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Intelligent recruitment: How to identify, select, and retain talents from around the world using artificial intelligence

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ABSTRACT

This research analyzes how digital technologies contribute to improving the successive stages of the recruitment process: identifying, selecting, and retaining talented people. E-recruitment is an emerging and polymorphous phenomenon that starts with identification of candidates on social networks, continues through gamification of recruitment and job interviews with chatbots, and ends by matching a candidate and a job using artificial intelligence. These technologies are particularly useful for social businesses looking to recruit not only skilled people, but above all employees who have behaviors and values that match their mission. The methodology is based on grounded theory, participant observation, and qualitative data collection. A multiple case study is designed to analyze, compare, and combine several technologies dedicated to recruitment: (1) a social network with LinkedIn, (2) a MOOC with Udacity, (3) a serious game called *Reveal* from L'Oréal, (4) a chatbot called *Ari* from TextRecruit, and (5) a massive data analysis matching system with Randstad.tech. The discussion examines the respective performance and limits of these tools and their convergence via a progressive integration that leads to an uberization of recruitment. Managerial recommendations are formulated to support recruiters in their adoption of e-recruitment.

1. Introduction

Innovating has become essential to identify, select, and retain the best talents from around the world during an economic context of recession and intense competitiveness (Sahay, 2014). But it has also benefited from a social perspective, creating added value in the recruitment, talent detection and hiring processes (Perdana et al., 2020) by creating more transparent and fair recruitment platforms, and more inclusive training opportunities for all employees without measuring gender, religion, etc. (Warden et al., 2016). Human resource management (HRM) is therefore evolving to integrate digital technologies and improve their performance in the development and retention of human capital (Sivertzen et al., 2013). Although competition for talented employees is intensifying, the size of recruitment teams remains stable. Recruiters need to use appropriate and effective technologies to carry out their missions, especially because most of these teams believe that their recruitment volumes will increase, and they will have to handle more work (Sahay, 2014).

The need for effective and efficient recruiting technologies is greater in social businesses where it is even more difficult to select and retain the right employees. Indeed, it is much more complex to assess values and principles than knowledge and skills. Moreover, in addition to financial independence, these companies must recruit the right talents to achieve social objectives. The combination of profit to be self-sustainable and philanthropic services to benefit society requires very specific profiles that artificial intelligence devices can help identify. These tools also help potential employees to be aware of social businesses' focus on having a positive impact on the environment and society while being profitable. They will understand that the essential qualities for working in these companies are transparency, accountability, and diligence (Sonne, 2012).

Most recruiters use systems that are obsolete and date back to the 20th century, but their targets spend their time on applications and networks that did not exist a few years ago. Recruiters are hampered by organizational, cultural, technological, and financial limitations that prevent them from accessing more modern tools. Job seekers are increasingly relying on social networks and dedicated applications to find jobs. Some employees and temporary workers ask to have remote

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video interviews, sign their contract with their smartphone, and get paid electronically. Young talents are hyperconnected and accessible in virtual spaces that recruiters struggle to invest in. This discrepancy between the technologies used by recruiters and candidates can explain partially why supply and demand have difficulty meeting each other (Carrillat et al., 2014). Among the most-sought-after qualities, mastery of these technologies is often required. This is particularly the case for social businesses, which see in the advent of the digital economy the digitization of mobilization and social dialog. These organizations must therefore improve their level of digital maturity in all areas, including human resources management and recruitment (Mas and Gómez, 2020).

Digital technologies also make it possible to reach out to individuals who are passive but are open to proposals to change jobs. Top talented individuals do not need to look for work because employers fight to: (1) be the first to hire them before they graduate; (2) keep them when they are lucky to have been able to integrate them into their teams; and (3) take them out of the company where they are employed by offering them better conditions and a more appreciative environment. The balance of power is no longer the same, so recruiters must consider their profession differently. It is no longer a question of asking potential candidates what they can bring to the company but of presenting to them what the company can offer in terms of professional life and the reasons why the potential employee should consider working there. Recruiters must also put in place the conditions for retention of these talented individuals, who will be solicited by other recruiters, by meeting their needs and striving to improve their level of satisfaction. A company that wants access to these individuals must therefore be creative and make efforts to reach them, even if it has a prestigious employer brand (Sivertzen et al., 2013). Mastering the most powerful technologies to capture these talents is therefore a major competitive advantage.

This article aims to explore the emerging phenomenon of e-recruitment and the extent to which it can improve the identification, selection, and retention of talents to enable social businesses to achieve their goals. The use of artificial intelligence in recruiting allows for more rigorous assessment of emotional intelligence, better alignment of moral values, and stronger employee engagement. It also contributes to rapid integration and well-being at work. All these elements lead to the attainment of financial sustainability and social missions.

The research therefore provides a complete overview of available technologies, a critical analysis of their advantages and limitations, perspectives on their evolution, and managerial recommendations concerning their use. The second part of this article offers a review of the literature dedicated to different forms of e-recruitment, associated practices, and impacts on the performance of the process. The third part is devoted to the research methodology, based on grounded theory, and a multiple case study using a constructivist approach. The fourth part explores five typical and emblematic cases of e-recruitment via different technologies: (1) a social network with LinkedIn, (2) a MOOC with Udacity, (3) a serious game called *Reveal* from L'Oréal, (4) a chatbot with *Ari* from TextRecruit, and (5) a big data analysis matching system with Randstad.tech. The fifth part of the article offers a discussion and perspectives about these cases. A conclusion then summarizes the main findings of the research and provides managerial recommendations.

2. Literature review: different forms of e-recruitment

The use of e-HRM, which includes e-recruitment, is growing rapidly, and most major business groups have incorporated it into their practices (Parry and Tyson, 2011). However, technologies evolve very quickly, and the first tools are already surpassed by a new wave of social-ludic systems that combine artificial intelligence and big data.

2.1. Social networks as an infinite pool of talents for social businesses

The Internet significantly facilitates recruitment simultaneously for recruiters and those being recruited (Carrillat et al., 2014). Social networks, whether professional or traditional, are a major source of potential talent who are accessible to recruit very easily and at a low cost. These networks also reveal valuable information that was previously inaccessible to recruiters. Potential employers therefore strive to develop their digital presence, reputation, and attractiveness, which are critical to their ability to capture talented employees. Recruiters maintain their own profiles, design pages for their business, send newsletters, animate blogs, and participate in professional communities. They also use social networks to check and supplement the information provided by potential employees. Some use automated tools constantly to scan social networks in search of the rare pearl (Faliagka et al., 2012). However, social networks are creating an increased pressure on recruiters to work faster and absorb much larger and more diversified streams of information to find the right candidates for their jobs.

Social networks facilitate recruitment through four different mechanisms: (1) the connector role, which allows quick and direct contact between job-searchers and recruiters, (2) the development of the employer brand, which contributes to the company's reputation, visibility, and attractiveness and promotes contact, (3) transparency in relationships, which contributes to building trust and encouraging richer and more humane exchanges, far from the formality of job interviews, and (4) specifying the proposed job data, which leads to a gradual ranking of applicants according to idiosyncratic and objective criteria. However, social networks also produce a form of frenzy and instability that makes it difficult to follow and master talent flows. Giving greater importance to the second point mentioned about the development of the employer brand. These platforms help increase social purpose. From a social perspective, this helps other companies to know their competitors and that candidates interested in working for them can obtain relevant information about the company in which they are interested in working. Through these platforms, it is possible to know in a transparent way the social actions carried out by the organization, its vision and mission, its principles, and the business culture. This makes it easier for the candidate to get to know the company more closely and to better prepare for interviews (Kumar et al., 2018; Mas and Gómez, 2020).

Given its audience with young active people, Facebook, for example, allows collection of spontaneous candidacies, announcing events, diffusing offers, and promoting the values and culture of the company by engaging in viral marketing (Carrillat et al., 2014). All major global companies, such as Coca-Cola, L'Oréal, Ernst & Young, The Home Depot, BNP Paribas, Walmart, and GE, are present on Facebook through pages dedicated to recruitment. Numerous recruitment firms and professional networks are also active on social networks to find talent and improve their image and reputation. These companies maintain a permanent link with their target audiences and interact with them via community managers. LinkedIn's social network has become synonymous with recruitment and seems to be a must for job-seeking talent and companies willing to attract them. Artificial intelligence allows the analysis of very heterogeneous and unstructured data coming from different social networks. It makes it possible to measure the adequacy between the knowledge and skills of candidates with the activities and the needs of companies (Pasat and Vasilescu, 2019).

Recruitment via social networks makes it possible to contact passive candidates who are not actively job searching but who may be open to opportunities for professional mobility (Sivertzen et al., 2013). Excellent candidates do not have the time to look for work, but they may feel flattered that people think of them and make them interesting offers. The efforts of recruiters become essential because they must convince those people who are already satisfied with their situation to take the risk of leaving it to work elsewhere. The recruiters can attract these potential employees with different forms of remuneration, but it is above all the environment and working conditions, values, and culture of the company, as well as the vision and the personality of the leaders, that will be decisive. Emotional and intangible rewards are favored over those that are financial and tangible. This is especially true for social businesses which use social media extensively to (1) promote their

actions, (2) communicate the results they have achieved and the rewards they have received, (3) disseminate their values, ideas, and experiences, and (4) to raise funds to finance their projects through crowdfunding (Presenza et al., 2019). Thanks to this daily presence and the multiple posts on a wide variety of social networks, these social businesses attract highly motivated talents who recognize themselves in the values thus demonstrated. They will not hesitate to take the first step and apply because they know that they will be able to exercise their skills and will feel fulfilled in such a working environment.

When the social dimension is more important than the financial dimension, talent selection focuses on human aspects that are not visible on the résumé or easily measurable. Recruiters need to take a different approach because they have to convince internal actors that the talent they have identified, if they are not necessarily the best technically, are the ones who will fit best into the company and who will provide the best performance. Social networks give the impression of a more authentic and less formal relationship (Miller & Tucker, 2012): modern recruiters want to establish a direct and friendly dialog with potential employees, with peer-to-peer exchanges adapted to the specific needs and expectations of each and every one of them. The implementation of new technology to recruiting and retaining knowledge workers in an e-commerce, information-intensive environment offers computer-assisted screening interviews and statistical prediction to aid in reducing recruiting costs, time-to-hire and employee turnover (Smith and Rupp, 2004). Potential employees are sensitive to these more personal and open relationships. No subject of conversation should be taboo, even those in which the candidate may have a contrary opinion to the practices and beliefs of the organization; mutual understanding and the ability to question oneself are encouraged. Institutional communication becomes playful, interactive, and spreads via social networks to create buzz in order to generate maximum support and a strong sense of belonging (Carrillat et al., 2014). However, potential candidates are still very reluctant to become friends on social networks with organizations and brands that they suspect of wanting to manipulate them and to be in an interested and commercial approach.

2.2. Hiring talent through a game or virtual world

Serious games are digital technologies that combine serious use with a fun environment. Whether for training, promotion, awareness, or recruitment, these games are also designed to entertain and provide a form of distraction for the player (Allal-Chérif and Makhlouf, 2016). They are used in companies of all sizes, shapes, and sectors, in public service, the military, schools, and universities, as well as associations generating social benefits from many areas and improving them (García-Álvarez et al., 2018; Rincón-Flores et al., 2020). Serious games are simulations that recreate real environments or invent fictitious spaces in which players will be confronted with an artificial intelligence that will challenge them, analyze their behavior, interact with them via non-player characters, and offer them complex and entertaining scenarios (Yannakakis and Togelius, 2015). They are considered in some companies to be the ideal tool for recruiting, training, and promoting the employer brand (Allal-Chérif and Makhlouf, 2016). For managers, serious games can identify, select, and capture talents in schools and universities and attract them to a company to which they would not have applied spontaneously. This is the case with games such as BNP Paribas *Ace Manager,* played by thousands of finance students in more than 140 countries; *Safran e-Sailing Team,* a virtual cruise race in which more than 150 schools have participated, or *Moonshield* from Thales, which has been played 450,000 times and is accessible via smartphones.

Serious games have radically changed the practices of HR departments and have improved their performance in terms of recruitment (Allal-Chérif and Makhlouf, 2016). Recruiters use serious games to test if a talent player can analyze situations, make good choices quickly, adapt to unforeseen events, optimize resources, coordinate skills, and propose original solutions. The games offer managers the ability to identify, select, and retain talented employees because they can discover the company, explore its organization, and learn while having fun in futuristic worlds. Potential employees embody superheroes or spies; thwart the activities of criminals; conquer markets, territories, or planets; save the world; or simply become leaders of their own business (Allal-Cherif and Makhlouf, 2016). The most talented candidates want to take on the challenges they face and show they are the best. The integration of some of these games into the training programs of the most prestigious universities attests to an academic recognition of their educational interest. These serious games constitute modern and fun learning platforms that offer rich and diverse educational content, strong immersive power, alternative playing modes, high transferability of acquired knowledge and skills, interactivity and sociability among learners, as well as evaluation, debriefing and follow-up procedures (Guillén-Nieto and Aleson-Carbonell, 2012).

Serious games not only involve the left brain—rational, logical, analytical, and sequential—but also the right brain—intuitive, creative, proactive, and relational. They identify the skills, traits, and behaviors compatible with the corporate culture and suggest which candidates are likely to flourish. In games with avatars, players have no age, gender, color, beauty, diplomas, origins, or accents. The selection criteria are much more objective because appearance and attraction are removed (Allal-Chérif and Makhlouf, 2016). Candidates are immune to prejudices behind their computer screen and use mastery of digital technologies as a stooge (Zelenskaya and Singh, 2011). The power of long studies is relativized by the mastery of virtual universes and new communication and evaluation codes. Large businesses invest heavily in serious games, especially with the aim of improving their ability to identify, select, and retain talent, such as Randstad's game *Misivias,* which cost more than $200,000 to produce and was developed to assess the managerial skills of analysis and decision making. Thanks to artificial intelligence, serious games can include tools for simultaneous analysis of the behavior of the avatar in the game and the emotions expressed on the player's face. AI can also gradually adapt the difficulty and course of the game to the player's skill level (Westera et al., 2020). It will encourage him to better use his intuition, to develop his capacity for anticipation, to propose more creative solutions, and to coordinate with other players.

2.3. Training as a job interview

Massive online open courses (MOOCs) are online universities that offer free and accessible courses to the public. These interactive websites aim to bring together people who are interested in the same subject and who wish to exchange information and learn about a specific field. They offer a new and collaborative way to teach, develop, structure, and share knowledge with multimedia documents, videos, case studies, simulations, games, testimonials, self-assessment systems, digital intellectual contributions, wikis, and blogs, all under the supervision of eminent professors assisted by instructors (Martin, 2012). The greater the teacher's reputation, the more attractive his or her course will be, because it will be a way for learners to access one of the world's leading experts in a domain.

The objective of a MOOC is to offer people of all ages, social levels, and nationalities the opportunity to connect with each other and with professors and to take free courses of the highest academic standard in the world (García-Peñalvo et al., 2018; Dotsika and Watkins, 2017). Learners can gain knowledge and skills associated with their chosen discipline by taking online courses, participating in interactive learning activities, and collaborating on a dedicated social network. In MOOCs, teaching takes very different forms that combine to improve the effectiveness of learning. Different challenges, quizzes, and tests validate each step and enable moving on to the next one (Martin, 2012). Most documents, learning materials, and cases are optional, and learners are encouraged to design their customized course based on their starting level and the speed at which they wish to complete and validate the course.

Students can answer each other's questions and the professor intervenes only if no one is able to come up with a satisfactory answer. The theoretical and formal part of the course, with a very academic approach and many definitions, is reduced to the minimum to make room for scenarios with a much more practical perspective. Courses evolve very quickly: they integrate news, discoveries, and technological innovations into the educational content. Students can give real-time feedback and teachers adapt the following sessions based on specific requests, remarks, and criticisms (Chang and Wei et al., 2016).

One of the main contributions of MOOCs is to build networks: the meeting of talented individuals who participate in the same courses sometimes generates research and development projects, technological innovations, and start-ups (Dotsika and Watkins, 2017). MOOCs therefore function as incubators and recruitment sites. They facilitate the realization and implementation of initiatives and ideas that isolated individuals could not achieve on their own, leading to significant value creation from these digital technologies (Porter, 2015). These achievements are new resources that will provide MOOCs with new subjects of study. A virtuous circle of knowledge creation is thus being set up and is gradually being developed, bringing out the brightest students on the planet.

These training tools are therefore at the heart of the phenomenon of e-recruitment and benefit society by promoting equal opportunities regardless of social status. MOOCs can be used by social businesses to present their missions and to attract talented people with aligned values. They can offer social training to develop and assess the social knowledge and behaviors of these potential employees and use the course to preselect them. These MOOCs can also allow social entrepreneurs to meet according to their affinities, develop projects, and launch their own social business (Solórzano-García et al., 2020). MOOCs help social businesses (1) publicize social missions and make them more attractive for candidates; (2) recognize students who are potential employees and better satisfy their needs; and (3) motivate learners to join their organization or to create their own. Social online education stimulates social entrepreneurship and provides students with the keys to achieve their goals and to build a work environment that will favor their personal development.

The best universities in the world have invested significant amounts in free MOOCs, although some options such as obtaining certificates or diplomas are charged small amounts. Massachusetts Institute of Technology (MIT) and Harvard University have invested $60 million in the nonprofit edX project, which brings together 180 partners and offers nearly 3300 courses in 24 languages to more than 34 million online students. At the beginning of 2021, one of the main platforms, Coursera, brought together more than 77 million learners from all over the world who participated in the 5100 courses offered by more than 200 partners from 50 countries including Stanford, Yale, Columbia, Princeton, Caltech, Tech Georgia, HEC, ESSEC, Lund, Duke, Bocconi, and the Universities of Hong Kong, Nanjing, Kyoto, and Sydney. However, the economic model of MOOCs remains fragile and one of the ways to finance them is to develop the sponsoring of courses by large companies who thus gain direct access to the best talent and the most promising projects while promoting their employer brand and their good practices (Porter, 2015).

Since 2012, several generations of MOOCs have already developed (Young, 2021). MOOCs are evolving from standardization to personalization to allow learners with different backgrounds and expectations to find what will be most useful to them on the platform. Artificial intelligence turns MOOCs into smart learning environments able to adjust the offer, the courses, and the teaching methods to the needs of the learners and provide them with personalized support according to their profiles (Yu et al., 2017). AI will animate virtual learning companions and give them human behaviors and traits such as certain emotions, humor, or a personality. These digital assistants can be generalized and replace human assistants who cannot support thousands of students. They will manage to maintain the level of engagement and interest of learners by challenging them, helping them to overcome difficulties, and directing them towards content that meets their expectations.

2.4. Being recruited in a social business by a smart robot

A chatbot is a virtual and autonomous intelligent agent who can have conversations or negotiate with humans or other chatbots. These robots are set up to analyze the needs and questions of their real or virtual interlocutors and to provide them with answers, information, guidance, and services. The best-known example of a chatbot is Siri, the artificial intelligence that iPhone users can ask to answer questions and do actions and searches. Other intelligent agents are gaining entry into our day-to-day lives with technologies such as autonomous vehicles or home-based personal assistants such as Google Home Max, Amazon Echo Plus, and Apple HomePod.

In the field of recruitment, chatbots can accomplish the following: (1) get in touch with potential candidates by sending them messages via e-mail, SMS, Skype, Messenger, WhatsApp, or Facebook, (2) converse with these candidates to pre-screen them using simple criteria; (3) answer their questions about the proposed job and the recruiting company; (4) plan and prepare the actual interview; and (5) indicate to candidates what the next steps in the recruitment process are. These exchanges can take place simultaneously with thousands of candidates, allowing recruiters to focus on those who have the most potential and move faster through them. These chatbots are not going to perform the same tasks as those of physical recruiters, but they complement their actions. For example, they will be able to work on two-thirds of CVs that are ignored in a traditional selection process and allow the company to get in touch with 100% of candidates, which a real recruiter can't afford the time to do. They will also give feedback to candidates who have been staggered, which is not possible in most organizations.

Chatbots help to improve the employer brand of companies that can now interact with all candidates upstream and downstream in the recruitment process. In addition, the use of chatbots helps to reduce the costs of selecting, recruiting, and retaining talents, which is essential for social businesses that have limited resources to achieve their goals. The integration of chatbots will not only save a lot of money, but also a lot of time. On the other hand, lack of responsiveness and reduced and impersonal communication dissuade candidates from being interested in a company. The employer brand often is decisive for candidates who have applied to several organizations and are hesitating in their choices (Sivertzen et al., 2013). There are dozens of recruiting chatbots on the market and their ability to automate part of the recruitment process by improving quality and reducing costs makes them very attractive to multinational groups or human resource service companies that manage large volumes. The implementation of a chatbot implies having powerful computer tools and committing to rigorous follow-up. For the moment, it is mainly large multinationals that have invested in these technologies, such as Axa and its Joby recruiter robot, which guides candidates through thousands of job offers in dozens of different countries and accompanies them throughout their application.

Companies that are moving into new countries are particularly in need of early detection of talent who will be the mainstay of these subsidiaries abroad. Without knowledge of the local labor market and with an employer brand that is not yet established, it is essential to use effective tools that are able in a few clicks to provide data on the available sources of talent and get in contact with them on behalf of the company via chatbots that promote remote exchanges with a multitude of candidates. This exploration of the labor market in a new territory is happening at speeds and with efficiency that were unachievable without digital technologies.

Recruitment chatbots enable interviews with 100% of candidates, 24 h a day, 7 days a week. These chatbots can contact potential recruits on their favorite social networks and adopt their preferred mode of communication. They are customizable and are tailor-made to meet the needs associated with each type of job offered by each company

(Callejas et al., 2014). As for serious games and simulations of all kinds, the US military is a pioneer in chatbot technology with *Sergeant Star,* the virtual recruiter who has asked more than 11 million questions, the equivalent of the work of more than 50 real recruiters. To promote a positive attitude towards chatbots and increase users' perception of social presence, it is relevant to integrate a social-oriented interaction style (De Cicco, Silva, and Romana, 2020). This aspect is much more important than the embodiment of the chatbot by an avatar which has little influence on the engagement of the interlocutors.

2.5. Massive data analysis to trigger love at first sight between talents and social businesses

Digital technologies encourage HR managers to approach their missions in a new way (Parry and Tyson, 2011). Thus, recruitment is increasingly seen as a date between a candidate and a job offer, which can be managed as on the dating service Meetic: artificial intelligences measure the degree of compatibility of the candidates with the position to which they apply and the culture of the chosen company. Data analysis facilitates the match between social businesses and candidates based on the one hand on the culture and strategy of the company, and on the other hand on the personality and objectives of the candidates. Affinity recruitment is concerned with personality, behavior, emotional intelligence, moral values, and deep motivations. These elements are far more critical to the success of the enterprise than the knowledge and skills that many candidates have and that become necessary but not sufficient for recruitment. For applicants, this method of recruitment is a way to find an employer who will let them flourish and who will provide the means to their professional achievement.

The younger generations are particularly sensitive to well-being at work and value the comfort of life more than salary and material benefits. Candidates express their expectations not only about their professional missions but also personal living conditions (Sandifer et al., 2015). Algorithms make comparisons between the information provided by the company and the information that the candidates provide via questionnaires, tests, simulations, or games or that is accessible on social networks. The matching thus achieved determines ideal associations by considering the requirements of each stakeholder and offering choices that go beyond the obvious. Virtual speed dating is then organized between employers and potential employees in search of professional love at first sight.

Predictive recruitment is based on the analysis and reconciliation of internal and external data. It is a question of comparing the statistics associated with the activities and the performances of the referent employees to those that are provided by applicants. This means transforming the characteristics of the training, skills, and experiences of these candidates into measurable data that can be correlated with those of the recruiting organization (Faliagka et al., 2012).

Some of the data used by the matching systems are not spontaneously provided by the candidates but come from their virtual presence on the Internet. Semantic analysis identifies their interests, concerns, activities, and desires. Multicriteria analysis relies on dozens of indicators that are weighted and evaluated to generate a global rating and a ranking of candidates. Big data analytics helps recruiters visualize talent flows between companies and between cities, locates areas of scarcity and abundance of talent, assesses the attractiveness of their business compared to others, and identifies what the candidates are looking for as a priority.

3. Research methodology

The chosen methodology is based on the exploration of five cases of digital technologies for recruitment. The studied cases are emblematic and typical, which facilitate the understanding, identification, and situation setting. The case method is a relevant research strategy for analyzing the emergence, adoption, and dissemination of e-recruitment for three reasons: (1) case studies are conducted directly in the field to generate concepts, analysis grids, typologies, and theories based on observed practices, (2) the research is mainly intended to answer the questions "how" and "why" in an exploratory context, and (3) there is still a strong potential for academic production in this area. Analysis of observations made in the field leads to discussing results, establishing perspectives, and making recommendations.

Grounded theory induces immersion in the empirical data of the theories concerning the phenomena observed in the field. A process of exploration, comparison, and inference makes it possible to develop new theories, formulate original ideas, and propose innovative solutions to managerial issues (Glaser and Strauss, 1967). Exploring complex situations through immersion in several cases has the main missions of clarifying interactions between different actors and better understanding certain organizational mechanisms.

This qualitative research is based on a multiple case study with the objective of exploring the emerging phenomenon of e-recruitment to produce a theoretical contribution from the field of observation (Eisenhardt, 1989). It is therefore a question of adopting a constructivist epistemological approach and proceeding by induction from precise examples of the practices of recruiters to formulate hypotheses that will then be discussed in a broader context. The recruitment process is complex, whether technology-assisted or not, which justifies the use of the case method. The multiple case study is intended to: (1) compare the different modes of recruitment, (2) define the advantages and disadvantages of each with respect to others, and (3) establish to what extent they can be combined (Yin, 1984). The actors in the process and the technologies they use are observed in their real environment and in an authentic context (Miller & Tucker, 2012). The cases studied increase in complexity to enhance the analysis by successive strata of phenomena and variables (Eisenhardt, 1989).

E-recruitment, and more specifically the use of artificial intelligence and the analysis of massive data in the recruitment process, is the subject of a very limited literature. This area is not mature, evolving quickly, and relatively unstable. Those attributes qualify e-recruitment for the case study methodology, which is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1984, p. 23).

Yin (1984, 2015) explained that the number of cases was not a criterion for the validity of the method: it is not necessary to have a multitude of cases to identify relevant parameters of analysis. It is less the number of cases than the methodological rigor of the construction of these cases that is decisive in the description, understanding, and explanation of certain phenomena. The use of several cases only strengthens the results already achieved with one and maximizes the lessons by immersing oneself in different contexts. The number of cases depends on the research objectives. If it is a question of exploring new practices or of discussing an original concept, one or a few cases are enough. Several representative, emblematic, and typical cases have been selected so that they can become familiar and contribute to a better immersion. These cases cover different forms of e-recruitment through their own technologies. They have received favorable feedback from the publishers who designed them and the sponsors who are their main users.

This multiple case study is designed to analyze, compare, and combine several information and communication technologies for recruitment: (1) a social network with LinkedIn, (2) a MOOC with Udacity, (3) a serious game called *Reveal* from L'Oréal, (4) a chatbot with Ari from TextRecruit, and (5) a massive data analysis matching system with Randstad.tech. The chosen cases are typical, international cases, each recognized as references and pioneers in their respective fields. The choice of five cases is intended to cover all the technologies identified in the literature and to enable a thorough study without the amount of data becoming problematic. Indeed, "a number between 4 and 10 cases usually works well. With fewer than 4 cases, it is often

difficult to generate theory (…). With more than 10 cases, it quickly becomes difficult to cope with the complexity" (Eisenhardt, 1989, p. 545).

The chosen methodology enables the use of several complementary data sources. The data collection combines for each case a participant observation in the role of recruiter, a review of the academic literature, and a review of the specialized press and forums dedicated to e-recruitment. The use of primary and secondary data allows for better triangulation, enhancing the reliability of each case and enabling a more precise and nuanced analysis. During an immersion in each of the cases studied, data collection and analysis are carried out in parallel in accordance with the precepts of the systematic methodology of the grounded theory (Glaser and Strauss, 1967).

The collection and analysis of data takes place in several phases: (1) direct observation of the uses of different technologies from the point of view of the recruiter, (2) the progressive transcription of the factors that positively or negatively influence the recruitment process, that is, the identification, selection, and retention of talent, (3) the identification of recurring emerging themes and major concerns common to many cases, (4) a review of the academic literature and a press review based on the keywords derived from the observation, and (5) a content analysis to deepen the themes and to determine overall coherence and subtleties (Miles and Huberman, 1984).

4. Results of observation and case analysis

The following case studies focus on digital technologies for talent identification, selection, and retention. All these technologies are emerging, but they are all already used in the recruitment process of several companies. They are presented from the simplest to the most complex according to their current stage of evolution.

4.1. The social network linkedin

LinkedIn is a professional social network founded in California in December 2002, 15 months before Facebook, and bought in 2016 by Microsoft for $26 billion. The site has 530 million members in 200 countries, including about 200 million active monthly, and operates in a freemium mode: registration and basic services are free but access to some advanced features is billed via a subscription. Members fill out a career form online and share their experiences, accomplishments, employers, projects, and contacts from their professional network. Fifty million profiles are viewed daily on LinkedIn. Each member can highlight personal skills, among a choice of 50,000 already referenced, and accredit those of his or her contacts. Executives, entrepreneurs, and freelancers consider LinkedIn to be an important tool for their visibility and digital credibility.

LinkedIn is used by its members to set up cross-organizational communities of practice for specific professions, sectors, or activities. Members can benchmark and discuss project opportunities. They can also consult job offers and co-opt each other. For example, members use level-one contacts in their network to present them to their level-two contacts. LinkedIn grants its members access to more than 10 million job offers and data on the companies they would like to work for. Members can consult job offers and learn about the missions and locations proposed, salary levels, contact details, performance, and highlights of the firm, as well as development perspectives. Since 2011, it is possible to apply for a job offer directly from LinkedIn using one's profile as if it were a CV. Members, whether they are actively seeking or simply open to opportunities, can also receive job offers tailored to their profiles by email, and they are informed of the companies and other organizations that have visited their profile.

Business HR and headhunters also use LinkedIn to find talented people to recruit through the dedicated platform LinkedIn Recruiter. The search engine of the platform, with 20 specific filters and Boolean functions, identifies potential recruits based on their qualifications, skills, and experiences. Recruiters can send news to their subscribers, post announcements, build a pool of potential candidates, identify those who are really interested in their business, set an ideal profile, suggest certain talents to colleagues, and contact targeted members without being part of their contacts thanks to InMail. According to the statistics provided by LinkedIn, a job offer is viewed approximately 500 times on average and receives more than 50 applications. The recruiters manage the candidatures, or the answers of the potentials contacted from a complete individualized history of the exchanges in LinkedIn Pipeline.

More than 18 million businesses have an official institutional page where they present their activities, culture, and values. They incorporate arguments to improve their employer brand and to attract talented individuals from all around the world, such as testimonials from employees who explain why they are happy to work for this company. Videos and hypertext links can be integrated to boost the presentation of the company and enhance its welcoming and attractive perception. Recruiters can compile statistics about their subscribers and visitors to define the profiles that are attracted to their business page.

4.2. Reveal, the serious game from L'Oréal

Reveal from L'Oréal is a video game designed for students and graduates. Its goal is above all to help users discover the culture and organization of the multinational and immerse them in its universe. Hundreds of employees and three full-time human resources experts were mobilized during 18 months to design *Reveal* so that the virtual world is as faithful as possible to the reality of the group, integrating each element of its complexity, organization, culture, values, and history.

Reveal is an adventure game in which players visit the different locations of the group and must launch new products by adopting the specific methods of L'Oréal. Players are placed directly in a universe inspired by the game *Sims* and find themselves embodying a young recruit on the day of hiring. After having met with an HR manager who introduces them to the corporate culture and the integration process, players integrate with their team and get to know their superiors. Players will evolve in six environments, called *rooms*, to contribute to the conquest of new markets, like how the company L'Oréal is willing to develop its turnover in emerging countries.

Players interact with the avatars of 35 non-player characters who ask questions and challenge them to earn points and progress in the world rankings. Scenarios worthy of the best online role-playing games have been developed by a team of business experts and video game designers who have integrated multiple enigmas. Some solutions are based on indices that require very thorough investigation work. Players discover how the company functions interact: purchasing, logistics, production, marketing, sales, R&D, HR, and finance. All these functions call on knowledge of products, adapted know-how of specific practices, and a know-how-to-be that manifests itself in identifying opportunities, managing risks, teamwork, decision making, and the implementation of more-or-less bold strategies.

The game assesses the technical abilities of the candidates and their capacity to transfer what they have learned in a virtual professional environment that is a real-world emulation. This academic approach is complemented by a much more empirical approach with tests made to measure if candidates are compatible with the culture and values of the company, able to communicate well with colleagues and lead a team, sensitive to the weak warning signals of an event, and have a global vision and a sustainable and responsible perspective. As a result, the most successful players are not those who have gained the most knowledge, but those who adopt the best behaviors in the game.

In addition to being at the heart of L'Oréal's employer brand strategy, *Reveal* facilitates the identification and recruitment of the most outstanding young talent in all countries in which the group operates. With more than 21,000 registrations before its launch in January 2010, thanks to a dedicated Facebook page, *Reveal* has established itself as a

serious game of reference whose attractiveness for candidates from the world's leading schools is undeniable. Already solid and regularly ranked among the best in the world, the employer brand of L'Oréal is strengthened and modernized, becoming popular with younger generations. *Reveal* provides a reference point for other serious games and has won numerous awards. The first year, out of the 70,000 players who participated in the adventures proposed in the game, 4500 finished. There were 3300 trainees shortlisted, including 185 hired. In some countries, the game is mandatory to facilitate the orientation and selection of innumerable applications that cannot be processed by human recruiters.

Reveal has replaced several other games previously created by L'Oréal, such as *E Strat, Ingenius,* and *Innovation Lab*. Only the *Brandstorm* marketing game, created in 1992 and in its 26th edition in 2018, continues alongside *Reveal.* A personalized assessment allows each candidate, after having tested several positions, to associate his or her skills to a specific job. The best ones have the opportunity to spend two weeks in a subsidiary. The international human resources firm Cubiks, which specializes in skills assessments and personality diagnosis, designed questionnaires to highlight personality, envy, creativity, openness, and originality.

4.3. The udacity mooc

Sebastian Thrun, Stanford University professor, is a world-renowned pioneer of artificial intelligence and robotics. Former vice president of Google, he is behind the Google autonomous car, a project he launched to improve road safety following the deaths of loved ones in an accident. Another project that is important to him is to make available quality education for free, or almost, to the widest possible audience and to help talented individuals who cannot afford the best universities to learn from the best professors and find a good job. He started achieving this goal in 2011 while teaching 200 students a year at Stanford by using information and communication technologies to launch a master-level course on artificial intelligence accessible to all and free.

Thrun has transposed his course materials and exams into videos, interactive media, forums, quizzes, and case studies. He has created the largest virtual classroom of all time with 160,000 students who followed the teachings of one of the world's leading experts in his field for three months. Students also worked for free on the translation of the course into 44 different languages. Many documents and activities are optional and allow students to tailor their course to their own interests, objectives, and level affecting the social environment, being adaptable, flexible, and respectful with each individual. The students respond to each other, and Thrun intervenes only if no one has the solution to a problem. Students can give him feedback on the course in real time and the professor and his assistants adapt the class from one session to another to meet the demands and criticisms made.

The 410 best students in all of Thrun's courses were online students, the first on-site Stanford student ranking 411th. This means that hundreds of mostly underprivileged students living in underdeveloped countries achieved better results than the best students at one of the best universities in the world. This test proved decisive and made it possible (1) to solve a certain number of difficulties related to students' identification, exam validations, and resource accessibility by tens of thousands of people at the same time, and (2) to introduce individualized educational follow-up in a context of mass education.

Thrun then decided to launch the platform Udacity, a virtual university completely online and completely independent, intended to disseminate high-level courses to the greatest number of users at low or no cost. He believes so much in this project that he has also invested $200,000 of his own funds. The will of the prestigious professors enlisted is not only to allow hundreds of thousands of people to improve their knowledge and skills without having to pay a fortune and possibly get into debt for decades but also to revolutionize teaching by involving students a lot more, producing a fairer and more egalitarian education adapted to each individual. The first returns exceeded expectations with hundreds of thousands of students registered on the platform representing 470 local communities. The site has grown from a dozen to 238 courses and nano-degrees at the beginning of 2018, including some in partnership with prestigious companies. Partner universities have even chosen to develop comprehensive courses on Udacity, such as the Georgia Institute of Technology's MSc in Computer Science, the first massive online open degree (MOOD) sponsored by AT&T.

From the start, businesses have expressed their interest in collaborating with Udacity and gaining access to the talented individuals around the world that the platform can detect. One of the funding methods is based on course sponsorship and the sale of the best-performing students' contact information. Twenty multinationals committed themselves very early to recognize the certificates issued by Udacity as diplomas. Today, large groups such as Google, Amazon, Microsoft, GE, Accenture, IBM, AT&T, Nvidia, BMW, and Mercedes-Benz are partners of the platform, offering scholarships, and finance the development of courses. They enroll their own employees in training to promote them and recruit other individuals who achieve the best results.

The two million members of the Udacity community are called *Udacians.* They can gather during "meetups" organized in several hundred cities on all continents. The first global meetup took place on September 15, 2012, in 424 cities. During these meetings, working groups are formed, students work together and ask questions, and they can start a collaboration to create a company, product, or technology. Star professors sometimes make an appearance to encourage the dynamics and stimulate engagement in the community. These meetups are the perfect place for recruiters and headhunters who want to meet talented individuals and offer them jobs. Udacity Showcase is the independent forum of the Udacity website where student entrepreneurs from the virtual university can present the projects they have achieved through the courses they have taken. These projects can be incubated in companies that want to own an innovation and the talented individuals associated with it.

4.4. Ari, the recruiting chatbot from textrecruit

Ari is a conversational robot dedicated to recruitment developed by the company TextRecruit. This Californian start-up, created in 2014, specializes in the external communication of human resources, especially using mobile terminals. It relies on new digital technologies and artificial intelligence to provide its customers with tools to optimize exchanges during the process of sourcing, selection, and integration of candidates. TextRecruit offers to contact candidates on mobile applications that are best suited for a young and connected audience. It is a modern, user-friendly, and effective way of capturing talent that requires almost no effort: no application to download, no specific site to visit, no form to fill, or document to send. It is all about conversing on everyone's favorite platforms: Facebook, LinkedIn, Messenger, WhatsApp, WeChat, Skype, or just texting. The main goal is to hunt for the prospects who have the most potential and to convince them to apply without feeling they are being forced to do anything.

The main goal of the Ari chatbot is to automate all the simple and repetitive tasks that a recruiter has to do and that generate little added value in relation to the time and energy needed to accomplish them. Ari is therefore able to move the process forward with each candidate based on availability and responsiveness, 24 h a day, 7 days a week, until a human recruiter who oversees the process regains control to perform more critical and decisive tasks. Ari can browse and enrich the profiles that are accessible in the applicant tracking system (ATS) databases such as ADP, CareerBuilder, Greenhouse, Jobscience, SmartRecruiters, or TargetRecruit. Ari makes it possible not to leave the candidates without receiving answers and maintaining a high level of commitment to the recruitment process.

Ari can be customized according to the identity and the external

communication strategy of any company. Its functionalities are multiple and can be adapted according to the specific needs of each organization. Ari is able to: (1) analyze CVs or databases online, (2) create shortlists of potential candidates and prioritize them according to defined criteria, (3) get in touch with them on their favorite messaging system, (4) ask them about their knowledge, skills, and experiences, (5) present them with job descriptions and information about the company, its values, and culture, (6) ask them questions about their interests and their motivations, (7) collect administrative information about them, (8) retrieve shared documents online, (9) make appointments for face-to-face or distance interviews, (10) answer the most frequently asked questions, (11) present the next steps in the recruitment process, and (12) maintain contact so that candidates do not feel forgotten or overlooked. Because Ari's scope of action is strictly limited to the specific area of recruitment, it develops a high level of expertise and can answer practically all the questions from which it learns answers progressively.

Ari can converse with several hundred candidates at a time. It understands and uses all forms of everyday language to make the exchanges as natural as possible so that interlocutors do not realize that they are communicating with a robot, although the younger generations are already very familiar with artificial intelligences. The conversations between Ari and the candidates are monitored by an operator who can regain control if deemed necessary or if the artificial intelligence solicits him or her to get involved, such as to answer a question too complex or too precise for which Ari does not know the answer. Based on IBM's world-renowned Watson technology, Ari can learn through machine learning by analyzing the subtleties and frequencies of responses provided by human recruiters and replicating them when similar questions arise. TextRecruit estimates that 80% of the upstream recruitment activities can be fully automated and carried out with a comparable level of quality by Ari as by human recruiters. Ari is used by large companies such as XPO Logistics, Liberty Mutual Group, CDW Corporation, Randstad Holding, and Sodexo.

4.5. The massive data analysis and matching system randstad.tech

Randstad is one of the world's largest human resources management groups and the world's second largest temporary agency with $24 billion in sales in 2016. In 2013, the company decided to invest in a project of self-uberization of a number of its services: (1) streamline the labor market and reduce unemployment, (2) reach more applicants and more recruiters, and (3) connect supply and demand more efficiently. With the launch of Randstad Big Data in 2016, the group wants to position itself as a leader in innovation dedicated to recruitment.

Randstad started from the paradox that millions of jobs are not filled in many countries, so the number of job seekers is very high. Randstad can respond to only less than one in two offers. The group wants to put the most advanced digital technologies at the service of human resources and more specifically recruitment to associate in real time the skills sought by recruiters and those that are accessible in a given geographical area. Randstad has therefore developed, with Oracle and Capgemini, algorithms that match the available profiles and offers to be fulfilled, based on big data analytics.

Randstad compares its technology to dating websites that can find singles who have a compatible profile in the region or e-commerce sites that make suggestions for purchases based on orders placed and pages viewed. Using the same matching mechanisms, and thanks to the massive data available, Randstad proposes bringing supply and demand closer together and connecting candidates and recruiters. The data used come from: (1) the 150 million CVs listed by Randstad, which benefits from Monster's US $429 million buy-out in 2016, (2) its record of 12 million jobs per year, (3) its referencing of thousands of professions and more than 11,000 skills, (4) corporate partner databases, and (5) open access government and institutional databases.

The objective is to start from the CV of available candidates and to look for other information that does not appear there. The artificial intelligence will therefore browse social networks, databases, websites, and all documents available online to increase the amount of data that it will then be able to analyze. The reconciliation of the data provided and collected will enable a better understanding and study of the profile of each candidate. The system guarantees neutrality in analysis and the most diversified sourcing possible. Recruiters who validate the screening may not even have access to certain data that are sometimes used to discriminate against candidates, such as gender, age, or country of origin.

However, Randstad.tech is not limited to matching and goes far beyond. Gradually, various scenarios have been considered by the system to promote access to the labor market for candidates and the satisfaction of job offers for recruiters affecting the labor market and society itself, changing the ways of recruiting and training candidates. Randstad Big Data locates job requirements and skills that could be satisfied in different regions and even countries and promotes the geographic mobility of applicants who access distant but very attractive offers. When certain skills are not available on the market, the platform is able to provide "business gateways" to profiles of candidates who seek different jobs, but that mobilize very close knowledge and know-how. Depending on these transferable skills, vocational retraining is then suggested to certain candidates who wish to evolve to other functions and who will benefit from a time of training during the integration into their new company. Another use is to help companies wishing to open a new site to choose its location based on accessibility to skills required by future employees. These newer and more advanced features are of particular interest to the management of large groups that are growing, the local authorities that can measure their attractiveness, and the executives who can drive their careers. The dynamic analysis of massive data over several years will also provide a forward-looking approach to the labor market, for example, to predict recruitment trends and promote certain upstream training.

5. Discussion and theoretical contribution

Although it is still early to discuss the impact of digital technologies on recruitment practices, the five cases studied are indicative of radical changes in the process. Implemented technologies foster contact between recruiters and talent and optimize a process that is faster, more systematic, more specific, and more objective. New features help social businesses reach previously inaccessible targets and achieve better results in terms of attractiveness, integration, and retention. They can carry out their social missions and maintain their financial balance with optimized human resources at a reduced cost. If they have certain limitations, the studied technologies could converge and be integrated to combine their strengths and reduce their weaknesses. It has also been possible to observe how these new platforms affect society and how social models, forms of management, and teachings methods change; all this to better face job interviews and generate job opportunities towards a reinforcement of social businesses. In addition, it is important to note that these platforms have affected the forms of training, battering inequalities, and facing objectivity.

5.1. High-performance technologies better suited to talents practices

Companies are looking to recruit young people who have the potential to become managers and take on responsibilities fairly quickly, especially because recruitment and integration take time and have a relatively high cost. It is therefore important to limit turnover, not recruit someone who will leave at the first opportunity, and have a return on investment in the form of sustainable involvement of new recruits. It is no longer sufficient to check that candidates have the skills to fill a position at a given moment. In addition to their knowledge, know-how, and well-being, it is necessary to evaluate their know-how-to-be and know-how-to-become and determine the career path that they can follow. Organizational loyalty and commitment are key elements of this

ability to evolve into management positions. MOOCs and serious games put candidates into a situation that makes it possible to evaluate their behaviors and interactions. They are essential for the development of the soft skills that in the medium to long term help social businesses achieve their set objectives (Palacios-Marqués et al., 2021).

This offers benefits that help new methods of recruitment and training from a social perspective by creating more objective and transparent recruitment platforms. Data analysis and matching systems determine the compatibility of an individual's personality and values with the work environment proposed by an organization. Given the hypercompetitive context of today's markets, the main objective of all the technologies studied is above all to be quick, whether for talent seeking a job or for companies looking to recruit them: talented individuals do not want others to succeed in getting the best positions before them, and companies want to prevent the best talent from working elsewhere. The use of conversational robots eliminates the limitations related to the availability of recruiters and saves time in the preparation and follow-up of applications.

This greater availability of recruiters allows them better working comfort, more satisfaction, and more well-being. This is all the more critical in social businesses which prioritize this well-being at work and seek to better process the applications of all candidates. These recruiters also pay particular attention to aligning the moral principles and values of candidates with those of the company. Support from these new smart technologies is therefore even more important for social businesses.

The classical selection based on analysis of candidate CVs has shown its limits: although they may provide a fairly precise vision of knowledge and know-how, this analysis does not make it possible to evaluate the know-how-to-be, the know-how-to-become, and other such values. However, the ability of a candidate to join a team, get along well with managers, and adopt the culture of the company is essential. The traditional approach limits the sourcing area to candidates who have applied, and therefore to the influx of applicants, without attracting potential talented individuals who might be interested in an opportunity to reorient their career path. This is also reflected in the subjectivity of the evaluator and that may be conditioned. However, with the new platforms they find themselves in a fight for equal opportunities, for example the use of an avatar, where everything is measured equally.

CVs focus attention on hard skills, that are relatively accessible and easy to evaluate, and not soft skills, that are much more difficult to measure. This method gives very conventional results that do not allow differentiating, being more agile, renewing the ways of thinking, or stimulating innovation. Classic or professional social networks provide complementary and decisive information that chatbots and data analysis technologies can collect, compile, and study. MOOCs and serious games produce new specific data and are easy to integrate into the selection process.

Hiring interviews, often rather short and timed, usually consist of a series of questions that are often: (1) unnecessary and whose answers are already in the CV, (2) embarrassing and uncomfortable for the candidate without really adding value, and (3) destabilizing and provoking a defensive reaction and a tense relationship. Such standardized interviews are counterproductive and do not lead to identifying the rare pearl. More transparent and interactive technologies, such as social networks, immersive systems, such as serious games, or training and orientation tools, such as MOOCs, allow for a much more qualitative approach centered on behavior, feelings, and deep values (Allal-Cherif and Makhlouf, 2016). Candidates are recognized for who they are, and their identity is considered in a much more complete and useful way. In short, it creates equal opportunities for all candidates, regardless of their gender, age, culture, ethnicity, etc.

Data analysis is presented as an objective and rigorous method of selecting the best candidates for a given position. Any unconscious bias of a recruiter is potentially eliminated. Indeed, when a human being is likely to be influenced by his or her personal interests, discriminate against certain candidates, or be guided by attraction, a computer system will optimize the results solely according to the parameters that correspond to the needs of the company. The criteria taken into account will be more numerous and will not be limited to easily quantifiable aspects. Big data promote diversity and objectivity whereas CVs lead to the exclusion of certain applications of criteria that are independent of professional aptitudes. Candidates appreciate being considered not as resources but as future collaborators and fully-fledged people, with their rational, relational, emotional, and creative dimensions.

5.2. The limits of e-recruitment digital technologies

Recruitment technologies have high direct and indirect costs and require recruiters to be trained. E-recruitment implies a different vision of this profession: more open, social, human, and forward-looking. It is no longer a question of meeting the immediate needs but rather anticipating future needs. It is no longer about selecting talents but rather capturing them and ensuring their loyalty which is crucial for social businesses' stability and long-term vision. Simply changing tools is not enough, and the very practice of recruitment in organizations must be rethought. It is a completely new ecosystem that must be implemented in order to project the corporate culture externally and to guarantee a global and systematic approach leading to a real competitiveness to gain talented individuals. The analyzed social tools have been found to serve as a great option for social businesses. In this way, potential candidates can align their values, thoughts, behaviors, and interests with social businesses. It has been seen how, for example, LinkedIn Talent helps social companies to identify the most suitable employees for their published vacancies. LinkedIn Talent offers a space where the recruiter and candidate can establish their interests and competencies with the tests offered by this social network. Thus, social businesses open their geographical recruitment areas, where any restriction by location is eliminated, and open their range of opportunities to get the best candidates that fit their social objectives.

There are some negative considerations. The playfulness of serious games or certain other technologies presented as innovative and close to the expectations of potential young recruits can discredit the recruiting company and have a detrimental effect on its reputation and employer brand. The gadget side can scare off the most talented prospects who will see a sleeve effect as not very subtle or even ridiculous. Some people are completely against the concept of playing in the workplace or in a professional context. Recruiters offering candidates a contact in this form would distance their organization from these potential employees. The same reaction can occur with the impersonal and artificial side of chatbots and other forms of artificial intelligence, which can be discouraging or disconcerting.

Beyond the undeniable success of MOOCs, researchers have identified some limitations of these tools: (1) the completion rate is quite low, about 7% on some sites, (2) the adaptation of courses to beginner or advanced levels is sometimes not optimized, (3) the quality of teaching initially delivered only by the best teachers in the world has become very heterogeneous, (4) some highly technical and complex courses are not very attractive, and (5) companies still hardly recognize the certificates issued after online training (Fidalgo-Blanco et al., 2015). Experts question the quality of MOOC education and the validity of evaluations. Some of the courses simply involve combining a basic social network with a series of short videos and quizzes without sophistication. The ability to identify and select talents would then be very limited for such tools. If the reliability of MOOCs is questioned, recruiters will not trust them to assist in identifying and selecting talents. Indeed, they wish to rely on high-end technologies in a quest for excellence, not on low-cost tools with contestable performance (Dotsika and Watkins, 2017).

Massive data analysis also has its limitations. It may in fact miss some of the human and behavioral factors that are essential in a recruitment process. Knowledge, work experience, and performance are not sufficient to determine whether a candidate will be compatible with existing teams. The parameterization and weighting of various criteria and

indicators are decisive in the performance of such systems. The data may also lead to a profiling and formating phenomena that exclude atypical, unpredictable, and potentially much more interesting profiles. Because the analysis is based on classic and obvious correlations, all companies that use similar technologies risk achieving the same results and targeting stereotypical recruits who will be clichés with a low value added. However, talented individuals and consumers hate to feel categorized and associated with predetermined types. Big data would then have the opposite result to the one for which it is used: to remove the true talent, the exceptional people who do not check the boxes. The dehumanization of the candidate-selection process to better take into account human qualities may seem rather paradoxical.

The convergence of digital technologies and the uberization of recruitment

All the technologies were studied separately to facilitate understanding and analysis, but they can be combined with each other to create synergies, and they sometimes have very close functionalities. Social networks are the places where serious games and MOOCs are promoted; they allow interaction with recruiting chatbots and they produce data that can be analyzed by artificial intelligences and matching systems. The interactivity of social networks can be associated with the fun aspects of serious games, the innovative pedagogy of MOOCs, the artificial intelligence of chatbots, and the power of big data analysis. Using software based on a multicriteria hierarchical method, it is possible to extract and classify candidate personality traits from a semantical analysis of their profiles and posts on social networks (Faliagka et al., 2012). Such an analysis can be combined with that of the CV and be followed by a correlation test with a job offer. Recruiters consult almost systematically the profiles of candidates they plan to recruit on social networks, which highlights the need for employees to be vigilant about their content, because each element can be considered to recruit or dismiss them. Indeed, it is easy for individuals to ruin their reputation by misusing social networks.

Gradually, MOOCs integrate serious games to: (1) make the trainings more exciting and immersive, (2) confront learners with professional situations in the most fun and realistic way, and (3) promote best practices and behaviors (Allal-Chérif and Makhlouf, 2016). Serious games bring solutions to certain MOOC limits thanks to an adaptive and playful approach (Vaibhav and Gupta, 2015). They provide a much higher density and contextualization of the knowledge transmitted. These benefits result in an increase in the proportion of learners completing the training and more gradual and in-depth assessments. Immersion in the games increases the realism of the situations and the feeling of proximity with the other participants. In addition, large companies invest millions of dollars in the design of serious games to train their employees and make them available for free to the general public via websites, especially to students. Some big industrial groups even create professional virtual universities with several serious games that everyone can play. Other firms partner with universities to integrate their games into their training programs. There is therefore a convergence between MOOCs and serious games: MOOCs offer serious games and serious games connect with each other to form MOOCs.

In 2017, the social network LinkedIn, which has a global vision of the job market, incorporated new features that use massive data analysis under the name Talent Insights. These tools are crucial for social businesses because they help to identify the potential and most suitable employees. These social businesses are characterized by having limited resources compared to large organizations. For this reason, LinkedIn Talent helps in a fast and measurable way, regardless of the geographical area, to identify the ideal candidates. These tools make it possible, among other things, to determine, for a given talent population, trends in terms of skills availability, turnover, attractiveness of companies, trades, fields, sectors, or geographical areas, and put in place strategies adapted to future developments. Recruiters who subscribe to the platform with access to LinkedIn Talent Insights can configure their dashboard to learn: (1) the number of individuals who occupy a specific function at a specific place at a specific time, (2) the skills associated with this function and their evolution, (3) the number of job offers proposed for this function and whether this number is increasing or decreasing globally or by city and by economic sector, (4) the level of difficulty to recruit for the position, (5) the percentage of talents who have changed their employer or function during a given period, (6) the origin of the talents in a city or company and their destination when they depart from it, (7) the perception and power of the employer brand of their enterprise among this population and compared to that of other companies, and (8) even the statistics of their competitors with respect to recruitments, turnover, and searches for this function. Recruiters know instantly, in real time and in great detail, their chances of capturing talent, and they can implement the most appropriate measures to achieve it.

6. Conclusion

Although the use of information systems by human resources has been limited for a long time to administrative aspects, such as contract management, schedules, and payroll, some organizations used IT very early with a more tactical and strategic approach. The HR function is already familiar with digital technologies and uses different types of information systems in its missions. The field of e-recruitment is developing rapidly, and recruiters must acquire new tools, develop new skills, and significantly modify their approaches to their profession. For social businesses operating with limited resources and trying to recruit people with the right profile, it is important to move from administrative, static, and responsive management of talent to agile, dynamic, and proactive management.

Social networks, serious games, MOOCs, chatbots, and big data analytics–matching systems are different and complementary forms of digital technologies that significantly improve the identification, selection, and retention of talent, especially for social businesses. These new technologies allow for mass customization and a less industrial and bureaucratic management of the recruitment process. However, whatever the technology used, it can only be implemented as part of a broader recruitment protocol in which it will help in decision making without taking the place of the professionals whose job it is. Future research may explore each of these technologies in more detail, the best way for social businesses to use them, and how best to integrate them into the overall recruitment system.

Social networks give privileged access to a large number of talented individuals around the world and allow direct communication with them in a friendly and informal way. These networks provide complementary and decisive information on potential candidates and allow them to prospect passive talents who are not looking for work but are open to opportunities. Serious games place talented individuals in immersive virtual universes that enable recruiters to evaluate their skills and have a more qualitative approach to recruitment. Training as a means of identifying talent is a practice facilitated by MOOCs, which also promote the employer brand. Chatbots encourage the collection of information, answers to questions, planning of the different deadlines, and complete follow-up of 100% of the candidates, including those who will not be selected. Matching systems that rely on the analysis of massive data make it possible to associate profiles of candidates with vacant positions on the basis of objective criteria. The results obtained by focusing on social enterprises which have very high requirements and few resources can therefore be generalized to more commercial enterprises, those less focused on soft skills, and which have more resources.

The mastery of digital technologies becomes a criterion of performance for recruiters and a selection criterion for candidates who have the ability to manipulate these technologies to influence the results in their favor. The technologies used become accessible to non-professional recruiters who can serve as relays or intermediaries between talented individuals and recruiters. A form of uberization of recruitment occurs because each person becomes a potential recruit, even without actively

seeking a job, and each can become a recruiter using certain features of dedicated technologies.

Declaration of Competing Interest

none

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