?". Here the variation of answers was again in line further deepening the Human – AI/ AM collaboration, leveraging their strengths. Some of people truly believe that in near future the recruitment process will be fully automated, while others claim that Talent Management will be even more in focus. The central place of the answers remains the idea of the data-driven decision-making process.

IV. RECOMMENDATIONS

The results obtained from the empirical research on the use of Algorithmic Management and Artificial Intelligence for the purposes of Human Resource Management, conducted among ICT companies in Bulgaria, unequivocally show that employees, management and business owners positively define their need and implementation. At the same time, the respondents show a comparative understanding of the outlined disadvantages in the use of AM and AI, believing that with the development of technologies these shortcomings could be overcome. In this line, our recommendations could be summarized in the following several proposals:

Developing advanced predictive analytics for workforce planning in ICT companies

The development of advanced predictive analytics for workforce planning represents a strategic imperative for ICT companies seeking to thrive in an increasingly competitive and dynamic environment. By leveraging AI algorithms to predict future workforce trends, skills gaps, and talent needs, organizations can gain a significant competitive advantage by aligning their human capital strategies with business objectives and market demands. Through collaborative efforts, continuous learning, and ethical practices, the vision of proactive workforce planning and talent management can be realized, driving innovation, growth, and success in the ICT sector.

Dynamic skill matching for optimal resource allocation in ICT companies

The development of AI-powered platforms for dynamic skill matching represents a strategic opportunity for ICT companies to optimize resource allocation, enhance project outcomes, and foster employee growth and satisfaction. By leveraging real-time data and AI algorithms, organizations can ensure that the right talent is deployed for each task, maximizing efficiency and productivity. Through continuous learning, transparency, and a focus on fairness and privacy, the vision of dynamic skill matching can be realized, driving innovation, agility, and success in the ICT sector.AI-powered employee feedback systems: Develop AI-driven feedback systems that collect, analyze, and synthesize employee feedback from various sources, including performance reviews, surveys, and social media. This will provide valuable insights into employee sentiment and engagement, enabling HR teams to take proactive measures to address concerns and improve employee satisfaction.

Establishing ethical AI guidelines for HRM in ICT companies

Establishing ethical AI guidelines specific to HRM in ICT companies is essential to foster trust, fairness, and accountability in AI-driven HRM processes. By promoting transparency, mitigating bias, and upholding ethical principles, organizations can harness the transformative potential of AI while safeguarding against potential risks and ethical concerns. Through collaboration, education, and continuous improvement, the vision of responsible AI governance in HRM can be realized, driving positive outcomes for employees, candidates, and organizations alike within the ICT sector.

Implementing explainable AI for decision support in HRM

Implementing Explainable AI for Decision Support in HRM is crucial for enhancing transparency, trust, and accountability in algorithmic decision-making processes. By enabling stakeholders to understand how AI algorithms analyze data and generate recommendations, organizations can foster collaboration, informed decision-making, and ethical AI governance in HRM. Through continuous improvement, transparency, and collaboration, the vision of XAI-enabled HRM can be realized, driving positive outcomes for employees, managers, and organizations alike.

Developing collaborative human-AI workflows for HRM

Developing collaborative human-AI workflows represents a strategic opportunity for HRM to leverage the strengths of both humans and AI systems, driving efficiency, innovation, and value creation. By fostering a culture of collaboration, learning, and ethical AI governance, organizations can harness the full potential of AI while preserving human-centric values and ensuring that decision-making processes remain empathetic, ethical, and inclusive. Through continuous improvement, interdisciplinary collaboration, and human-centric design, the vision of collaborative human-AI workflows can be realized, driving positive outcomes for HR professionals, employees, and organizations in the digital age.

Implementing AI-driven talent acquisition strategies in ICT companies

Implementing AI-driven talent acquisition strategies represents a strategic initiative for ICT companies seeking to attract and retain top talent in a competitive market. By leveraging AI technologies to automate and optimize recruitment processes, organizations can improve efficiency, enhance candidate quality, and foster diversity and inclusion. Through ethical considerations, continuous learning, and data-driven decision-making, the vision of AI-driven talent acquisition can be realized, driving positive outcomes for HR professionals, candidates, and organizations in the ICT sector.

V. CONCLUSION

The ICT sector is one of the most dynamically developing, with fierce competition and a passion for future progress. People working in ICT companies are used to the dynamics of the external and internal environment and, therefore, are more inclined to embrace new technologies, innovations and trends. In this connection is the proposed study related to the possibilities of using Algorithmic Management and Artificial Intelligence for the purposes of Human Resource Management in ICT companies. Their experience could subsequently be used in the development of digitalization of HRM strategies for companies from other economic sectors.

Our proposals for the future development of AM and AI in HRM in ICT companies are the following: Developing advanced predictive analytics for workforce planning in ICT companies; Dynamic skill matching for optimal resource allocation in ICT companies; Establishing ethical AI guidelines for HRM in ICT companies; Implementing explainable AI for decision support in HRM; Developing collaborative human-AI workflows for HRM; Implementing AI-driven talent acquisition strategies in ICT companies.

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