Trends in Recruitment Information and Communication System using Artificial Intelligence in Industry 4.0

Nidhi Oswal[1], Karamath Ateeq[2] and Saju Mathew[3]

[1]*Business Department, Khawarizmi International College, Abu Dhabi, U.A.E.*
[2]*BSIT Department, Skyline University, Sharjah, U.A.E.*
[3]*Freelance Research Consultant, Kerala, India*

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Abstract: Automation of industry and business practices termed as Industry 4.0(Fourth Industrial revolution) has led to the production of the smart machine. Information systems and applications used for business processes are now integrated with data analytics. The job description of employees is changing to suit the industry needs. Innovations in algorithms for decision making make AI (Artificial Intelligence) a useful recruitment tool for implementing Human resource management (HRM) strategy. The recruitment process has been a cognitive human ability. This has been taken over by machines which act as virtual assistants in providing recruitment solutions technically.HR personnel is now empowered to implement strategic business plans developed by the top management. In this paper, AI technologies, and the use of AI platforms to select employees with the required skill set to match management's business strategy is focused on. The paper also highlights Industry 4.0 and technology trends that have changed the functions of HR and redefined the role of HR personnel. Information and communication about job vacancies, skills set required, benefits, and compensations due, etc. are now being digitalized. Recruitment using AI has made it possible to hunt for a workforce globally. AI plays a significant role in collecting data of the candidate through various sources and evaluates the required candidates based on job description more efficiently and in an unbiased manner. The use of AI demonstrates higher accuracy than human recruiters and increased productivity to satisfy the dynamic needs of business processes. Applications of AI allow candidates and employees to experience personalized and more intuitive results.

1 INTRODUCTION

The development of technology and the economical progression has brought a tremendous revolution in the industries and the organization are now adapting to the digital era. Digital technology had already made its way to the manufacturing and service industry in terms of automation software. The technology was shifted a level ahead with the emergence of the industry 4.0 revolution or what it is called today as the Internet of Things (IoT). Industry 4.0 provided a whole new vision or a holistic view of the manufacturing and service industry in terms of real-time big data, the interconnectivity of departments, usage of machine language, improved and faster processes. Various digital tools like cloud computing, cybersecurity, networking, nanotechnology, and Artificial Intelligence were bringing innovation in designing the organizational processes with minimizing the human factor or interference of human biases into the processes. Now, innovation in organizational process design using the digital tools of IoT can provide organizations a competitive edge.

One of the most important departments of an organization whether it's a manufacturing or a service is its Human Resource Department who manages an organization's people and with the inclusion of latest technology can shrink the time taken for all the activities of the department, which directly shows the growth in the industrial development and performance. Hence it's very crucial for every industry or business to update their technology and bring new innovations to cope themselves in the new generation competitive period.

One such new technology that is nowadays controlling all the major sectors of the industries is "Artificial Intelligence". With the introduction of artificial intelligence in the Human Resource Department has brought a significant revolution by combining the human intelligence and the innovation of the digital technologies in automating all the activities performed by the department. Now, using AI, machines can drive the processes with the human intelligence factor. John McCarthy first used the term Artificial Intelligence in 1950. Already more than 60% of businesses are using AI to its fullest and it is valued by trillion $ by 2018 (Albert, 2019). AI is the new face of the business world. A whole new glossary is created for HR crucial activities in the era of industry4.0 (Bondarouk and Brewster, 2016).

Various crucial activities of the HR department include recruitment, selection, hiring, training and development, and talent management for the development of an organization (Nawaz, 2019). Within the global market where technology brings rapid changes in the demands and desires of the consumers, human resources are considered valuable resources in the job markets. In recent times with various economic, political, and social changes going over the world, it has become more challenging for HR managers to identify and acquire talented human resources for their companies.

Recruitment processes need to be redesigned to identify the most suitable candidates and encouraging them to initiate the process of applying within the company. AI enables the recruitment process to be more efficient with the intelligent data-driven decision. Programs using AI help in matching the desired skills of the candidate as per the job description. Now, HR managers have access to lots of data, real-time data. AI-enabled tools help the HR managers to segregate the candidates on the predefined data. Results are more accurate and reliable leading to an increase in productivity with low-cost as human errors and bias factors are reduced to a high level. Of course, organizations now need to spend time and money on training the employees to work efficiently and effectively with digital technologies. An outstanding recognition was received by Volvo, a luxury car company at the Brussels Motor show due to their AI embedded car used to interview the candidates for the post of service technicians (Vedapradha et al., 2019). But the use of AI in various HR processes has reduced manpower and created some ambiguity between manpower and machine power (Geetha R. and Bhanu D., 2018).

The main objective of the paper is to comprehend the connection between the Human Resource and Artificial Intelligence and to focus on the trends in the recruitment process related to information and communication system using AI.

The methodology used to write this paper is based on the literature review and the secondary data. A thorough review of all the secondary data from various journal publications, conference proceedings, websites and the books are referred while drafting this paper. All the keywords mentions in the paper were researched to describe the objective of the paper.

2 TRENDS IN WORKFORCE RECRUITMENT

In this modest business world, the human resource department is an essential part of any organization for its improvement and organizational performance. To be effective and prosperous in the business world, organizations have to attempt greater customer gratification which is a dynamic key for their existence and to accomplish this, organizations have to adopt innovative human resource methods so that they can be unique among their competitors. The most common work carried out by human resources are- recruitment & selection, training & development, and other activities related to retaining skilled, loyal, and motivated employees in an organization. The most important activities that Human Resource Management (HRM) deals with is - recognizing, attaining, and developing a productive workforce so that they can work for the organization's goals and objectives in the most appropriate fashion. Among these, the most interesting and challenging activity is carried out is to identify and acquire the most desirable candidates whose skills match the desired set of skills required to perform in a specific job.

These activities are the most time-consuming process and which leads to wastage of a lot of money due to poor recruitment method and technology used. (Hmoud B & Laszlo V, 2019). Over the years many researchers had given a different definition for Human Resource Management (HRM).

According to Edwin B. Flippo recruitment is defined as "searching and identifying the potential employees and to encourage them so that they can work for the organization's development and the objectives". Any mistakes done in this process can

affect the financial and the economic growth of the organization. The traditional recruitment process of an organization has a potential impact on recruitment activities and has a greater impact on the prospective candidates who apply for the desired job. The traditional recruitment process was a very extensive process where a lot of paperwork was used and they were not focusing on any specific models of recruitment.

The most common steps that were used in the traditional recruitment process were –

1. To identify the vacancy in the organization.
2. To prepare the job description and desired personal skills.
3. To identifying the sources of qualified applicants and screening the candidates from the huge pool of candidates.
4. Shortlisting and conducting interviews.
5. Decision making and hiring the most suitable candidate

As an improvement Breaugh J. A (2008), developed a Breaugh recruitment process model which consists of four phases. The following table 1 shows the Breaugh Recruitment Process Model (Breaugh, 2008).

Table 1: Breaugh Recruitment Process Model.

Step 1	Establish recruitment objectives
Step 2	Develop a recruitment strategy
Step 3	Carry out recruitment activities
Step 4	Evaluate recruitment results

Thebe and Van Der Waldt developed 11 macro-level steps for the recruitment process. Muller and Baum Mueller, J.R & Baum, B. in 2011 developed another 12 steps recruitment process model (Oswal, Khaleeli, Alarmoti, 2020). But both of these developed models were presenting the traditional recruitment process only which was very time consuming, complicated, bias, showed racism, and failed to identify the originality of the information that is provided by the applicant (Beattie, G. & Johnson, P., 2012).

To overcome all the difficulties that were faced by human resources the organizations are now adapting to new technology and one of such emerging technologies is "Artificial Intelligence (AI)". Currently, Artificial Intelligence has completely

taken the control over human resource department and the other working sectors.

3 ARTIFICIAL INTELLIGENCE (AI)

Artificial Intelligence (AI), is the most recent emerging technology that uses human intelligence and which is used by most of the organization to expand the efficiency and the performance of the organization. AI has the incredible power to act like a human brain and it gives full competence by using different inputs to give proper outputs in human resource management. Artificial intelligence uses different sets of algorithms and based on it, it performs its actions. Though the concept of Artificial Intelligence was found in the 1950s, the actual development and its exploration happened recently. Currently, the development of artificial intelligence had happened so fast that it is been used across all the fields of life. The growth of the Internet has also added advantage to the development of artificial intelligence.

Artificial intelligence plays a vital role in human resource management by reducing the workload of the human resource manager since artificial intelligence uses chat-bot agnostic solutions and algorithms. Based upon the different algorithms the entire process of recruitment, selection, training, development, etc., takes place. Due to the usage of artificial intelligence, it has completely reduced the manual and paperwork that was done in the traditional recruitment process. The technology provides online services to the employees as well as to the applicants by communicating with them with the help of a chat-box. The following figure 1 show the life cycle of artificial intelligence for human resources.
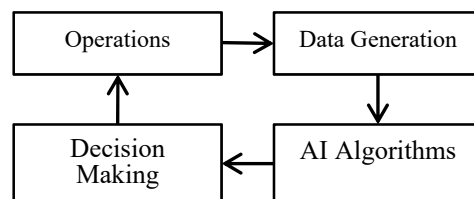

Figure 1: Life cycle of artificial intelligence for human resource.

Operations are an important part where the organization shows its interest to hire an employee. In the recruiting process, an ample amount is wasted by the human resource hence the organization wants

to apply the operations of artificial intelligence to reduce the cost of hiring. Following table 2 shows the human resource most common functions and its corresponding forecast jobs for workforce analytics:

Table 2: Human Resource functions and its corresponding forecast jobs.

HR Functions	Forecast jobs
Recruiting	Are we acquiring the good candidates?
Selection	Are jobs offered to those who will be the best employees?
On-boarding	Which practices cause new hires to become useful faster
Training	What interventions make sense for which individuals, and do they improve in their performance?
Performance Management	Do our practices improve job performance?
Advancement	Can we predict who will perform best in new roles?
Retention	Can we predict who is likely to leave and manage the level of retention?
Employee benefits	Can we identify which benefits matter most to employees, what are the effects of those benefits (e.g., do they improve recruiting and retention)?

All the above mentioned human resource operations may affect the efficiency of the organizations. These operations create a huge amount of data which can be in the form of text, recording, etc. The above operations can be used to develop the corresponding recruiting algorithms for artificial intelligence which can be used to trace the data on digital activities. The important inputs such as ATS (Application Tracking System) produce data generation.

For data generation, the data is extracted from different databases which are converted into a common useable format and they all clubbed together before the analysis is done.

Artificial intelligence algorithms refer to an extensive set of methods or techniques that can be familiarized and acquired from large data to create algorithms that can perform the better task and provide better predictions.

Decision making is the final stage of the life cycle which is used based on the understanding of the algorithms developed. In human resource decision making have more preference or choice,

how they can utilize the experimental evidence that is extracted from different models so that they can standardize the recruiting process for the organization.

4 TRENDS IN RECRUITMENT: USAGE OF AI

The landscape of recruitment is changing with AI being included in the HR manager's toolbox. Job advertisements are now optimized, published, and purchased using AI. Performance of advertisements and analysis of market data is done using predictive algorithms. This is later followed by scheduling interviews and placements. Algorithms and the use of AI facilitate the selection of the ideal job advertisement on the right platform and at the right time to reach the ideal candidate. Marketing is taking over the advertisement.

Recruitment marketing creates an employer brand and an attractive, engaging, and interesting job ad. Chabot is widely used to schedule interviews to pre-screen candidates. A human-sounding conversation that captures videos, pictures responses, documents, etc. is used. Chat boxes can converse through text, email, and chat since these robots are programmed to be assumptive, intuitive, and empathetic. ATS resume databases are screened for talented candidates who suit the roles at the organization. The candidates are then matched for the requirements open at the organization. This is further extended to social media or email communication to contact the candidate. Social media profiles are looked into to add to the candidate's profile. Besides this job aggregator is a technology that includes AI and bots to pierce into social channels, career sites, and job boards to advertise a job vacancy.

Figure 2 shows the conceptual framework of recruitment process using artificial intelligence.
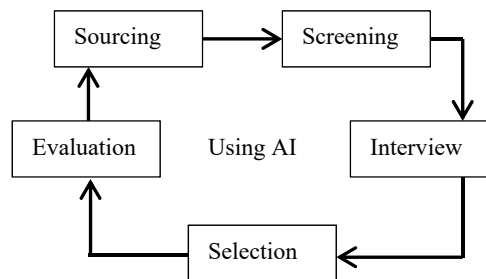

Figure 2: Conceptual recruitment framework using AI.

In the above figure all the activities of the recruitment is done using artificial intelligence.

- Sourcing - shows job description or advertisement of the job
- Screening – candidates qualification or skill assessment is done
- Interview – can be conducted text-based, online or face-to-face
- Selection – on the basis of merit and fulfilment of jobs requirement candidates are selected and given offer letter
- Evaluation – all the selected candidates will be evaluated on the basis of their work performance.

A unique URL is required for each job specification. With the advent of AI and technology, the role of HRM personnel is iterating to redefine new responsibilities.

Table 3: Redefined HR roles & Platforms Used for Communication and Recruitment. (The Top 13 Best AI Recruiting Tools).

Redefined HR roles	Platforms used for communication and recruitment
Digital Lead Ambassador	Fetcher www.fetcher.ai
Bot Monitor	XOR www.xor.ai
Head of Relevance and Purpose	Hiretual www.hiretual.com
Head of work Reinvention and Reskilling	Eightfold www.eightfold.ai
HR Data scientist	Pymetrics www.pymetrics.ai
Head of Insights	Textio www.textio.com
Bot Monitor and HR Data Scientist	Humanly www.humanly.io
Diversity and Inclusion Officer	Paradox www.paradox.ai

5 MANAGING INFORMATION AND COMMUNICATION IN RECRUITMENT USING AI

Time-consuming traditions and customs make recruitment activities a laborious process. Evaluation of people with skills to match the job specification is being considered a monotonous job. Automation of recruitment can lead to new doors for communicating and managing information collected by using AI. Since recruitment influences the organization, it should be unbiased and handled by machines. Many candidates may pull out of a position and feel unproductive. It also damages the employer's brand and business. Shifts in technology are changing the way job seekers find a job and hiring managers to know the candidates through interviews applications and negotiations.

AI and automation aids in recruitment through new channels of information and communication. According to the Recruiter Nation Survey conducted in 2018, shows that nearly 43% of human resource managers have communicated to the job seeking candidates through text only. Texting can be beneficial in recruitment if communication remains professional. Text-based interviews are also conducted which as compared other types of interviews are less stressful and which helps the candidates to communicate freely without any nervousness. Christian Mairoll, CEO of Emsisoft, says that he conducted text-based interviews which were very beneficial to him and the candidates were selected on the merit basis based on their verbal and written skills.

But it has been found that texting is not suitable for the first contact or replacement of phone or in-person interview. It cannot be a creative way to get the attention of the organization. Today, AI and big data are used by organizations as information assets are increasing. Since the subjective nature of people can be a hindrance, big data and AI is less biased in the recruitment process.AI helps cannot replace human-human communication and the final decision in recruitment however the recruiter can communicate more effectively and maintain the interest of the candidate towards the company.AI communicates based on the background and information provided by the candidate. Laborious communication like application letters, filling up the resume is now automated .facts about the candidate are scanned from various sources and communicated to the recruiter through AI and analysis of data. Natural language algorithms connected to the user interface enable recruiters to give personal feedback to each candidate.

HR professionals are finding themselves at the frontend to assist businesses to respond to the change. AI can be a driver to explore:

- Why Industry 4.0 has created a transformation in strategies and practices of HR

- What can the HR managers do to integrate the change for their workforce and the organization
- How can the HR respond to emerging technologies, critical skills, and roles required in the organization

Figure 3 shows how different functions of human resource management can be carried out with the help of artificial intelligence technologies making a new trend in recruitment process artificial intelligence human resource management system.

HRM

| Strategic Planning, Performance Management, Recruitment & Deployment, Training & Development, Employment Relations, Compensation Management |

AI Technologies

| Expert system, Data Mining, Knowledge Discovery, Big Data Analytics, OCR, Intelligent Robots, Face Recognition, NLP, Visual Scanning System, Voice Interaction, Neural Network |

AI-HRM

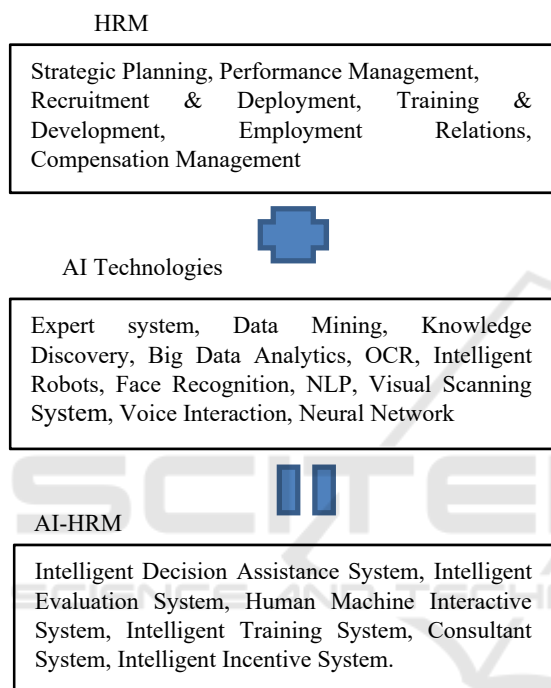| Intelligent Decision Assistance System, Intelligent Evaluation System, Human Machine Interactive System, Intelligent Training System, Consultant System, Intelligent Incentive System. |

Figure 3: Trends in Recruitment using AI Technologies.

During the Industry 4.0 period, recruitment starts with a transformation in business strategies. HR managers gear up to reach out to employees with extended skills. This process is made efficient by adopting suitable algorithms and machine learning to automate the information and communication process through AI.

Figure 4 shows structural architecture of new trend in recruitment process- artificial intelligence human resource management system, showing how the information can be managed and communicated to the candidates.

The most important feature of AI embedded tools like textio uses augmented writing tools for the job description to surpass any kind of business and is more inclusive in terms of diversity. This will add more transparency to the recruitment process. AI can estimate options by analyzing big data. Emerging

technology applications in HR like assessing pay equity, calculating the end of service benefits, and monitoring employee compensation are some areas where AI can reinforce the information that was documented.
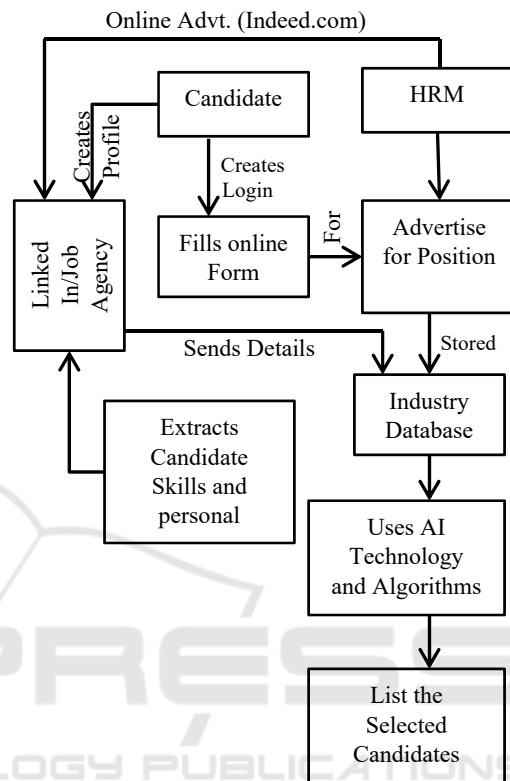

Figure 4: Structural Architecture for AI-HRM.

6 ADVANTAGES OF AI-HRM

Following are the advantages of new trend in recruiting process AI-HRM;

1. Selecting the correct candidates: with the help of AI technology the system selects the correct and matched profile of candidate for the advertised position.
2. Enhanced integration of analytics: from the large pool of candidates profile AI technology selects the matched profile quickly thereby increasing and improving the efficiency of recruiting process.
3. Improved recruiting quality: AI technology creates multiple rounds of recruitment process so that minute details of the candidates can be collected before making selection decision.

4. Better decision making: AI technology selects the correct candidate for the correct position from the pool of the candidate's profile.

5. Automation and non-biased: Due to the usage of AI technology no human intervention is required making the system automated and bias free.

6. Employment growth and motivation: Regular training programs and development courses are conducted by the organization. Due to usage of AI technology all the programs and the materials can be customized and the employee can undertake the training program at his own time.

7. Organizational development: Using AI technology organization can closely monitor the performance and requirements of the employee creating a strong and healthy bond between the organization and employee.

7 LIMITATIONS

AI has redefined each job to make it more efficient but still, the limitations exist. Human touch is irreplaceable in various steps of HR functions. Since the HR role is mainly related to managing humans, so human interference cannot be completely removed. Certain challenges faced while implementing the AI in the recruitment process for managing the information and communication with candidates are:

- Unable to get feedback from prospective candidates' experience about the organization's initial recruitment process.
- Abstract human characteristics like empathy, emotions, and intuitive decision making are still to be instilled in AI.
- Applications like ATS limit the choices for the recruiters. These AI-enabled applications help the recruiters in searching for suitable candidates by using keywords.
- Experienced candidates who are not tech-savvy may not add these hot job searched keywords into their CV. They could be missed out by the recruiters if they are depending on ATS to search the candidates.
- Observation of the body language during the face-to-face interview is missed out by machines and chat boxes.

- AI still needs to add features of understanding the psychological traits of a candidate for top-level management jobs.
- During the selection process, it is difficult for AI to monitor the employees learning abilities and motivational factors.
- The soft skills evaluation is still a challenge for AI. Since the initial process involves machines, candidates missed out on the opportunity to meet the employers.
- As per Global human capital, still, 69% of the companies are not ready in terms of facilities and employees.
- Since it's an addition to the cost, organizations are still under the dilemma related to full usage of AI in HR functions.

8 CONCLUSION

The fusion of humans and machines has restructured various departments in an organization and their processes. HR functions have also undergone various changes with the usage of AI. The implication of AI has provided the HR team with tools to analyze a large amount of data, provides flexibility and intelligent insight into the whole process of recruitment. Automated processes of Recruitment information and communication make processes faster and efficient providing recruiters the productive time to focus on strategic issues related to HR. For effective usage, recruiters should be fully trained to use the applications most appropriately. Organizations should make a careful selection of applications available in the market keeping in mind the factors related to cost, user-friendliness, flexibility, and reliability. HR functions especially recruitment should be performed with a precise combination of AI and human roles. To stay ahead in the competition, organizations should automate HR processes but not forgetting the human factor in traditional recruitment style.

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