Artificial Intelligence Use in Human Resources Management: Strategy and Operation's Impact

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Artificial Intelligence Use in Human Resources Management: Strategy and operation's impact

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***Abstract*— HR technology leaders foresee AI's growing role in a variety of areas, such as aiding recruitment, improving compliance, augmenting training, streamlining onboarding and more. New artificial intelligence technologies that automate and augment the workforce could be the key to solving some of the thorny issues and increased demands for HR to accomplish more with fewer resources. The article presents the application of artificial intelligence in Human Resources, the challenges and how to use AI to support and develop a successful workforce.**

Keywords— ***Artificial Intelligence, Machine Learning, AI in HR, HRtech, Human Resources Management, HR Analytics, Future of work.***

I. INTRODUCTION

The digital revolution is a human revolution. While new technologies are what's driving the Fourth Industrial Revolution, ultimately, it is people who will bring it to life in businesses. HR Leaders play a pivotal role in helping to lead our organizations to a new future of work - one that has the potential to be more inclusive, more purposeful and in order to deliver a more positive impact to our people and our consumers (Leena Nair Chief HR Officer, Unilever, 2019)

The core of HRM practices aims to recruit, develop and retain needed talents for the organization (Platanou and al. 2016). In fact, implementing digitalization means adopting digital recruitment, digital career development, as well as digital processes and procedures that manage relationships and interactions among employees on one hand and between employees and the organization on the other hand.

However, despite digitalization or digital transformation presents several advantages, there are also several raised questions about its challenges and disadvantages? For example, what role could AI play in HR? is the HR strategy impacted by artificial intelligence? What are the HR processes most impacted by AI? Will AI take over HR? what are the top uses of AI in the recruiting process? This paper aims to provide some clarification on these questions based on a real time database adding to the rapidly evolving literature.

II. ARTIFICIAL INTELLEGENCE

According to Sundar Pichai, CEO of Google [1], Artificial Intelligence (AI) is probably the most important thing humanity has ever worked on… more profound than electricity or fire. AI is expected to be one of the most disruptive new emerging technologies (Van de Gevel and Noussair 2013).

A. Types of AI

AI refers to 'machines that act intelligently … when a machine can make the right decision in uncertain circumstances; it can be said to be intelligent' (New Scientist 2017, p. 3).

A distinction needs to be made between 'narrow' (or 'weak') AI and Artificial General Intelligence (AGI) ('strong' AI). Narrow AI is an AI that makes use of algorithms to exploit large volumes of data to make predictions learning more from data about a specific domain (LeCun et al. 2015). Narrow AI is, therefore, domain-specific, excellent at specific tasks such as playing chess or recommending a product; its 'intelligence', however, cannot transfer to another domain. In contrast, AGI refers to a true intelligence that would be indistinguishable from human intelligence and that can be applied to all problem solving, and that would present a new general-purpose technology (Trajtenberg 2018). AGI does not exist at the time of writing this paper.

Table 1 Weak and strong AI characteristics (Woosung Park, 2019)

	Rational Computing (Weak AI)	**Similarity to human (Strong AI)**
Thinking and inferring	Rational thinking (fixed algorithm) Charniak McDermott, 1985 Winston,1992	Human-like thinking (self-learning) (autonomus thinking) Haugeland, 1985 Bellman, 1991
Action AI + Hardware (Robot, IoT)	Rational acting Pool et al., 1998 Nilsson, 1998	Humn-like acting kurzweil, 1990 Rich Knight, 1991

B. Branches of AI

Al is the next logical step in business evolution now that we have the capability to capture, store and analyze more data than ever before. Al technologies include machine learning, natural language processing, deep learning and RPA (Robotic Automation Process).

The graph below (O. Ezraty, 2017) [3] summarizes the categories of application of Artificial Intelligence.

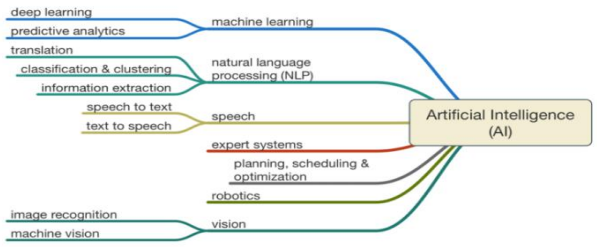

Fig. 1. Branches of AI

To solve the complex problems by using Artificial Intelligence, there are various processes like Machine learning, Deep learning,), Robotics including RPA, Expert System and Fuzzy logics, (Indira Pradhan, 2014).

Each technology has use cases that affect our lives in both consumer and workplace contexts. Adoption and investment in these technologies is rapidly increasing, and both governments and employers around the world are aggressively pursuing research and development of advanced systems powered by Al (BEN EUBANKS 2018).

III. "HR AND AI" STRATEGY IN BUSINESS

A. HR transformation in the digital era

Today's world of HR is more complex than ever before, and a disruptive environment requires companies to be more agile to respond to market demands. Talent acquisition, learning, workforce management and other core HR practice areas are all affected by changes in candidate and employee preferences, which places even greater demand on today's HR function. Figure 1 shows this channel of change in technology, business strategy and human resource management.

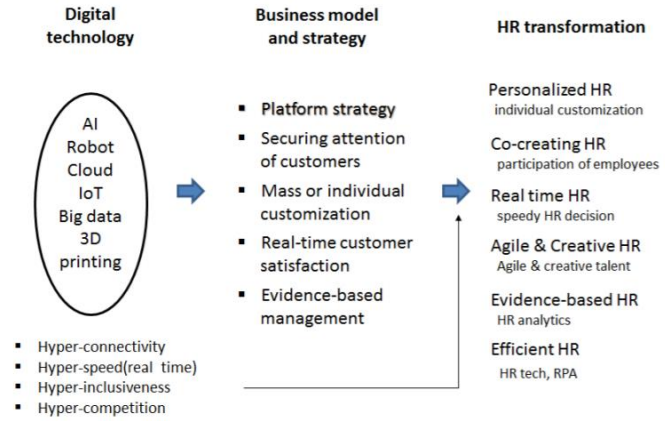

Fig. 2. HR Transformation (Woosung Park, 2019)

Personalized HR: HR decisions must be based on personal competence, needs or potential. Indeed, IBM replace traditional collective development by individually customized training and development.

Evidence-based HRM: More and more CEOs acknowledge the necessity to use more data or fact-based decision-making (Pfeffer and Shutton, 2006). That is called evidenced-based management

Efficient HR: Diver's methods using AI are often called HR tech, and robotic process automation (RPA) is the most popular among them. This RPA aims to reduce working time and workforce which allows employee to concentrate more valuable work

B. HR strategy in the era of AI

As strategic human resource theory says, HR strategy must follow business strategy (Baird and Meshoulam, 1988; Wright and Snell, 1998). And many authors emphasize the role of the strategic partner of business (Ulrich, 1996). Keeping in mind this theoretical discussion, authors (W. Park Kyung Hee,2019) propose some HR strategies fitting to the strategic orientation of AI use in firms.

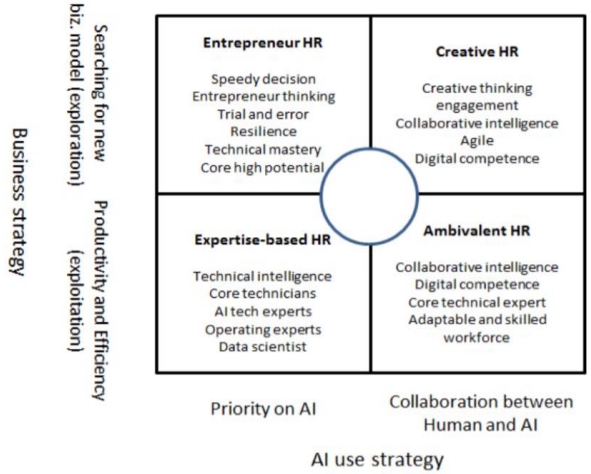

Fig. 3. HR and AI use strategy in firms (W. Park Kyung Hee, 2019)

When considering an AI platform, it is worth evaluating whether the goal of that system is to automate a task or to augment a person to perform that task more efficiently or both.

Even in the firms having AI focus strategy, they need core people who can collaborate with AI to make an innovative change in the business model. According to Wilson and Daugherty (2018), the more the firms adopt the human-machine collaboration principle, the higher their performance level is. The success Key for employee augmentation is "Human/Machine collaboration". In industry 4.0, humans and machines work together hand in hand. For example, in the smart factory of Mercedes-Benz, AI-controlled big machines work side by side with workers, and they help and teach each other.

IV. AI IN HR PROCESS

A. *The journey to HR 4.0*

Business leaders, partnering with their human resources counterparts, need to implement an HR4.0 strategy in the fourth industrial revolution 4.0 (World Economic Forum, 2019) to achieve the optimal combination of human workforce and automation and ensure a positive impact on the future.

We can therefore distinguish (François Geuze, 2020):

- A classic HR 1.0 function.
- An HR 2.0 function positioning itself as a facilitator and working in a logic of intermediation between employees, management and governance. This involves, for example, integrating more collaborative logic thanks to social networks (detection of potential, training, etc.).
- An HR 3.0 function challenging the order of the missions thanks to better identification of priorities and methods of action, thanks to a detailed and predictive analysis of the data at our disposal

It is the harmonious articulation of these operating modes 1.0, 2.0, 3.0 in an iterative loop logic that will then constitute HRD 4.0 (see Figure 4.1).

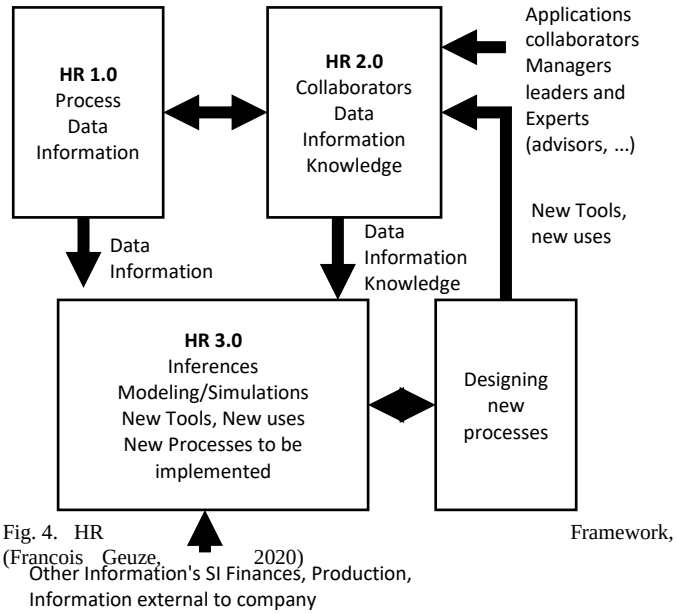

Fig. 4. HR Framework, (Francois Geuze, 2020)

B. *Impact of AI on HR operations*

Four main HR process could be considered in analyzing the impact of AI in HR operations (Ben Eubanks,2019) with the following key points [4]:

Core HR and workforce management

Payroll, workforce management and benefits administration all share common characteristics: highly routine, high volume and high cost of errors. This makes them ripe for disruption by artificial intelligence. Offloading tasks from HR teams to the employees themselves using self-service and chatbots can free up HR staff to focus on more critical pieces of the business. Employers can't focus on actions like hiring and training until they have ironed out the issues around core HR and workforce management.

Talent acquisition

Due to the volume of applications relative to job openings, talent acquisition offers a wide variety of opportunities for automation through Al technologies from candidate screening to matching and more. One targeted application of machine learning technologies in recruiting is in reducing bias and improving diversity. Recruiting technology applications are incredibly varied and plentiful, serving niche use cases in almost any conceivable area.

Learning and development

Al technologies can help to identify the best methods on an individual level, improving learning outcomes by enabling "continuous learning". Artificial intelligence can help not only to match up learners and mentors but also to capture those informal learning moments in ways traditional technologies can't. Looking forward, a blend of AR, VR and MR will help to create more life-like learning scenarios and situations to drive active learning. Unlike passive consumption of learning content, trainers can generate visceral reactions that solidify learning concepts far beyond the walls of the classroom

Talent management

Managers play a key role in the engagement of employees and they must use AI technology on hand to support that relationship, not replace it. Business leaders can use Al to create a more holistic view of employees and their capabilities, leveraging that information to rapidly build teams, create talent pipelines for key roles and solve business-critical problems with the right mix of skills.

Other HR areas

Other HR Areas impacted by AI are Employee Experience and people Analytics (Ian Bailie,2019). In fact, in the "employee experience" Area, AI can strongly conduct employee engagement tasks like intelligent surveys, real-time feedback platforms, rewards and recognitions to name a few. In "people analytics", AI could help to derive more advanced analytics and really start to be more predictive, basin on the daily HR data generated.

V. EXEMPLIFICATION: APPLICATION OF AI IN RECRUITMENT

A. Potential of AI in Talent Acquisition

According to several surveys (Littler 2018), recruiting and hiring is among the main areas where AI and data analytics are being used the most to improve workforce management decisions. Richard Coombes (2018), leader of HR transformation practice at Deloitte highlights that Artificial Intelligence (AI) offers a host of new capabilities for HR departments and using AI for recruitment eliminates the behavioral and perceptive bias that may happen during human interaction.

The use of Artificial intelligence and machine learning for job search would reduce the time and cost for both company and the candidate. New technology on recruitment will lead to use more timing on selecting prospective aspirants and less on resume scrutiny.

According to Allan Bongard (2019), the most prevalent applications of AI in recruitment are screening and sourcing candidates. These applications allow time saving and better mapping of Talent (Table2 below):

Table 2: Importance of AI in recruitment (Allan Bongard, 2019)

Where artificial intelligence can be most useful (%):

Sourcing candidates	68
Screening candidates	57
Nurturing Candidates	43
Scheduling candidates	39
Engaging with candidates	24
Interviewing candidates	17

Key benefits of artificial intelligence (%)

73	Saves time
49	Removes human bias
24	Delivers best candidate matches
34	Saves money

Sources: LinkedIn; Statista; my survey among 2,400 individuals conducted November 2018

Many AI uses in the two stages of recruitment Sourcing and screening candidates exist (Table3 below):

Table 3 : AI uses case in recruitment (Michel Barabel, 2020).

Sourcing to screening stages	**AI use case 1**	**AI use case 2**	**AI use case 3**	**AI use case 4**
Identify profiles	Semantic analysis to identify candidates	Probability that a candidate will be receptive to a job offer	Identification of useful keywords for the search for a candidate	
Matching profiles	Geolocation of offers and candidates	Organization of urgent replacements	Identification of positions corresponding to the profile	Identification of candidates for a given position
Pre-select	Textual analysis of candidates' responses	Filter profiles by several criteria	Automatic segmentation to identify the best profiles	Checking of CVs (detection of anomalies) and references
Select	Predictive Hiring (5.2) analysis (probability of success in the job...)	Personality analysis based on contributions on the Web (social networks, articles...)	Eye tracking and facial expression analysis (micro-expression), voice analysis	Analysis of behavior during a serious game or online activity

B. Machine Learning use in predictive hiring

In this section, the potential of Artificial Intelligence in Human Resource Management is explored in predictive hiring. This example explores ways to apply machine learning algorithms in recruitment to predict the likelihood of future success by applicant basing on soft skills.

As highlighted by Domingos [12], machine learning algorithms consist of combining just three components, which are the representation, the evaluation and the optimization:

$$Learning = Representation\ (Algorithms: KNN, SVM, LG \ldots) + Evaluation\ (Confusion\ matrix, F1 - Score \ldots) + Optimization\ (Gradient\ descend, Regularization)$$

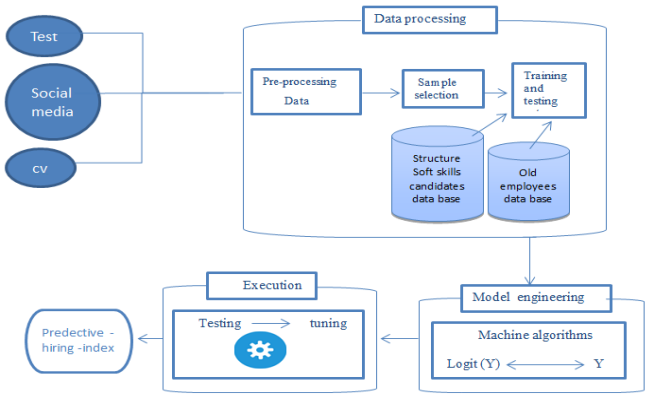

Fig. 5. Predictive hiring model

The input Data are soft skills evaluated. Before creating a model, we divide our dataset into training (80%) and testing (20%). the training segment is important for ML algorithms to be used to train the model before testing it to ensure its robustness for its validation and then application. This example uses three classification algorithms: Logistic Regression, KNN and SVM.

Table 4 : Performance evaluation of the three models

Metrics	KNN	Logistic regression		SVM
		Before Optimization	After optimization	
Accuracy-test Accuracy-train	0.95 (95%) 0.83 (83%)	0.85 (85%) 0.83 (83%)	0.95 (95%) 0.85 (85%)	0.95 (95%) 0.92 (92%)
Recall	0.94	0.83	0.95	0.944
Precision	1.0	1.0	1.0	1.0
MSE	0.05	0.15	0.05	0.1
MAE	0.05	0.15	0.05	0.1
F1-Score	0.95	0.87	0.95	0.954
AUCROC Curve	0.972	0.91	0.972	0.972
Correlation	0.793	0.577	0.69	0.80

The three used algorithms provide good results and are similar. This simple example gives insight that AI-based HR applications could help institutions to raise their hiring productivity.

VI. Conclusion

After the cloud, artificial intelligence (AI) and machine learning (ML) are the new disruptive forces in the HCM space. HR organizations that harness these technologies effectively will have the edge in the war for talent. Despite the rising concerns about the possibility of Al and ML making humans redundant, it will allow in reality the freeing up of the workforce for higher-value jobs. This has resulted in a fundamental shift in the way organizations look at their workforce and processes. Consequently, a growing number of companies undertaking digital HR transformations are now looking at actively leveraging Al and ML in their journey. Today, Organizations expect that HCM applications to help them maximize productivity through automated processes/transactions that do not need human interventions. The larger objective is to enable the human workforce to focus more on critical and strategic areas. Leading HCM products have also started incorporating Al and ML as core features.

AIs will not, however, soon be able to listen to employee concerns, make judgments, facilitate teams, and address personality conflicts, among others. For this, human managers and leaders will be needed. Managers will likely view AI software as a powerful management tool and perhaps even a kind of colleague.

It is imperative to keep ethics at the core of everything we do, and AI is no exception. Artificial Intelligence must be designed in an ethical, human-centric model that is aligned with the values and ethical principles of complete human society ("Everyday Ethics for Artificial Intelligence", 2019).

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