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THE OBJECTIVE NEED TO IMPLEMENT AN INFORMATION SYSTEM TO AUTOMATE DAILY TASKS IN RECRUITMENT WORKFLOW

Abstract. This article emphasizes the demand and significance of the implementation and integration of an information system for the nowadays recruitment process optimization. The article introduces the inherent characteristics and nature of information systems and outlines an essential range of tasks they can perform in the context of recruitment. This research examines and determines the direction of implementation of information technology systems, automation, and regular recruiters' routine tasks and processes optimization using artificial intelligence assistance. The primary objectives of the implementation of the proposed information system are quality improvements, human resources saving, unification of the processes, and introduction of the end-to-end solution for candidate interviewing. The weak sides of existing processes, solutions, and the correlation between the effectiveness of the recruitment workflow and work automation are determined. The article conclusively proves that the introduction and utilization of new information system tools and solutions are indispensable conditions for successful up-to-date recruitment and it would be significant input into business development strategies since it will help to not only save human resources but as well work for the company's market brand, reputation gain and significantly decrease risks of wrong hiring.

Keywords: systems, information systems, information technologies, automation, artificial intelligence, recruitment, optimization.

Introduction

The critical component of every modern company is a person or rather a professional in his field. But professionals do not appear in organizations by themselves, they appear in the recruitment process. Recruitment is an integral and essential part of human resource management. The main task of recruitment is to find, evaluate and further hire candidates most suitable for a specific vacant position. The history of recruitment goes back thousands of years, the first mentions of recruitment date back to ancient Egyptian and Roman times. However, each of the eras of recruitment is united by a common need to modernize processes to adapt to changes in society and technology in order to increase efficiency [1].

In the recruitment process, the interview of the candidate is perhaps the most important stage, because a high-quality interview is an opportunity to determine at an early stage whether the candidate is really suitable for a specific position or not. Unsuccessful selection of a candidate, or a negative impression of the company can lead to derivative financial or time losses, a decrease in team productivity, a deterioration of the working climate, and additional risks. An established candidate interview process is the company's investment in the predictability of mutually beneficial and harmonious cooperation between the company and the potential candidate.

An ideal interview process consists of several stages. According to the best recruitment practices, the interview begins with introductions between present participants and a story from the interviewer about the project and its features. After completing the introductory speech, the candidate can ask questions that interest him. All this makes it possible to reduce the level of stress and mentally prepare the candidate for the most difficult stage of the interview. After completing the answers to the candidate's questions, the most responsible stage for the interviewer and the most difficult for the candidate begins - the determination of

the real level of competencies using a previously created role competency matrix (RCM) [1].

A role competency matrix is a structured tool that companies use to assess and determine skills, actual qualification levels, and competencies relative to specific positions and levels within the company. The main purpose of the role competencies matrix is to help in making mindful and informed decisions regarding the assessment of the level of qualifications of the subsequent hiring, and promotion, as well as for the construction of a further self-development roadmap [9].

Analysis of existing information systems.

Usually, every company has a number of tools that are used to create a bank of candidates and further manage them, prepare for interviews, directly conduct interviews, etc. But the main problem with these tools is that they are not united in one single system that would allow you to do the work from start to finish in one environment, and also have structured historical data. Based on our own experience and according to the survey of recruiters in several IT companies, we can conclude that the following tools are mostly used:

- a bank of candidates is usually created using internal CRM systems or using "Google Sheets";
- for the management of the role competency matrices and the subsequent creation of a unique instance of the interview by copying the document of a specific RCM, "Google Sheets" is the most used; Fig. 1 shows an example;
- various pre-trained Large Language Models (LLMs) are used to generate texts relevant to the interview process. The Large Language Model is a neural network model deeply trained on a large dataset, which is capable of fast and efficient analysis and processing of linguistic structures. The main advantage is the ability to recognize and generate human-understandable texts [7];
- "Google Calendar" or any other alternative such as "Outlook Calendar" is usually used for meeting deadlines, reminders, and scheduling.

	A	B	C	D
1	Question	Question Notes	Answer Scores (0-5)	Answer Notes
2	How can we test React projects ?			
3	How to block browser "back" click?			
4	How to do "forceUpdate" with hooks ?			
5	When callback refs might be useful?			
6	What can you tell about performance in React? How can we measure and improve it?			
7	What is it useImperativeHandle ?			
8	How would you implement SSR with React ?			
9	If you have component which takes children and let's imagine that inside of the component you need to assign specific className for each children . How would you do it?			
10	How to do expensive calculations only once when component mounted ?	useMemo vs useState		

Fig. 1. Example of the interview instance based on RCM in "Google Sheets" (first 10 rows)

Each of the above-mentioned tools performs its atomic task well, but due to the lack of interconnection between them, problems arise at each stage of the interview that reduces the efficiency and productivity of the process as a whole.

The research purpose. The purpose of this article is to analyze existing best practices in the recruiting and hiring process, identify weaknesses and bottlenecks, and search for innovative technical solutions to improve and/or automate processes.

Main part

Taking into account the results of the analysis of existing processes, solutions, and best practices, this article proposes to improve the interview process by implementing an information system that will allow organizing an end-to-end interview process, which will significantly positively affect the quality of each of stages of this process for each of the participants in this process, including the candidate. The proposed technology solution in this article will be a web application that will include the following key features:

- management of the bank of candidates (profiles), including the possibility of reviewing the history of previous interviews for each specific candidate;
- management of role competency matrix instances;
- creation of a unique instance of the interview based on the candidate's profile and competency matrix;
- the possibility of filling out and editing a unique instance of the interview;
- the possibility of automatic generation of feedback and a road map of further development based on the results of the interview powered by generative artificial intelligence;
- the possibility of sending feedback directly from the application using contact data from the candidate's profile;
- regular automatic reminders about the feedback deadline for the recruiter and interviewer.

Candidate bank management is necessary to be able to create an individual profile per each candidate. The candidate's profile will contain full name, e-mail, an optional field for phone, a CV in the form of an uploaded file, and a "Notes" field for other notes. It will also be possible to view the history of previous interviews and start a new interview on each candidate's profile.

Each company has its own standards of requirements for different specialties and different skill

levels, even more, each specialist has his own vision. In order to unify the requirements for candidates for specific positions and for specific levels, companies use the role competency matrices. Also, RCM tends to change over time. According to the aforementioned information, we can conclude that we will need to develop the feature for creating and editing role competency matrices. One of the advantages of our solution will be that all the company's role competency matrices will be in a centralized place, which will make it possible to unify quality standards at the company level and facilitate the interviewer's preparation for the interview. Also due to the fact that instead of a large number of different not connected with each other matrixes in "Google Sheets", the company will have unified role competency matrices for different roles and skill levels, which will allow companies to cooperate in the development of common high-quality RCMs, instead of many matrices of the average quality of each individual interviewer which will lead to significant quality improvements.

The combination of the candidate's profile and competency matrices within one information system will allow system users to create a unique copy of the interview very quickly and conveniently. In order to start an interview, the user needs to select a candidate, go to the candidate's profile, click the "Create interview" button, in the dialog, select the competency matrix corresponding to the candidate's position from the drop-down list and click the "Start interview" button.

According to interview best practices, before starting with the atomic questions from the competency matrix, the interview should start with general questions about past experience and relevant questions from both the interviewer and the candidate sides. This allows the candidate to reduce the level of stress, thereby minimizing the side effect of emotional fluctuations during the answers to questions from the competency matrix. But this initial stage of the interview is no less important because this stage helps to understand candidates' patterns of thinking, how the candidate resolves real business problems and interacts with the team, etc. All these details of the discussion should always be noted down. Quite often, interviewers keep notes separate from the interview, which leads to the fact that these notes are quite often lost. To resolve this problem, the interview instance will have a built-in separate field for summary notes, which will allow the notes to be saved directly with the other answers, rather than in a third-party document that will not be directly related to the interview.

After the introductory stage of the interview, the most responsible stage of evaluating the candidate's competence begins with the help of a series of questions predetermined in the company's role competence matrix, which helps the interviewer to determine how deep the candidate's knowledge relative to the specific position and level. When creating an instance of an interview, a copy of the RCM with additional columns "Scores" and "Answer notes" will be created from the competency matrix, which will allow the interviewer to assign a score to each answer and add answer notes during the interview or after its completion. Those two fields are needed to allow further analysis and evaluation of the candidate's suitability or unsuitability to a certain level in his specialty. This step is extremely important not only to reduce risks and provide a better evaluation for the company itself but also to be able to preserve historical artifacts after the interview. These historical artifacts first of all will give an opportunity to create high-quality feedback and also if the candidate does not pass the interview the first time, the artifacts will allow for subsequent attempts to compare the results of the last interview with historical data, so the company can make constructive conclusions about the candidate's developmental progression or lack thereof.

After the interview is over, regardless of whether the candidate is a good fit for the position or not, it is important to provide feedback to the interviewer. Feedback usually consists of two parts combined in one message: feedback from the recruiter and feedback from the interviewer. Usually, recruiters are more accurate and responsible in terms of providing feedback, because it is in their direct interest to close the position. Interviewers, in turn, quite often do not take feedback seriously enough and provide very low-quality and superficial feedback or do not provide it at all. Even though interviewers are usually experienced professionals in their field, there are many reasons why problems can arise during the interviewer's feedback stage, the main ones being:

- the consistently high workload on the interviewer, which forces the interviewer to save time for the main projects, or, on the contrary, to sacrifice the time allocated for the main tasks for the sake of writing detailed feedback;
- the human factor in the form of laziness or lack of attention;
- lack of knowledge and understanding that providing feedback at the end of the interview is a sign of professionalism for the company and as well of an interviewer.

In the last few years, it was absolutely proven in practice that businesses without unification, optimization, and automation of the processes would be less competitive and non-efficient in the market. Even traditional business models such as restaurant business nowadays require modernization by information systems introduction in all processes, especially in regular routine tasks to be able to supply high-quality service with fewer resource consumption [5]. In recent years, artificial intelligence technologies have turned into everyday assistants. Recruitment is no exception because the use of technologies and various tools allows for significantly increased productivity, accuracy and quality with less expenditure of both time and resources [2].

This article offers a solution to the above-mentioned problem of lack of detailed feedback using modern

generative artificial intelligence technologies. Generative artificial intelligence in the modern world has become a powerful assistant in every field of society in the form of chatbots such as: "ChatGPT" from OpenAI, "Bing" from Microsoft, "Bard" from Google, and many others [6]. These assistants are only the tip of the iceberg in the form of a convenient user interface. Taking as an example one of the most popular chatbots today, "ChatGPT", you can see that behind the scenes of this user-friendly solution is a large language model that has its own API, thanks to which the "ChatGPT" service helps people solve everyday problems of varying complexity using a familiar chat interface. Since creating a Large Language Model is an extremely resource-intensive and expensive process, we suggest using already trained neural networks, namely one of the language models from OpenAI. To solve the task of automating the creation of feedback, we will take the LLM model from OpenAI and the corresponding API for integration with our product as a basis. One of the many examples of the use of LLM, namely "gpt-3.5-turbo", is the scientific study "Large Language Models (GPT) for automating feedback on programming assignments", which was conducted in 2023. This study fully and completely confirms the effectiveness and appropriateness of involving artificial intelligence to automate the generation of feedback for programmers based on initial data. In our case, we will have different input data and expected final output results [10].

Thanks to the integration with the API of the "gpt-3.5-turbo" large language model, we will create for the interviewer and the recruiter the possibility of generating a "draft" version of the feedback, which will save the major part of the time for writing the feedback. It is important to note that the "gpt-3.5-turbo" model will perform the role of an intelligent assistant and is not designed to completely replace a person, because artificial intelligence does not guarantee an ideal result, so there is a need for final moderation by an interviewer and recruiter and, if necessary, making changes. "gpt-3.5-turbo" API allows the definition of the detailed context before the request of the output. We're going to define the context based on the interview instance and then request detailed feedback (Listing 1). The interviewer should be the first one to complete his feedback because based on it, the recruiter and CEO will analyze and make further decisions about the candidate. However, the recruiter will be able to edit the interviewer's feedback before sending it to the candidate, because they have the necessary best practices of communication and soft skills that make feedback not only constructive but also pleasant for the candidate, taking into account various psychological aspects.

Due to the presence of the candidate's profile, in which there will be a mandatory field "E-mail", we propose to implement the possibility for the recruiter to send final feedback from our web application from the page of the interview instance. The integration of sending email letters to candidates will allow recruiters to always use unified branded letter templates, and replace manual copy-paste of the before prepared in the system feedback because manual copying increases the probability of errors and enforces recruiters to do manual formatting for each individual feedback in the email clients they use. In our case, feedback text is going to automatically fit into the predefined email letter template, so no extra formatting is needed which will save a significant amount

of time. This functionality will allow not only to make the process more reliable and resources saving but also, due

to standardization, to maintain consistently high-quality feedback and work for the company's reputation.

```
import openai

openai.ChatCompletion.create(
    model="gpt-3.5-turbo",
    messages=[
        {"role": "system", "content": "Automated Interview Feedback"},
        {"role": "user", "content": "Candidate: John Doe"},
        {"role": "assistant", "content": "Interviewer: Jane Smith"},
        {"role": "user", "content": "Technical Question 1: Explain object-oriented programming."},
        {"role": "assistant", "content": "Candidate's Response: ..."},
        {"role": "user", "content": "Technical Question 2: What is the purpose of a constructor in a class?"},
        {"role": "assistant", "content": "Candidate's Response: ..."},
        {"role": "user", "content": "Technical Question 3: Implement a binary search algorithm."},
        {"role": "assistant", "content": "Candidate's Response: ..."},
        ...
        {"role": "user", "content": "Feedback Request: Please provide feedback on the candidate's responses."},
    ]
)
```

Listing 1. Example of the OpenAI's "gpt-3.5-turbo" API usage

Sending feedback can be considered the end of the interview lifecycle, after which the interview instance becomes read-only even for the interviewer and recruiter to prevent post-facto changes.

In addition to the quality of the feedback, it is equally important to provide it in a timely manner within the terms agreed in advance with the candidate. Feedback delays sometimes lead to significant candidate stress due to uncertainty, which also affects the subsequent impression of the company, so it's really important to meet agreed deadlines [8].

Even if the feedback is extensive and detailed, but sent with a significant delay, this will be a sign of unprofessionalism, and it will also be a blocking factor for the further steps of the recruiter regarding this candidate because the recruiter cannot take responsibility for the results of the interview with the interviewer without provided feedback by the interviewer. Also, the delay in feedback imposes the risk that the candidate will accept an offer from a company that reacted faster and provided feedback with an offer for further cooperation.

Given that it is important not only to meet deadlines but also to provide feedback as soon as possible to minimize the chance of accepting an offer from another company, there is a need to constantly remind both the interviewer and the recruiter that a specific interview instance is still not completed and waiting for feedback. Of course, you could delegate the responsibility of reminders to a recruiter, but there is nothing more valuable than a person's time that can be put to far greater benefit than constant reminders. To solve this problem, we suggest using cron jobs to solve this routine task. Cron jobs are tasks or programs that run on a regular basis at a predetermined time interval [3].

In our case, utilizing cron jobs, we will be able to implement the automation of regular reminders to the interviewer and the recruiter about the presence of interview instances that are waiting for sending of the final feedback to the candidate. The daily interval will be selected as the default value but can be changed in the system settings. The inevitability of regular systematic reminders about the deadlines for providing feedback will also be a psychological incentive for the interviewer and the recruiter not to postpone the process for a long time.

Every information system which works with sensitive user data takes responsibility for secured data storage. In our case, the system is going to have sensitive data about the company's standards and at the same time private data of candidates (contacts, CVs, history of interviews, etc.). To protect confidentiality and privacy, our application will be secured by following industry standard best practices such as Advanced Encryption Standard (AES) encryption. AES encryption is the proven way to remain the user's and business data safe. AES encryption is used worldwide including by the US government. One of the most usual use cases for AES encryption in web projects is the usage of the Secure Sockets Layer (SSL) which is the most basic but still very important best practice to protect user's data. SSL helps to encrypt transmitted data between the user and the browser. SSL helps to prevent a wide range of cyber-attacks, where Man-in-the-Middle (MitM) Attack is one of the most often used to attack web projects without SSL [4].

Conclusion

Every solution should have its objectives. Based on the research we have made we have found that some of the recruitment processes need to be modified and automated. Our primary objective of the information system developed to be applied for recruitment interviews is end-to-end flow organization including automation of the regular routine, but still very important parts of the process such as feedback generation through AI GPT models. Those innovations should rapidly enhance business efficiency, and decrease time and money consumption per each interview with remaining high-quality standards. Also, the implementation of this system benefits both the interviewer and the candidate because of the streamlined user experience and great final result.

By integrating generative artificial intelligence, the company gains much quicker, more accurate evaluations of the candidates. Also even if the candidate was not the best fit for the specific position, automation will help to leave the candidate with the impression of a professional company because of expanded feedback which leads the company to a bolstered reputation in the market.

This automated information system offers multiple fundamental advantages compared to classic processes. The combination of the bank of candidates, matrixes of competencies, interviewing, and feedback generation

helps to build relative relationships between entities which leads to the swift processing of candidates, seeing the history of evaluations, and in general resolves regular issues of unconnected between each other services used for recruitment. If we go deeper, as a positive side effect we receive advanced coordination and predictability ensuring that staff involved in the interview process has a standardized and fair evaluation process per each candidate. The history of the interviews helps to analyze historical data to detect whether candidates made any progress since the last interview.

A detailed review of existing articles and literature relative to the field of recruitment defined the objective demand and driving influence of AI and technologies on up-to-date recruitment processes. Based on analyzed information we've found the growing trend of automation to streamline evaluations and AI usage for further feedback. That proves that our idea of automation and incorporating AI into the interview and feedback loop is actual and will help to make recruiters' and interviewers' daily jobs easier.

The product proposed in this article would be possible to scale further to be used not only in the recruitment processes of new candidates evaluation and hiring but as well for regular performance reviews of the employees to evaluate their knowledge changes and further self-development roadmaps generation on a regular basis. So there's a perspective area for further research and development in this area to cover not only the recruitment but wider human resources tasks relative to knowledge evaluation which exists in nowadays companies.

In conclusion, the information technology system designed for the organization of the end-to-end flow of interviews and final feedback generation empowered by AI – is definitely beneficial for any forward-looking organization. The core of its significance is in its ability to save both financial and human resources, but at the same time enhance the quality, accuracy, and efficiency of candidate evaluation and of the process itself. Through the integration of this solution, companies would be able to optimize their processes and get great people onboarded quicker with fewer risks.

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Об'єктивна необхідність впровадження інформаційної системи для автоматизації щоденних завдань у робочому процесі рекрутингу

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Анотація. Ця стаття підкреслює необхідність та важливість впровадження та інтеграції інформаційної системи для оптимізації сучасного процесу рекрутингу персоналу. Стаття знайомить із властивими характеристиками та природою інформаційних систем, а також окреслює спектр важливих завдань, які вони здатні виконувати у контексті підбору та найму персоналу. У цьому дослідженні розглядається та визначається шлях впровадження інформаційних технологій та систем, автоматизації, а також оптимізації буденних задач та процесів рекрутерів за допомогою штучного інтелекту. Основними завданнями впровадження запропонованої інформаційної системи є підвищення якості, економія людських ресурсів, уніфікація процесів та впровадження наскрізного рішення для проведення співбесід з кандидатами. Визначено слабкі сторони існуючих процесів, рішень, а також виявлено пряму залежність ефективності робочого процесу рекрутера та автоматизації роботи. Стаття переконливо доводить, що запровадження та використання нових інструментів, рішень та інформаційних систем є неодмінною умовою успішності сучасного процесу рекрутингу та стане великим внеском у стратегії розвитку бізнесу, оскільки це дозволить не лише заощадити людські ресурси, але і працювати задля розвитку ринкового бренду та покращення репутації компанії, а також значно зменшувати ризики невдалого найму. Стаття переконливо доводить, що запровадження та використання нових інструментів і рішень інформаційної системи є неодмінною умовою для сучасного підбору персоналу та стане великим внеском у стратегії розвитку бізнесу, оскільки допоможе не лише заощадити людські ресурси, але й працювати на ринковий бренд компанії, підвищення репутації та зниження ризиків поганого найму.

Ключові слова: системи, інформаційні системи, інформаційні технології, автоматизація, штучний інтелект, рекрутинг, оптимізація.