

## RECRUITMENT BASED ON ARTIFICIAL INTELLIGENCE TECHNOLOGIES

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**Abstract.** In connection with the digital transformation of the economy, organizations are faced with the task of choosing methods of transition from the classical methods of human resource management to the "HR 3.0" model, which allows increasing the efficiency and speed of solving the problems of hiring, retaining and developing personnel as a result of using cloud technologies, chat bots and artificial intelligence. One of the key areas for improving human resource management is the digitalization of the recruiting process. The article proposes a technology for the implementation of digital recruiting by companies; a methodology for evaluating candidates' resume, a methodology for conducting preliminary interviews using intelligent dialogue systems based on the principles of machine learning; an example of using the chat bot in the selection and evaluation of candidates is considered; The advantages of digital recruiting over the classical methods of personnel selection are indicated.

**Keywords:** human resources management, digital recruiting, automated recruiting system, intelligent dialogue system, chat bot.

### Introduction

As a result of the gradual introduction of advanced methods and approaches into business processes, human resources management (HR) undergoes a digital transformation. At the stage of transition to the digital economy, artificial intelligence technologies, HR and predictive analytics, tools for working with large data sets, machine learning are introduced into the traditional management model; HR processes are robotized and automated, which in turn requires specialists to master new key skills [1].

Human resources management is moving to a new level - the "HR 3.0" model, which allows to increase the efficiency and speed of solving the problems of hiring, retaining and developing staff thanks to mobile technologies, technologies for searching candidates through social networks,

analysis of large data arrays, the use of cloud technologies and digital forms psychometric tools for staff assessment. The key areas of HR digitalization include: digital recruiting, HR marketing, staff training, HR analytics [2].

The process of recruiting and hiring staff most affects the company's business results. The classic form of the recruitment process is being replaced by digital recruiting. The main advantages of using automated personnel recruitment systems are: freeing up time for new tasks, ensuring transparency of the recruiting budget, and shortening the search for employees [3].

An analysis of the effectiveness of the introduction of digital technologies in the human resource management process has revealed areas in which automation fully met the expectations of specialists: sending notifications to candidates, recruiting analysts, ranking resumes and searching for candidates [4].

International research "The Future of HR", conducted in 2019 by "KPMG International", indicated the areas of digital human resource management [5]: the introduction of technologies and skills that provide benefits and competitive advantage from the use of big data analysis; the integration of human and digital labor through the use of artificial intelligence and machine learning; the use of HR analytics in order to improve the quality of management decisions and predict employee behavior, as well as their performance.

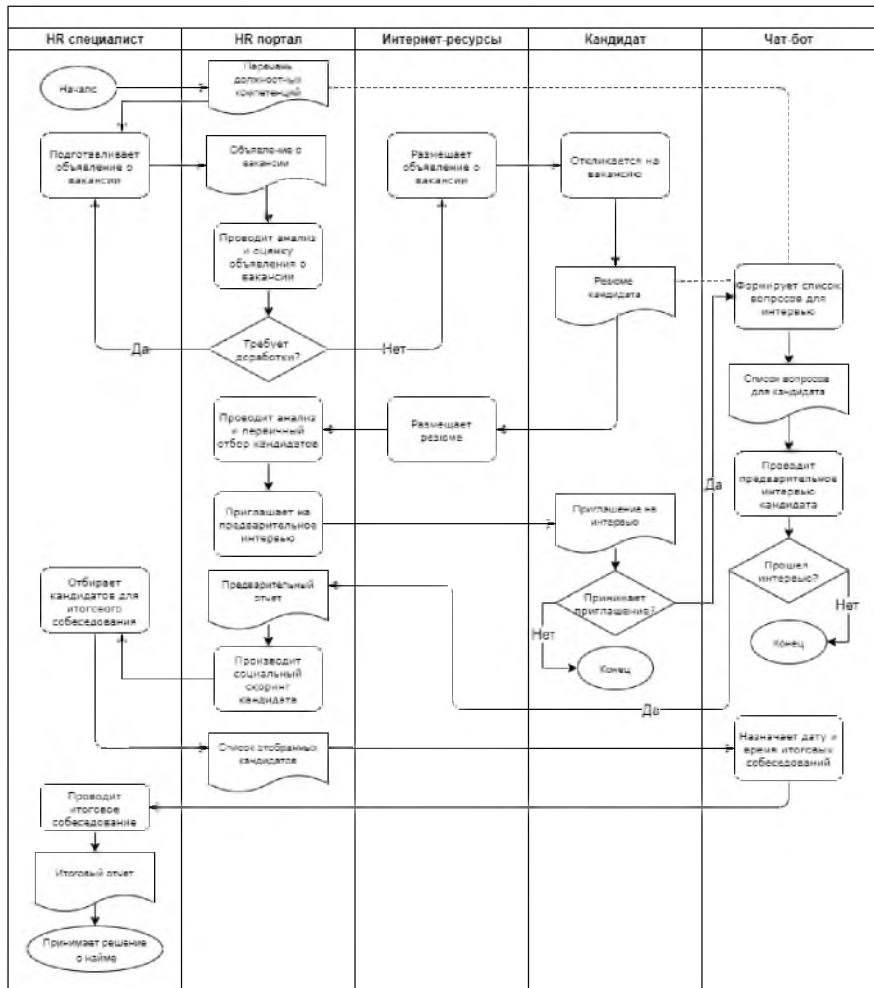
In this regard, organizations are faced with the task of choosing methods of transition from classical methods of human resource management to digital, giving competitive advantages.

### **Technology for the implementation of digital recruiting**

The classical implementation of the recruiting process contains a large number of routine operations and repetitive tasks that are advisable to automate, that is, convert the classic recruitment into digital form. The technological concept proposed by the author for implementing digital recruiting is presented in Figure 1 [6]. According to this figure, digital recruiting is a combination of the functions of subjects (HR specialist, candidate for the position) and objects (HR portal, Internet resources, chat bot) of the personnel selection system that allow you to close a vacancy in the shortest time and with the least effort and expense (find workplace).

The combination of technology elements such as "HR Portal" and "Chat bot" is an automated recruiting system (ARS) that allows you to: reduce the cognitive distortions allowed by recruiters and reduce the influence of the human factor; automate resume screening and preliminary interviews; establish communications with candidates and maintain them throughout the

hiring process; expand the staffing funnel; improve the quality of selected candidates; collect and process analytical data for objective decisions in recruiting management; eliminate the risk of losing information about valuable candidates and selection status; reduce the subjectivity of the selection process; reduce hiring costs and recruitment time; ensure the growth of labor productivity of HR specialist [3, 7].



**Figure 1 - Digital Recruiting Technology**

Source: compiled by the author.

The ARS system provides a transparent principle of operation [3]:

- HR specialist sets vacancy parameters by which the system selects the right applicants in Internet resources (on job search sites, social networks, online exchanges), imports suitable resumes into the HR portal database;
- HR portal carries out initial selection of candidates according to their resume;
- HR specialist instructs the chat bot to invite and conduct a preliminary interview with the selected candidates;
- the chat bot develops a list of questions and conducts an interview, the results of which are provided to an HR specialist;
- having received written consent, the HR portal conducts social scoring of candidate accounts on social networks;
- HR portal system sends to the specialist reports on selected candidates during preliminary tests;
- HR specialist selects candidates for final interviews with company experts;
- the chat bot contacts the candidates and sets the date and time of the final interviews, coordinating the schedules of the interviewing experts and candidates;
- HR specialist analyzes the results of interviews, provides them to the company management, which makes the final decision on hiring.

Thanks to ARS, a recruiter does not need to manually search for a resume, compare competencies and qualities of a candidate with the requirements of a vacancy, and contact applicants. The system also allows you to compile a resume database, analyze the sources of candidates search and determine the most effective among them, collect data on the number of interviews and compare them with previous periods, study the funnel of candidates, calculate the cost of response of candidates, create an external personnel reserve.

As practice shows, the most costly and lengthy recruiting processes, including a large number of routine and similar operations, are the initial selection of a resume and conducting a preliminary interview with the candidate. Thus, it is advisable to carry out these processes with the help of an intelligent dialogue system built on the principles of machine learning, a chat bot.

To date, the most popular recruiter bots are: XOR (xor.ai) - a bot on Telegram, Facebook and HeadHunter (hh.ru)); TalkPush (talkpush.com) - bot in Facebook Messenger; Wendy (wadeandwendy.ai) - screening bot in Slack; Skillaz is a system for automating the selection, decision-making, processing and analysis of jobseeker data on job search sites and social networks [8].

Consider the principle of the initial selection of candidates for their resume HR portal. The resume rating is set according to the aggregate score from a number of criteria having different specific weights, depending on the requirements of the vacancy, and aggregated in the integral indicator - aggregate resume score [3]:

$$P = \sum_{i=1}^n (b_i \times K_i),$$

where  $P$  – resume rating, score;  $b_i$  – the amount of points received by the candidate on the  $i$ -section of the criteria for evaluating a resume, score;  $K_i$  – the importance of the  $i$ -section of the criteria for evaluating a resume (depends on the requirements of the vacancy, affixed by HR specialist).

When evaluating an HR resume, a specialist assigns passing points to the portal system for each section of the matrix, depending on the position. Based on the requirements of the vacancy, the specialist establishes the significance level of the evaluation criteria section. Passing points and significance level are determined by specialists of the relevant services and company divisions (experts). Each vacancy competency identified is assigned points and competencies are ranked in the order they are expressed in a particular position.

At the next stage, the HR specialist connects to the chat bot process. At the recruiter's command, the system sends an active link to the candidate's mobile device that has passed the selection stage by resume. This link allows you to launch a chat bot on a specific platform of a social network, messenger or on the company's website, which develops a list of questions and conducts a preliminary interview [7]. In this case, the list of questions is divided into an informational and specialized unit.

The information block includes questions for the candidate that do not require specialization: profession (specialty), level of education, place of residence and willingness to move (business trips), purpose of passing tests (internship, getting a position), type of employment (full, partial, remote), desired salary level, basic skills, abilities and qualities of the candidate. The specialized unit is represented by narrowly focused issues, drawn up depending on: a list of job competencies; skills demanded in the labor market; the level of preparation of the candidate identified in the analysis of his resume. Based on the results of the answers to the questions of the specialized unit, information is generated about the proposed level of wages, the need for an internship by a candidate with experience, skills, abilities and qualities identified by the candidate.

At the end of the interview, the information collected by the bot is sent to the analytical unit of the ARS system (HR portal) to analyze the candidate's answers, the results of which determine the level of his competence, his compliance with the requirements of the vacancy, and also form a preliminary report provided by the HR specialist.

### **The practical application of intelligent dialogue systems, built on the principles of machine learning, in the selection of personnel**

Testing of the interview bot was carried out in the Vitebsk IT company with a staff of 120 people. Candidate level: graduate students of higher educational institutions of Vitebsk. The purpose of selection: practice and internships in the company. Number of candidates: 14 people. Baseline: interviews with candidates; Javascript developer job requirements posted on "Rabota. tut.by "(table 1).

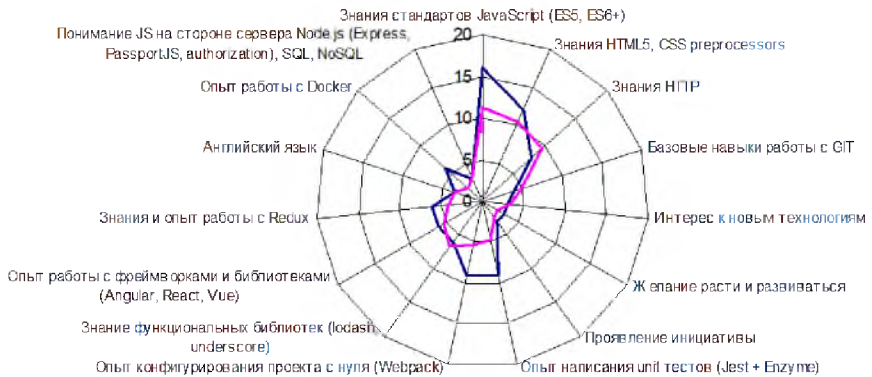
**Table 1 - Javascript developer job requirements**

Rank	Mandatory requirements	Score	Rank	Desirable skills	Score
1	Knowledge of JavaScript standards (ES5, ES6+)	16	1	Experience writing unit tests (Jest + Enzyme)	9
2	Knowledge of HTML5, CSS preprocessors	12	2	Experience in configuring a project from scratch (Webpack)	9
3	Knowledge of HTTP	8	3	Knowledge of functional libraries (lodash, underscore)	6
4	Basic skills for working with GIT	4	4	Experience with frameworks and libraries (Angular, React, Vue)	6
5	Interest in new technologies	3	5	Knowledge and experience with Redux	6
6	Desire to grow and develop	3	6	English language (no lower than "A2")	3,5
7	Initiative	3	7	Experience with Docker	6
			8	Understanding of JS on the server side of Node.js (Express, PassportJS, authorization), SQL, NoSQL	3
Total		49	Total		39,5

Source: compiled according to [Rabota. tut.by].

Based on the requirements of the vacancy and the level of training of candidates, the "InterviewBot" chat bot developed by the author on the "Telegram" platform made up questions for interviews in an informational and specialized block.

The results of the interviews were entered into the HR database, where the data for each candidate were analyzed, an average portrait of the applicant was compiled, and a diagram of the candidates' preparedness for the vacancy requirements was built (Figure 2).



The data of the “average” candidate are displayed in red, and the vacancy requirements in blue.

**Figure 2. – Diagram of the suitability of candidates for job requirements.**

The constructed correspondence diagram allows you to determine not only the level of knowledge, skills, but also the direction of training during practice and during the internship of candidates (JavaScript, HTML5, CSS preprocessors; writing unit tests; configuring a project from scratch (Webpack); working with frameworks and libraries (Angular, React, Vue); work with Redux and Docker).

The obtained candidate selection values using the chat bot were compared with the selection values carried out by an HR specialist, and the data were entered in the HR portal summary table (table 2).

**Table 2 – Comparative analysis of the selection of candidates conducted by chat bot and HR specialist**

Indicator	Value, %	
	Chat bot	HR specialist
The number of candidates who participated in the selection	100	100
The number of candidates selected	57,2	50,0
The number of candidates who received a second attempt to qualify after studying the necessary material	14,2	7,1
The number of candidates rejected	28,6	42,9

Source: compiled by the author.

Thus, the interview conducted by the chatbot allowed us to accept 1.1 times more candidates for internships, reduced the dropout rate by 1.5 times and doubled the number of candidates who received a second attempt to qualify after studying the necessary material.

"Interview bot" has the following advantages over a recruiter: a continuous process of work 24 hours a day, 365 days a year; the ability to work on various platforms, customizable to the needs of the candidate; multi-channel responses (the ability to respond to requests from multiple candidates at the same time); minimum current maintenance costs; continuous training and replenishment of the interview base; digital storage of received information in the ARS system.

### **Conclusion**

A common problem in assessing job seekers is the "human factor" (subjectivity of the assessment, technical errors, manifestation of emotions, loss of concentration, etc.) and short deadlines for processing large amounts of information. To solve this problem, employees of HR departments and specialized recruitment agencies are offered their digital counterparts - recruiting bots (recruitment chat bots), capable of: analyzing the data presented in the resume; to determine the level of competence and experience; schedule an interview; conduct an initial interview; to rank candidates.

When introducing a digital HR specialist, it is important to develop principles and metrics for staff recruitment; a list of questions relevant to the vacancy; methodology for analyzing the information received; choose a software product for the collection, processing and storage of HR information.

In order to reduce the time and labor costs of HR specialists, the convenience of collecting, processing and storing information, companies are encouraged to introduce an automated recruiting system that uses the capabilities of artificial intelligence and allows HR personnel to be freed from routine processes and repetitive monotonous tasks.

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