Recruitment in the era of Web 4.0: What place for artificial intelligence in recruitment?

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ABSTRACT: As digitalization puts everything into question, companies are becoming increasingly aware of the digital transformation that is challenging the way they react to their global ecosystem (Léon & Dejoux, 2018). AI has taken its place in our current lives; it has penetrated human life on all levels (the professional level is no exception) including recruitment which in turn finds itself faced with this technology (Mallard, 2018). This study aims to analyze the perceived adoption of artificial intelligence in recruitment through a systematic literature review and descriptive statistical analysis. Focusing on the private sector in Morocco, the study examines AI adoption challenges in five sectors: administration and office automation, human resources, production and manufacturing, finance and accounting, and education. The study was carried out by means of a questionnaire sent by e-mail to a pre-defined sample of companies. We received 66 responses. After removing the outliers, the final sample size was 60. Based on flat analyses, the results show a perception of job losses in the human resources and education sectors. Despite the advantages of AI, notably in terms of rapid processing and sorting of applications, as well as task automation. Private sector companies in Morocco operating in the five sectors defined in this study face AI adoption challenges due to a lack of resources.

Keywords: Web 4.0 Recruitment, Automation of Recruitment, Artificial Intelligence, Natural Language Processing, Recruitment Techniques.

I. INTRODUCTION

Recruitment is a crucial aspect of human resources management, attracting and selecting the most qualified candidates for a job. In recent years, the growing use of artificial intelligence (AI) has revolutionized the recruitment process, enabling organizations to automate many tasks, reduce prejudice and improve the quality of hires. In a recent study in 2024, IMF staff examine the potential impact of AI on the global labor market. The results of the study demonstrate the likelihood of jobs being replaced by AI, indeed nearly 40% of jobs worldwide are exposed to AI. Where automation and technology have traditionally focused on repetitive tasks, AI stands out for its ability to affect highly-skilled jobs. The aim of this work is to contribute to the existing literature on the perception of AI in a specific context. In addition, it provides information on the challenges and prospects for AI adoption by private sector companies. The choice to analyze the challenges of AI adoption in Morocco is justified by the IMF's finding that exposure to AI is expected to be 40% in emerging countries and 26% in low-income countries. This will consequently cause upheaval in both emerging and developing countries. Morocco, like many other countries, has witnessed a greater interest in integrating AI into recruitment.

However, integrating AI into recruitment in Morocco presents specific challenges and opportunities. The Moroccan labor market is characterized by a high level of informality, limited digital infrastructure and diverse cultural and linguistic backgrounds. The use of AI in recruitment can have considerable implications for job seekers, recruiters and organizations operating in the present Moroccan context. Therefore, it is essential to study the impact of AI on the recruitment process in Morocco in order to determine its effectiveness, limitations and potential risks.

This article aims to examine the extent to which the use of artificial intelligence is affecting the recruitment process in Morocco. This research aims to provide a comprehensive understanding of the role of AI in recruitment

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in Morocco, and to offer insights into how organizations can make the best use of this technology to achieve their goals. To answer our question: "What impact does the use of artificial intelligence have on the recruitment process? » we conducted a quantitative study among Moroccan recruiters. Our objective is to analyze the sectors most affected by the advent of AI, the perception of AI and the development of projects using this tool, as well as the challenges and requirements of adopting AI in the Moroccan context.

To this end, our research questions are: what are the sectors most influenced by AI? what are the challenges of AI adoption by Moroccan companies? What are the requirements for AI adoption by sector?

II. LITERATURE REVIEW

Recruitment is a strategic function for a company. It involves attracting the right quantity and quality of human resources to manage the company's financial, material and human capital. The arrival of new technologies has encouraged the emergence of new managerial tools and practices at company level, facilitating the HR department's mission and enabling it to focus on its main value-added missions.

Since the 1990s/2000s, the Internet has played an important role in the recruitment process, enabling both companies and candidates to benefit from online recruitment tools. These online tools, which have partly replaced traditional tools, now occupy an important place in candidates' search strategies. The Internet has brought many advantages, including transparency in the job market, and rapid, large-scale, low-cost dissemination of job offers. Nevertheless, some authors such as Fondeur (2006) speak of the "transparency-noise dilemma". Candidates are faced with the problem of "noise" due to the increasing number of jobs offers available online. On the other hand, companies are faced with an increase in "unqualified" applications. The Internet is perceived as a veritable jungle.

Growing rapidly over the last ten years, the web has become an essential tool for exchanging information. Thanks to environmental changes, the web is undergoing several evolutions.
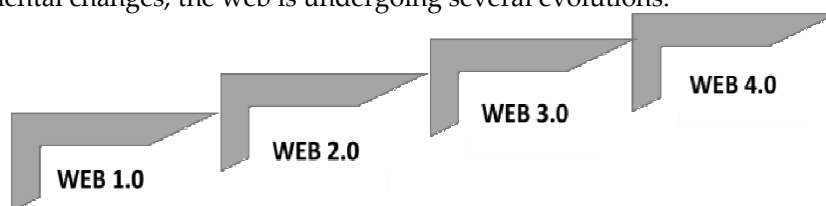

FIGURE 1. The web's evoloution

1. THE WEB 1.0 PHASE

Towards the end of the 90s, Web 1.0 appeared, being considered a "static web focused on the unidirectional distribution of information". The content of this web was mainly created by institutions and companies to present their products to consumers. Users were limited to a passive spectator position, and information exchange and sharing were not possible. This meant that web content was largely controlled by institutions and corporations.

In recruitment 1.0, a handful of job platforms had a monopoly on online advertising. Online CV libraries were paid for and closed. The cost was based on the number of pages viewed. In the Web 1.0 era, access to job offers was conditional on registration on a platform or directly on the company's site. Advertisements were only displayed in text format and in the form of drop-down lists. What's more, only one reading medium was available: the computer.

2. THE WEB 2.0 PHASE

Web 1.0 has been replaced by Web 2.0 or the social web, which refers to an evolution characterized by greater simplicity and interactivity. Various expressions are used to refer to "Web 2.0", such as "social network", "Digital Social Networks", "Social Media", "Web Interaction", etc., and refer to 2.0 sites such as Facebook, Twitter, LinkedIn, Viadeo or YouTube. Web 2.0 is user-centric, encouraging the exchange, creation and sharing of information through a variety of techniques and functionalities, such as social networks and blogs. In 2.0 recruitment, the classic CV has been modernized. Candidates now have other ways of communicating their experience, including professional social networks such as LinkedIn or Viadeo. Recruiters are also making increasing use of the Internet to search for information on candidates during the recruitment process. Although

recruiters can only rely on extra-professional information posted on the Internet about the candidate, it is important for candidates to be vigilant about their digital identity. Recruiters can also consult the candidate's LinkedIn or Viadeo profiles to verify the information provided by the candidate. As a result, candidates and recruiters have moved from a passive to an active status, with the help of blogs and social networks.

3. THE WEB 3.0 PHASE

The development of technology has led to the emergence of a new generation of the Internet, known as Web 3.0 or the Semantic Web. This new Web is designed to enhance and reinforce dynamic content using information generated from the analysis of data provided by Internet users. The creator of the World Wide Web, Tim Berners-Lee, is also behind the Semantic Web, whose aim is to give meaning to data and organize the information available according to the needs of each user, taking into account their location, preferences, etc. Recruitment can take place via online platforms specialized in technological fields, or via professional social networks. Candidates can also be recruited through hackathons or other technology-related events, where they can showcase their skills and creativity. Companies can also use data analysis tools to examine candidates' profiles and assess their suitability for a particular job. Interviews can also be conducted online, for example via videoconferencing.

4. THE WEB 4.0 PHASE

Then, web 3.0 is replaced by web 4.0 or the intelligent web. It "will enable ever finer use of individuals' data to take personalization logic to its logical conclusion". As Web 4.0 is still in development, there is no consensus on exactly how recruitment in Web 4.0 will unfold. However, some experts have proposed theories on how recruitment might be affected in Web 4.0. For example, some suggest that AI could be used to automate recruitment processes, including selecting candidates and organizing interviews. However, it's important to note that these theories are speculative and that Web 4.0 is still in development. It's difficult to predict exactly how recruitment in Web 4.0 will be affected. However, it is clear that technology will have a significant effect on the way companies recruit for the future. HR professionals and recruiters will need to keep abreast of the latest technological trends to adapt to the changing recruitment landscape.

Table 1. The Web 4.0 generation of online recruitment.

Name	Distinctive characteristics	Internet instrument type	Most important quality for recruitment
Web 4.0	Recruitment tasks are carried out by undefined groups i.e., indirect communication between the company and the people being crowdsourced.	All that proceeds including development tools and rewards for recommenders and (Possibly) recommended.	A wide variety of Social Groups can be reached with Recruitment information.

From the 2000s onwards, Véronique Heiwy (2024) defines Artificial Intelligence in the field of human resource management as a fantasy. It presents itself as a problem-solving alternative, a competitor to human resources (Andler, 2023), seen as frightening (Heiwy, 2021). The literature shows how AI can assist human resource management tasks. The desired objective must be expressed in terms of time, cost control, accuracy, and reliability of results (m-work, 2024).

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[1] V Heiwy (2024) , Intelligence artificielle pour la gestion des ressources humaines: quel impact? inforsid2024.sciencesconf.org

III. MATERIAL AND METHOD

Our research focuses on recruitment in the Web 4.0 era, so the study was carried out on the basis of a questionnaire provided by Sphinx comprising 15 closed questions of the single, multiple choice and frequency type. The questionnaire focuses on various aspects of AI in relation to the recruitment process.

1. DATA COLLECTION

We collected data from Moroccan recruiters currently employed in the private sector, opting for the convenience sampling method. Our sample also shows a high degree of variance in terms of sector of professional activity (34.5% are in finance and insurance, 20% in commerce, 20.7% in tourism, etc.). These data are collected using a defined sampling methodology, ensuring that the sample is representative. Data collection was carried out by e-mailing the questionnaire to a predefined company database. The sample size was 66 companies. After excluding outliers, our final population consists of 60 companies. Our samples are mobilized by the business sector variable. The study was based on descriptive and frequency analysis using Sphinx software. This method was chosen because the objective was to understand the perception and difficulties of adopting AI in the business sectors that will be the subject of our study. The choice of convenience sampling is justified because it is an uncomplicated method. Data collection using this method is easy and accessible. Among the potential biases of this method is that the sample may not be representative of the whole population, and the results may not apply to other groups.

To fill in the gaps before administering our empirical study. Our questionnaire was verified by researchers and professors, and also simplified and pre-tested. Before our questionnaire was distributed, it was proofread and corrected to ensure that the questions were clear, precise and consistent. The questionnaire was then simplified by using clear, easy-to-understand language, clarifying the means of response (multiple choice, scales), and eliminating redundant questions. Pre-testing of the questionnaire was carried out on a group of 5 companies to observe comprehension of the questions and detect any misunderstood questions.

Our questionnaire was administered electronically, with reminders and follow-ups. The choice of this method of administration depends on the nature of our survey and our sample. The choice is justified by the need to control the risk of data entry errors or of the influence of responses on the researcher, as well as the speed of processing. After sorting the data, some responses were deleted due to the lack of answers to certain questions that were not mandatory, but necessary for our analysis.

Table 2. The analysis phase.

The analysis phase	Description
Questionnaire verification	Proofreading and correcting questions
Questionnaire simplification	Clarification of answers and clarity of language
Pre-testing of questionnaire	Pre-test on a group of 5 companies to observe understanding of the questions and detect misunderstood questions.
Distribution of questionnaire	Diffusion of the questionnaire.
Collecting and analyzing responses	Collection of 66 responses, frequency analysis and flat sorting.

Table 3. Characteristics of Respondents.

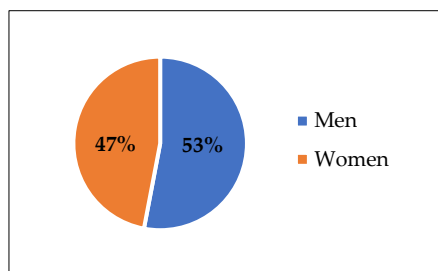| Sample distribution by age			
Age category	20 – 25 years	25 – 35 years	35 – 45 years	Over 45 years
Percentage	16,7%	62,3%	20%	0%

FIGURE 2. Sample distribution by gender.

IV. DATA ANALYSIS

We were able to collect a very large number of responses from the surveys, and a careful analysis of these revealed some very interesting results. However, this study is far from exhaustive. To get the most out of it, we need to deepen our analysis and processing, note forgetting to broaden our sample. The results of our empirical research will therefore be presented under several axes.

1. IMPACT ANALYSIS BY SECTOR

1.1 Sectors Most Affected by AI

Looking at the overall impact of AI on different sectors, respondents said that the sectors for which artificial intelligence will wipe out the most jobs can be presented as follows:

Table 4. The sectors most affected by AI. [1]

	Nb	% Obs
Administration and Office Automation	17	56,7%
Human Resources	27	90,0%
Production and Manufacturing	11	36,7%
Finance and Accounting	7	23,3%
Education	22	73,3%
Other	0	0%

[1] Source: Table based on literature, according to Wozniak (2014a, 2014b).

- 90% of recruiters responded that human resources will be most affected by the disappearance of jobs due to artificial intelligence. This is not surprising, as the use of AI in recruitment and human resources management can automate many administrative tasks, such as CV selection and job application management.
- 70% of recruiters responded that education will be the sector most affected by AI-driven job losses. This may be due to the use of AI to improve online teaching and personalize the learning experience for each student, as well as the creation of chatbots and other applications to answer students' questions.

In conclusion, the results indicate that the sectors most affected by job losses due to AI will be human resources, education and administration/office automation. However, it is important to note that AI can also create new jobs in these sectors, such as AI specialists or application developers, and that it can also improve the quality of work for professionals by enabling them to focus on more creative and complex tasks.

2. COMPANIES' PERCEPTION OF AI ADOPTION

The aim of the analysis in this section is to provide an answer to our research questions, particularly those relating to the perceptions of AI and the challenges of its adoption.
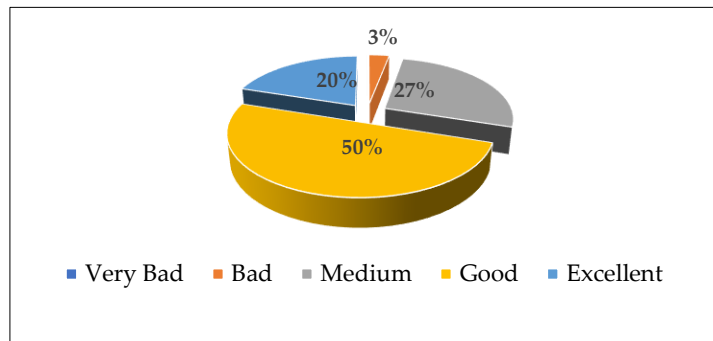
2.1 Degree Of AI Knowledge In Recruitment

FIGURE 3.   The degree of AI knowledge in recruitnment

- 20% of respondents consider themselves to have an excellent level of knowledge of artificial intelligence in recruitment i.e., they have already heard of AI tools in recruitment. These respondents have a good understanding of AI in the recruitment context, and could be key players in the implementation of AI solutions for recruitment.
- 50% of respondents have a good level of knowledge of AI in recruitment, indicating that they have at least some understanding of what AI tools in recruitment are. This could mean that these respondents are open to the adoption of AI in recruitment and are interested in learning more about these technologies.
- 27% of respondents have an average level of knowledge of AI in recruitment, which could indicate that they are less familiar with AI tools in recruitment and need more information to understand how these technologies can be used in their field.
- 3% of respondents have a fair level of knowledge of AI in recruitment, indicating that they have a very limited understanding of these technologies. These respondents may need more in-depth training to understand the benefits and limitations of using AI in recruitment.

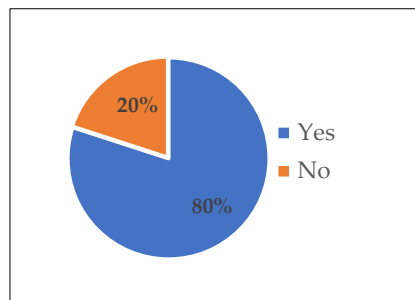*2.2 Mixed-Methods Data Analysis*

FIGURE 4. Development/Intention to develop (IA)

- The huge majority of companies in which the recruiters surveyed work (80%) are planning to develop projects linked to artificial intelligence in the recruitment process. This shows a trend towards the adoption of AI in recruitment. The remaining 20% said that their company does not wish to integrate AI into its recruitment, which could be due to a variety of reasons, such as preferences for traditional recruitment methods or a lack of resources to implement AI projects.
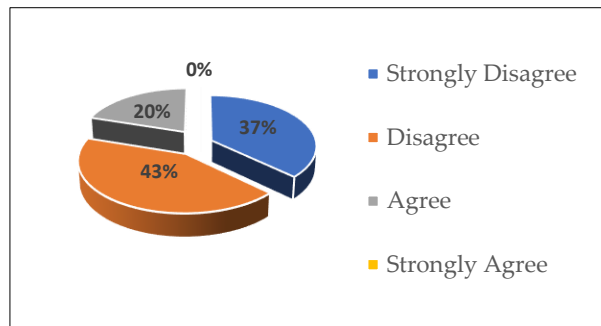
FIGURE 5. Substitution of recruiters by AI.

▪ The results of this question indicate that the majority of recruiters surveyed (80%) do not believe that artificial intelligence will eliminate recruiter jobs. Specifically, 37% of respondents answered "Strongly Disagree", suggesting that they are firmly convinced that recruiter jobs will not be eliminated by AI. 43% answered "Disagree", which may indicate some hesitation or uncertainty about the impact of AI on recruiter jobs. Finally, 20% answered "Agree", suggesting some worry about the future of recruiter jobs.

Overall, these results suggest that recruiters are not convinced that AI will completely replace their role, but that there could be changes to their work in the future. This perception may be due to a better understanding of AI's current capabilities, confidence in human skills that cannot be replaced by AI, or a lack of visibility on future technological advances.

2.3 The Pros And Cons Of AI In Recruitment

The benefits perceived by respondents regarding AI in recruitment are as follows:
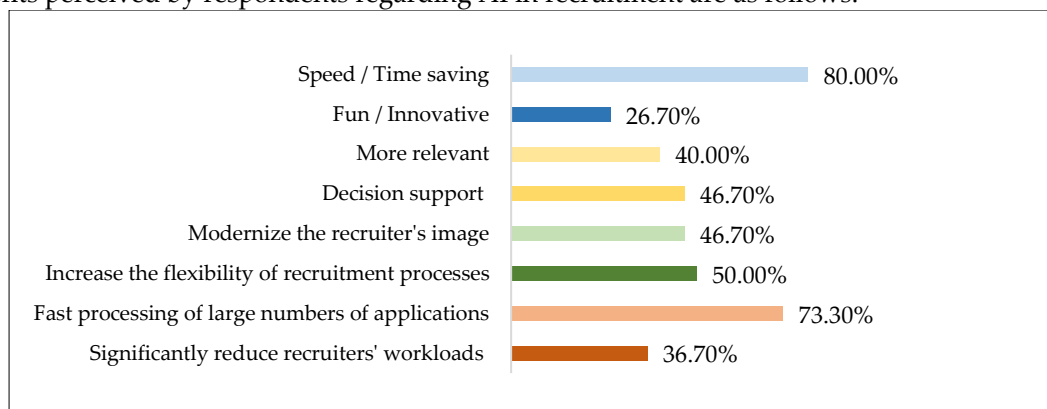

FIGURE 6. Advantage of AI in Recruitment.

▪ The results show that recruiters see several advantages in using artificial intelligence in recruitment. These include the rapid processing of large volumes of applications, cited by 73% of respondents. This can be particularly useful in large companies that receive thousands of applications for each position.

▪ Added to this is time savings, cited by 80% of respondents. AI can help automate certain time-consuming tasks, such as sorting applications and scheduling interviews, enabling recruiters to focus on more complex, higher value-added assignments. Furthermore, 46% of respondents cited the modernization of the recruiter's image as a potential benefit of AI in recruitment. This may be particularly important for companies seeking to position themselves as innovative and at the cutting edge of technology. 36% of respondents cited workload reduction as a potential benefit. This can be achieved by creating AI-powered job description templates and job offer letters, which can help standardize the process and improve the quality of job descriptions.

In sum, the results show that recruiters perceive several advantages to opting for AI in recruitment, including speed, efficiency, brand image and quality of workload writing. Concerning the disadvantages, the figure below presents them very clearly:
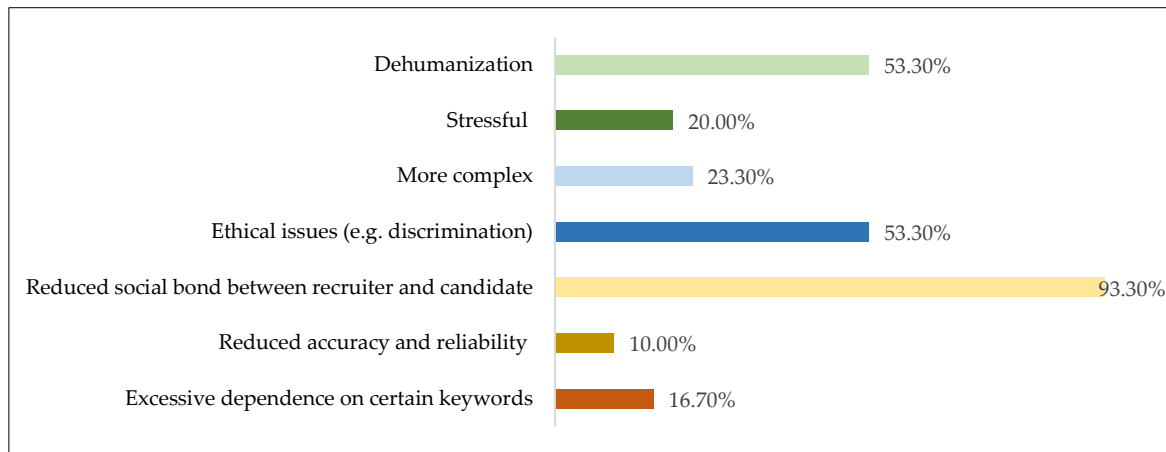
FIGURE 7. Disadvantage of AI in Recruitment.

- The results show that recruiters are concerned about the use of AI for recruitment. In particular, the social relationship between recruiter and candidate. Indeed, 93% of respondents cited a diminished social bond as one of the drawbacks of adopting AI in recruitment. This result suggests that the use of AI in recruitment can lead to a loss of human contact, which can affect the quality of professional relationships and the overall candidate experience.

- In addition, the de-individualization (or dehumanization) of recruitment processes, is also cited as a disadvantage of using AI, with 53% of recruiters expressing this opinion. This is another aspect that reflects the potential impact of AI use on human relations.

- Moreover, recruiters also mentioned ethical issues related to the use of AI in recruitment, with 53% of respondents highlighting concerns about personal data confidentiality and discrimination. These concerns underline the importance of transparency and fairness in recruitment processes, and the importance of preventing bias in candidate selection.

- 23% of recruiters mentioned that using AI in recruitment can be more complex than traditional methods. This response may suggest that some recruiters have personal preferences for traditional recruitment methods and are not yet entirely comfortable with AI and its applications.

In summary, the results show that the use of AI in recruitment can lead to disadvantages related to the loss of human contact, de-individualization, ethical concerns and complexity. These results highlight the need for caution and careful evaluation of the advantages and disadvantages of using AI in recruitment, ensuring that potential negative effects are minimized and benefits maximized.

3. THE CHALLENGES AND ISSUES OF AI ADOPTION IN THE MOROCCAN CONTEXT.

3.1 Degree of Difficulty in Integrating AI Into the Recruitment Process

Table 5. Degree of difficulty in introducing AI.

Degree of difficulty		
Average = 2,73 ' ◯ Agree '		
	Nb	% cit.
◯ **Strongly Disagree**	4	6,7%
◯ **Disagree**	14	23,3%
◯ **Agree**	36	60,0%
◯ **Strongly Agree**	6	10,0%
Total	60	100%

- As Table 5 shows, the majority of recruiters surveyed (60%) agree that there are difficulties in introducing and applying artificial intelligence in the recruitment process in Morocco. Furthermore, 10% strongly agree, suggesting that they consider the difficulties to be significant.

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- On the other hand, a minority of 6% of recruiters strongly disagree that there are difficulties, and 23% disagree. This means that, for them, the introduction of artificial intelligence into recruitment does not represent any major obstacles.
- These results suggest that the majority of recruiters reported facing difficulties with the introduction of AI into their hiring process, perhaps due to fears about infrastructure, application complexity, training requirements or other factors.

3.2 The Desire to be Trained in the Integraion of AI in Recruitment

Table 6. Training needed to apply AI.

AI application requirements		
Average = 2,60 ' ◯ Agree '		
	Nb	% cit.
◯ **Strongly Disagree**	12	20,0%
◯ **Disagree**	6	10,0%
◯ **Agree**	36	60,0%
◯ **Strongly Agree**	6	10,0%
Total	60	100%

- 20% of recruiters responded that they strongly disagree that they are sufficiently trained and prepared to use artificial intelligence tools in recruitment. This response suggests that they are not at all comfortable with this technology, and may not have confidence in its results.
- 10% of recruiters indicated that they disagreed that they were sufficiently trained and prepared to use AI tools in recruitment. This response suggests that these recruiters may be skeptical about using AI tools in the recruitment process, but they may be willing to learn.
- The majority of recruiters, 60%, responded that they were fairly willing to be sufficiently trained and prepared to use AI tools in recruitment. This response suggests that most recruiters are open to the idea of using AI tools in their work and are willing to invest in training in their use.
- Finally, 10% of recruiters responded that they strongly agreed that they should be sufficiently trained and prepared to use AI tools in recruitment. This response suggests that these recruiters have great confidence in AI tools and are convinced that they can be beneficial to their recruitment work.

In conclusion, the results show that most recruiters are open to the use of AI tools in their recruitment work and are willing to train in their use. However, a significant minority of recruiters are not convinced by this technology and may need reassurance about its effectiveness and reliability.
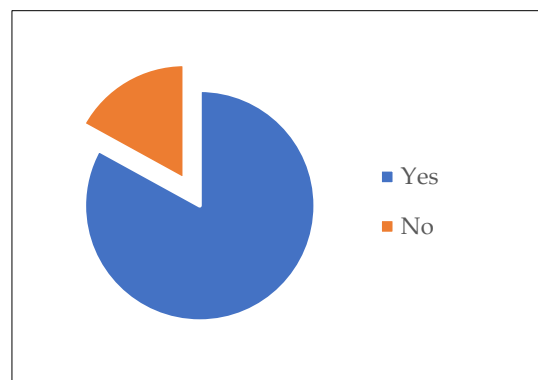
3.3 Employees' Perception of AI in Recruitment

FIGURE 8. Employees' perception of AI in recruitment.

- 83% of recruiters responded that their staff had accepted the introduction of AI into recruitment. This response suggests that the majority of recruitment teams are open to employing AI to improve their recruitment efficiency and quality.
- 17% of recruiters responded that their staff had refused the introduction of AI in recruitment. This response suggests that some employees may be reluctant to use AI in recruitment, perhaps due to concerns about ethics, confidentiality or the impact on human skills.

4   CONCLUSION

Our study is based on scientific research related to classic recruitment as well as modern recruitment, especially with the arrival of AI, which has disrupted and continues to disrupt the HR field. Out study examined the impact of using AI in recruitment. Artificial intelligence is often seen as a recruiter's ally, although it does have a few drawbacks that need to be taken into account. The empirical study enabled us to identify the impact of digitalization on the job of a recruiter in Morocco.

Recruiters' feedbacks (66 recruiters) shed important light on our findings. AI can automate certain traditional tasks, as it is designed to speed up the recruitment process, enabling recruiters to save time on more important and valuable tasks, but we also need to approach the subject from the candidate's point of view, in order to treat it from both sides, especially as the recruitment process is made up of the recruiter and the candidate. Will a candidate accept to be evaluated by a robot? What perceptions do job seekers have of the complete digitalization of the recruitment process? Among the limitations of this research is the lack of comparison of the results with existing data on recruitment practices before the advent of Web 4.0 or the implementation of AI. This opens up prospects for future research. Moreover, the lack of data availability may limit the generalizability of the results. The results of this study have been analyzed in a specific context and may change in other contexts.

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