

# A Review of Artificial Intelligence Based Platform in Human Resource Recruitment Process

Mohd Fakhri Mat Saad  
Faculty of Business, Communications,  
and Law  
INTI International University  
Nilai, Malaysia  
mohdfakhri.matsaad@newinti.edu.my

Ari Wibisono Listyo Nugro  
Faculty of Information Technology  
INTI International University  
Nilai, Malaysia  
i17013953@student.newinti.edu.my

Rajermani Thinakaran  
Faculty of Information Technology  
INTI International University  
Nilai, Malaysia  
rajermani.thina@newinti.edu.my

Mohammad Baijed  
Faculty of Information Technology  
INTI International University  
Nilai, Malaysia  
i20018719@student.newinti.edu.my

**Abstract—** This study focuses on three questions: What are the AI based platforms available? What types of AI features were used? What are the key activities of recruitment process involved? It employs systematic literature review (SLR) to 29 websites and literature manuscripts gathered from online search engines and databases published between 2015 and 2021. The AI based platforms were distributed on cloud technology via software-as-a-service (SaaS). Platforms reviewed were utilized in the sourcing, screening and selecting phase. Key activities such as profile matching, screening, profiling, rating and ranking, interview configuration and performance reporting are regarded to be prominently supported by the platforms. Features like source and scan suitable job candidates, facial and voice pattern recognition and word choice analysis were commonly integrated in the platforms. The study found that platforms were highly utilized in the initial and midway phases while less utilization observed in the ending phase of the recruitment process.

**Keywords—** artificial intelligence, human resource, recruitment, hiring

## I. INTRODUCTION

The pandemic of COVID-19 has inevitably transform the way industry conduct the business operations. Industry fields such as agriculture, healthcare, manufacturing, retail and education have undergone digital transformation to keep abreast with the industrial revolution 4.0 (IR4.0) as well as the push from the pandemic consequences. Consequently, support function of business operations including human resource (HR) has also experience the transformation. In HR, recruitment is among the key process which go through active transformation from manual to digital approach.

Electronic recruitment or e-recruitment uses corporate website and utilize search engine technology for company to post job advertisements and for job applicant to apply for job openings. Recruitment agencies are using cloud based software-as-a-service (SaaS) to reach out to online job seekers and obtain prompt attention from suitable applicants [1]. Video conferencing has also emerged as an important technology to support the interview phase conducted online [2]. Online job sourcing platforms like JobStreet, JobsDB and LinkedIn enable talent acquisition team to attract potential candidates especially the millennials group who are acquainted with the Internet technology.

While online job sourcing platform is perceived easy to use, it is fundamental to enhance current features to further

improve its usefulness. Features like alerting recruiter of incoming qualified application, checking data validity during encoding process, migrating sourced data to company's database for successful hiring, segregating applications based on specific qualifications and alerting applicant of application status and guiding for the next course of actions are among the suggestions for improvement [3].

To enable the improvement, online recruitment platform with AI technology have been developed and make known to enhance the recruitment process. The capability to integrate AI technology in the online recruitment platform is a key information technology (IT) strategy for organization in current digital age. While research of AI based platform in general HR functions have increased progressively, there are considerably limited studies assessing and synthesizing AI based platform within the context of recruitment process. The aim of this paper is to gather and review the available AI based platform for recruitment process from 2015 to 2021. The three research questions in this study are

- What are the AI based platforms available?
- What types of AI features were used?
- What are the key activities of recruitment process involved?

## II. RELATED WORK

The following section described the recruitment process in HR, e-Recruitment and AI in recruitment.

### A. Recruitment Process in HR

Recruitment is a key function in HR management to secure the best fit job candidate from a talent pool to take up job vacancy offer by organization. Recruiting the best fit candidate is imperative for organization to continue business operations effectively and efficiently. In current digital age, the way of recruitment process is conducted has changed in more innovative ways. Furthermore, competition among organizations in sourcing the best fit candidate is becoming more intense and challenging. Hence, it is crucial for organization to follow the emerging recruitment development trend and keep up with latest technology including the integration of AI technology.

Gartner [4] and Yawalkar [5] have outlined recruiting as the prime candidate for AI integration as hiring fast and right in a cost-efficient manner has become more challenging than ever before. AI offers highly scalable levels of improved efficiency and quality throughout the recruiting process and drive impacts on candidate experience. Referring to Fig. 1, Hmoud [6] has summarized the recruitment process into several main phases and key activities.

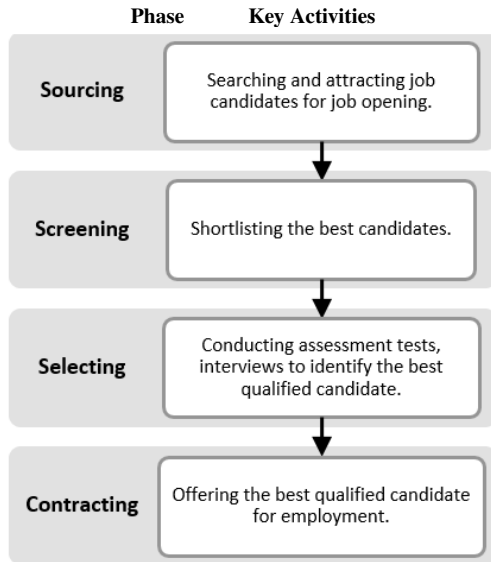


Fig. 1. Summary of Recruitment Process

### B. e-Recruitment

e-Recruitment is an expansion from the traditional recruitment process. The emergence of Internet technology coupled with networking advancement have bring forth the foundational ground of e-recruitment. Okolie and Irabor [2] defined e-recruitment as the practice of utilizing web based resources to perform recruitment tasks of searching, attracting, assessing, interviewing, and hiring new hires. E-recruitment offers added capability to the talent acquisition team in reaching and attracting a larger pool of potential candidates. Hence, enabling the selection process to be more productive and cost effective [2], [7]. In traditional recruitment, talent acquisition team had to invest more time and additional cost to source the best fit candidate all by themselves or through external recruitment agency. Candidate's information such as contact number, correspondence address, email address, employment history and expected salary can be stored and maintained in a more organized manner in the e-recruitment database [7].

In relation, candidate's resume can be uploaded as well and database maintenance activities such as data entry, data update and data retrieval can be performed more effectively. With Web 3.0 technology, interaction and engagement between talent acquisition team and job candidate are enhanced. The interaction and engagement can take place on the corporate's website, online job sourcing platform as well as on social networking platform. Candidate's generated data in the form of post, comment, or like can further improve candidate's experience and promote positive Internet collaboration.

Multimedia technology plays an integral part in e-recruitment. Video conferencing tool has also emerged as an important platform to facilitate online interview [2].

Additionally, search engine is a software which can gather and collect data about websites whereby search engine optimization (SEO) is a technique to provide faster reach on the search execution. Woon and Singh [8] suggested that most organizations had better invest in SEO technique to achieve higher and faster search results from keywords entered by online job seekers. Effectively, e-recruitment involves partial or complete automation of the activities in the recruitment processes. Okolie and Irabor [2] outlined the activities are like posting job advertisement, accepting job applications, storing resume of applicants, interviewing shortlisted applicants or sending messages and notifications to the applicants.

### C. AI in Recruitment

According to Vedapradha, Hariharan and Shivakami [9], various organizations have start to utilize features offered by AI based platform to upgrade their recruitment process. With Internet technology, AI algorithm can source and scan suitable job candidates from multiple databases of job platform such as provided by XOPA AI platform [10], [11]. High volume of job application is another known encounter in recruitment process. The utilization of AI based platform can significantly improve the turnaround time of the screening process [12]. XOPA AI platform also offer features of customizable pre-screening questions, chatbots for candidate screening and automation in resume screening. These features are among the innovative functions AI based platform can offered [13].

The advancement of multimedia technology such as video capturing and audio recording features have allow the traditional face-to-face interview to be substituted, migrated or re-considered with video screening interview. Video screening interview with facial recognition system, voice pattern analysis and word choice analysis is featured in AI based platform including Adnexio, XOPA AI, HireVue, Manatal, Harver, and Entelo [10], [11], [14], [15]. Sree and Geetha [16] have outlined that AI based platform plays an important role in screening job candidates and scheduling job interviews. Platform such as Adnexio, XOPA AI, HireVue, Manatal, Harver, Entelo and Talkpush come with these essential roles [10], [11], [14], [15].

AI based platform also empowers HR personnel with the capability to expedite selection of the right job candidate for the right job position in the talent pool, as offered by Adnexio, XOPA AI, HireVue, Manatal, Harver, Entelo, Hirectul, Eightfold, AmazingHiring and Humanly [10], [11], [14], [15]. Latest technology with intelligent algorithm for psychometric and sentiment analysis as featured in XOPA AI platform [10], [11] are among the other AI features that can be leveraged in recruitment process [17]. AI based platform may also assist in engaging, re-building, and on-boarding related tasks, hence improving the employer brand and reputation [18]. Besides, Sriram and Gandhi [19] have suggested that AI based platform can aids benefit to HR management functions in preparing and organizing job description, job specification, job applicant screening, new employee onboarding, new employee learning and development and new employee compensation mapping.

In addition, AI based platform can help to lookup job candidates' profile over the social network services (SNS). This serves as an extended methodology to allow talent acquisition team to conduct supplementary screening on the job candidates. One of the prominent SNS platform is LinkedIn, which hosts workers and professionals from various background, profiles, competencies and working experiences. Through machine learning (ML), AI based platform may also

recommend relevant job advertisement, generate notification and send automatic message to job candidates [17].

### III. METHOD IN SYSTEMATIC REVIEW

This study was conducted using adapted systematic literature review (SLR). In SLR, researchers will identify and select primary studies, extract, analyze, and synthesize data [20], [21]. Findings from the SLR will be disseminated as summary of existing research from analyzing and synthesizing research elements based on several defined phases (Fig. 2).

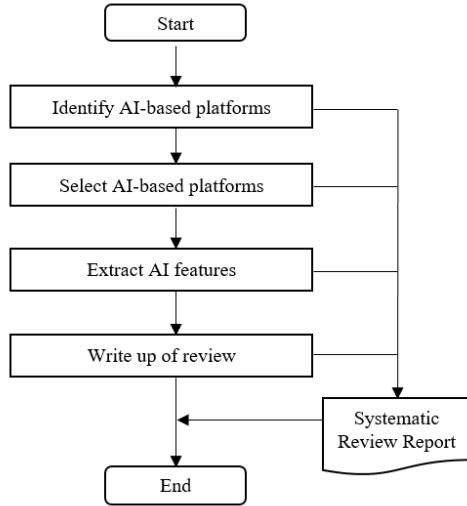


Fig. 2. Phases in SLR Process

#### A. Research Questions

This study aims to derive answer for the following research question

- Research Question 1: What are the AI based platforms available?
- Research Question 2: What types of AI features were used?
- Research Question 3: What are the key activities of recruitment process involved?

The research questions are formulated to develop further understanding on the practice of existing literature on AI platform in recruitment process. The formulation of the research questions is based on PICOC. As proposed by Petticrew and Roberts [22], PICOC constitutes five foundations which are Population, Intervention, Comparison, Outcomes and Context. Table I presents the summary of the PICOC adopted in the context of this study.

TABLE I. SUMMARY OF PICOC

Foundation	Detail
Population	HR Talent Acquisition team
Intervention	AI based platform
Comparison	AI based platform
Outcomes	List of AI based platform, AI features and key activities of recruitment process
Context	Organization

#### B. Identification of Relevant Architectures

This study uses primary sources from online search engine, online databases, journal articles, and conference papers. Online search engines utilized in this study are Google Chrome, Mozilla Firefox and Microsoft Edge. For the search, keywords used were AI based platform in HR, AI based platform in recruitment and AI based platform in hiring. The search execution of each search engine gave different sequence and set of website listing in the search results.

Review of existing literatures include journal articles published on online databases such as IEEEExplore, Scopus, ScienceDirect, ResearchGate, SpringerLink as well as conference papers within the period of five years between 2015 and 2021. The four primary sources are key and necessary to ensure broad coverage of relevant source.

#### C. Inclusive and Exclusive Criteria

To conduct the SLR, inclusive and exclusive criteria have been employed to guide the selection of existing literatures. The inclusive and exclusive criteria are outlined in Table II

TABLE II. OUTLINE OF INCLUSIVE AND EXCLUSIVE CRITERIA

Inclusive Criteria	Exclusive Criteria
Websites discussed about AI based platform in HR	Websites discussed topic other than AI based platform in HR
Websites discussed about AI based platform in recruitment	Websites discussed topic other than AI based platform in recruitment
Websites discussed about AI based platform in hiring	Websites discussed topic other than AI based platform in hiring
Websites published between 2015 to 2021	Websites published before 2015
Articles published in journal	Articles where only abstract is available
Articles published in conference proceedings	Articles published in foreign languages other than English
Articles discussed about AI based platform in HR	Articles discussed topic other than AI based platform in HR
Articles discussed about AI based platform in recruitment	Articles discussed topic other than AI based platform in recruitment
Articles discussed about AI based platform in hiring	Articles discussed topic other than AI based platform in hiring
Articles published between 2015 to 2021	Articles published before 2015
	Articles most recently published will be considered, for same research topic discussed by the same author

### IV. RESULTS AND DISCUSSIONS OF SYSTEMATIC REVIEW

Through the SLR, the results of the analysis (Table III) served as the input for the synthesis process. The formulation of the result is accomplished through the synthesis process in answering the research questions.

TABLE III. SUMMARY OF STUDY

AI Platform	AI Features	Key Activities of Recruitment Process
Adnexio [15]	Source & Scan Suitable Job Candidates	Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating &

		Ranking, Interview Configuration, Candidate Performance Reporting
XOPA AI [10] [11]	Recommend Job Advertisements to Suitable Candidates, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis	Resume Parsing, Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating & Ranking, Query Handling, Interview Configuration & Scheduling, Candidate Performance Reporting
HireVue [10] [11] [14]	Source & Scan Suitable Job Candidates	Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating & Ranking, Interview Configuration, Candidate Performance Reporting
Manatal [10] [11] [14]	Recommend Job Advertisements to Suitable Candidates	Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating & Ranking, Interview Configuration, Candidate Performance Reporting
Harver [10] [11] [14]	Customizable Pre-Screening Questions, Chatbots in Candidate Engagement, Automation in Resume Screening, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis, Psychometric Testing, Sentiment Analysis	Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating & Ranking, Interview Configuration, Candidate Performance Reporting
Entelo [10] [11] [14]	Source & Scan Suitable Job Candidates, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis	Profile Matching, Candidate Screening, Candidate Profiling, Candidate Rating & Ranking, Interview Configuration, Candidate Performance Reporting
Talkpush [11] [14]	Source & Scan Suitable Job Candidates, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis	Candidate Screening, Candidate Profiling, Interview Configuration
Hiretual [10] [11] [14]	Source & Scan Suitable Job Candidates, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis	Profile Matching, Candidate Screening, Candidate Profiling
Eightfold [10] [11] [14]	Source & Scan Suitable Job Candidates, Facial Recognition, Voice Pattern Recognition, Word Choice Analysis	Profile Matching, Candidate Screening, Candidate Profiling
AmazingHiring [10] [11] [14]	Scan Suitable Job Candidates, Chatbots in Candidate Engagement	Profile Matching, Candidate Screening, Candidate Profiling

Humanly [10] [11] [14]	Source & Scan Suitable Job Candidates	Profile Matching, Candidate Screening, Candidate Profiling
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### 1) Research Question 1: What are the AI based platforms available?

The reviewed websites [10], [11], [14], [15] discussed about AI based platforms for HR recruitment and hiring process. Eleven AI based platforms were gathered and studied namely Adnexio, XOPA AI, HireVue, Manatal, Harver, Entelo, Talkpush, Hiretual, Eightfold, AmazingHiring, and Humanly. All the AI based platforms are distributed online through cloud based model via software-as-a-service (SaaS) facility. The SaaS facility can be subscribed on-demand either free-of-charge or based on monthly or yearly subscription fees. Service providers of the platforms are based in various locations including Malaysia, Thailand, Singapore, Philippines, India, United States, and Netherlands. Generally, distribution of the platforms is delivered in a single package with standard access to the overall features. For XOPA AI, the distribution is packaged according to collection of features which can be subscribed, upgraded and scaled up independently.

### 2) Research Question 2: What types of AI features were used?

With the Internet technology, algorithms of the AI based platform can source and scan suitable job candidates from multiple databases of job board. In addition, AI based platform may help to lookup job candidates' profile over the social network services (SNS). Through machine learning (ML), AI based platform may also recommend job advertisements to suitable candidates [17]. Customizable pre-screening questions, chatbots for candidate screening and automation in resume screening are among the innovative functions AI based platform can offered [13], [16], [19]. Furthermore, the advancement of multimedia technology such as video capturing and audio recording features have allow the traditional face-to-face interview to be substituted and integrated with facial recognition, voice pattern recognition and word choice analysis in one-to-one or group video interview [17].

### 3) Research Question 3: What are the key activities of recruitment process involved?

Profile matching, candidate screening, candidate profiling, candidate rating and ranking are among the key activities involved and utilized in the AI based platforms [1], [23]. In addition, the AI based platforms were also utilized for query handling, interview configuration and scheduling as well as candidate performance reporting. From the review, it was known that key activities linked to candidate shortlisting are the most commonly involved. While key activities linked to candidate engagement were less commonly involved. This indicates that the AI based platforms were widely utilized in the initial and midway phases of the recruitment process. On the other hand, minimal or less emphasis was put on the ending phase.

## V. CONCLUSION AND RECOMMENDATION

Recruitment is a fundamental and key function in HR management. Processes in recruitment have significant short and long term impacts for organization in hiring the right candidate for the right job. Mission and vision of organization can be well achieved by a pool of best-fit employees across all

levels of organizational structure. Facilitated by the Internet technology, e-recruitment surfaced as the new approach in managing and administering recruitment activities. The outcomes of e-recruitment are considerably important especially in the context of simplifying and improving manual activities in the recruitment process.

Eventually due to the COVID-19 pandemic, push for further digitization has becoming an important consideration for organization. In the context of e-recruitment, AI based platform emerged as an innovative way to manage and administer key recruitment activities. Consequently, the utilization of AI based platform can significantly improve the turnaround time in the recruitment process [12]. AI based platforms reviewed in this study were mainly utilized in the sourcing, screening and selecting phases of recruitment process. Key activities in recruitment process such as profile matching, candidate screening, candidate profiling, candidate rating & ranking, interview configuration and candidate performance reporting are regarded to be prominently supported by the AI based platforms. AI features like source & scan suitable job candidates, facial recognition, voice pattern recognition and word choice analysis were identified to be commonly integrated in the platforms. Also, AI features such as customizable pre-screening questions, chatbots in candidate management, sentiment analysis and psychometric analysis powered with intelligent algorithm [17], are additional features that can be leveraged in AI based platform.

Further, decision making by HR talent acquisition team can be improved with prospect of predictive modeling through the collection of big data. New insights can be developed to bring about future recruitment outcomes. AI based platform can also enhance the candidate's experience through contextualization and personalization [4]. Besides, AI based platform have potential to offer extended benefit in the ending phase of recruitment process, i.e. contracting. New employee onboarding, new employee learning and development as well as new employee compensation mapping [19] are among key activities in the contracting phase which are relevant to be assessed and considered for future utilization of AI based platform.

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