

Artificial Intelligence-Based Hiring: An Exploratory Study of Hiring Market Reactions

Jaewan YANG¹
Minjae IM
Seunghwan CHOI
Jangil KIM
Dong Hyun KO

I. Introduction
 II. Theoretical background
 III. Field investigations of labor market reactions
 IV. Discussion
 V. Suggestions for employers and policy makers
 VI. Conclusion

With the development of technology, artificial intelligence (AI) is being used in multiple capacities in our society. In human resource management (HRM), AI-based hiring has recently been adopted and is rapidly diffusing among many firms around the world. Given that firms are facing many difficulties in hiring, the adoption of AI-based hiring could be an appealing alternative to the traditional hiring practices. However, our society does not have a good understanding of AI hiring, and the reactions of the labor market are largely unknown. In this study, we aimed to develop a better understanding of AI hiring through field investigations of job applicants, HRM professionals, and assessment center experts by collecting and analyzing both qualitative and quantitative data in South Korea. Our findings reveal many concerns regarding the use of AI hiring systems despite several advantages. A series of interviews with HRM experts indicated that the predictive validity of AI hiring needs improvement before it can be used more extensively. Additionally, our statistical analysis showed that job applicants who had experience with AI hiring had more concerns than applicants without such experience. However, the result of job applications did not affect the applicants' attitudes toward AI hiring. Suggestions for employers and policy makers are given.

I. Introduction

“Hire hard, manage easy.” This simple cliché directly notes the importance of effective hiring for organizations to achieve their strategic goals in doing business. This approach is emphasized by many successful leaders in the management of their organizations. For example, Jeff Bezos, the CEO of Amazon, confessed that when he hires managers, he spends the majority of interview time asking potential managers about their own hiring skills. Richard Fairbank, the CEO of Capital One, also stressed the importance of effective hiring, saying that at most companies, people spend 2% of their time recruiting and 75% managing their recruiting mistakes. In line with this notion, many empirical research studies have demonstrated the significance of employee selection for many organizational outcomes (e.g., Barrick and Zimmerman 2005; Cascio 2006; Coppin 2017; Ekwoaba et al. 2015; Podsakoff et al. 2011).

However, firms are facing many difficulties in hiring (Cappelli 2019). In particular, Korean firms are experiencing challenges such as extremely high workloads and soaring hiring costs, while job seekers are becoming distressed by a series of recent occurrences of hiring fraud in major Korean firms (Hankyoreh Daily 2018). Fortunately, artificial intelligence (AI)-based hiring systems using recent technological developments have the potential to be a useful tool for more effective and fairer hiring systems. The use of AI hiring is diffusing rapidly among Korean firms. In 2019, more than 400 firms had adopted AI hiring systems (Chosun

1. Corresponding author. College of Business, Hankuk University of Foreign Studies, 107 Imun-ro, Dongdaemun-gu, Seoul, 02450, Korea, +82-2-2173-3471, jwyang@hufs.ac.kr.

Daily 2018), and the number will continue to grow in 2020. In response, many Korean universities are offering classes and training programs to better equip their students for these new changes in the job market. AI hiring is clearly likely to become a new standard of employment tests in Korea in the near future.

Although these changes are promising, AI hiring is also expected to have drawbacks. Specifically, firms do not thoroughly understand what AI hiring systems do and whether they provide more accurate assessments of the future job performance of applicants. However, firms are making very large investments in these new hiring systems by purchasing AI hiring software packages or by developing such software within their organizations. Job applicants also fear these completely new hiring systems because they are unsure about their own performance in such selection tests. Unfortunately, firms and job seekers do not seem to receive good guidance for these changes, and no systematic approaches have been observed for the use of AI hiring systems in Korean society. In addition, academic studies exploring AI hiring are extremely rare.

Given that firms are unsure whether AI-based hiring is useful, an exploratory study of AI hiring practices can be a useful starting point to build our understanding of these new hiring systems. Thus, gathering feedback on the use of AI hiring from people who have experienced such systems might provide useful suggestions for future directions. In this study, we thus aimed to investigate AI-based hiring practices in the context of South Korea's labor market. With this aim, we collected information from stakeholders who would be affected by the use of AI hiring in the Korean labor market. Specifically, the responses of job applicants, human resources (HR) practitioners, and assessment center (AC) experts were examined. In doing so, we collected both quantitative and qualitative data by conducting an online survey and a series of expert interviews simultaneously in the study.

This study was intended to contribute to the literature related to hiring and selection as well as the emerging domain of AI-related research. To the best of our knowledge, research studies combining both selection and AI research do not yet exist. Thus, this study may be a good starting point for further research on this topic. Additionally, we aimed to provide valuable insights to managers and employers who are facing this new change in the labor market. Finally, our study findings can be of great use for policy makers who strive to shape more effective labor policies around the world. By incorporating feedback and opinions from people affected by developments in AI hiring, our study can contribute to the goal of creating a labor market where technology benefits both firms and job seekers.

II. Theoretical background

1. Characteristics of AI-based hiring systems

People started using the term "AI" only a few years ago. With the emergence of AlphaGo, which played the game "Go" with the famous Go player Lee Sedol in 2016, AI emerged rapidly in our lives and in society in general. There are many different definitions of AI, and society is still developing an understanding of it. Thus, it is not easy to define what AI truly is. However, one way to understand AI is reflected in the typology of Russell and Norvig (2010), who categorized AI into four different types based on the functional scope (rational computing vs. similarity to human intelligence) and functional type (thinking and inferring vs. connected to hardware). Although AI can be understood in different ways based on its purpose and functions, the fundamental core aspect of these types suggests that AI is a programmed algorithm with a learning capability that aims to imitate or outpace human intelligence.

Currently, AI is being used in many different sectors (e.g., manufacturing, customer management, medicine, legal services) in our society. Clearly, AI can also be used for the effective management of HR. One way to apply AI to human resource management (HRM) is to use AI in the process of employee hiring. Some organizations have already started to use AI for hiring, and several commercial versions of AI-based hiring programs have been released. According to the classification of Russell and Norvig (2010), AI hiring systems

fall in the intersection between rational computing and thinking (and inferring). AI hiring uses fixed algorithms and does not involve acting like a robot or the internet of things (IoT) in screening out candidates in an applicant pool.

In Korea, there are several commercially traded AI hiring programs and other programs that have been developed by large Korean firms with their own uses. In general, programs developed within organizations are not fully developed, and their functions are quite limited compared to those of commercially traded programs. In contrast to these rather limited AI hiring systems, commercially available programs are more functional and more advanced in multiple aspects. Specifically, the developer of one commercially traded AI hiring program that dominates the Korean AI hiring solution market insisted that the program can be used in multiple different industries and that the predictive validity of this AI system is high due to the use of big data (more than 100 million accumulated cases so far); however, these claims have not been proven.

Based on our field investigations of the AI hiring programs being used in Korea, we identified several features of AI hiring systems, as indicated below. In general, AI hiring systems consist of several functions, such as physical response detection, brain activity analysis, personality/aptitude tests, and performance prediction.

(1) *Physical response detection*

This feature indicates the functions related to the collection and analysis of an applicant's physical responses during job interviews by using information captured by a camera linked to an AI system. Specifically, this function detects an applicant's facial expression, heartbeat, and voice to determine the levels of attractiveness, emotional presentation ability, communication skills, etc. In this function, analyses such as text analysis, visual data analysis, and sound detection are used. The collected information is used to determine the overall attractiveness of applicants.

(2) *Brain activity analysis*

This feature concerns the collection and analysis of brain activities based on brain neuroscience. To perform this function, AI hiring systems assign to an applicant a series of tasks that the applicant needs to complete. In general, the applicant plays a simulated game, and the AI hiring system measures his or her performance to evaluate several different abilities governed by different areas of the human brain. Specifically, these abilities include memory, inference, planning, decision making, multitasking, etc. Performance on this feature generally indicates the level of general cognitive ability and is used as the basis for determining person-job fit.

(3) *Personality/Aptitude tests*

This function tests an applicant's personality or aptitude and thus is not a new feature of AI hiring systems. In many firms, a personality test or an aptitude test is usually a part of the selection procedure; however, online-based personality tests can effectively be incorporated into AI hiring systems to make important decisions in employee selection procedures. Specifically, decisions such as person-organization fit (Kristof-Brown 2000), potential to grow, and future job attitudes could be predicted based on the findings of such tests.

(4) *Performance prediction*

In contrast to the three features mentioned above, this feature refers to functions related to synthesizing and applying information collected from the three tests to predict future job performance. In doing so, AI hiring systems are used to analyze patterns in applicants' test results and compare them with the results for high/low performers in each job category. To perform this function, AI uses machine learning based on the predetermined

performance prediction model. The findings of this feature are used to make final hiring decisions.

These features of AI hiring might provide very different contexts to employers and job applicants in the employee selection procedure. Some people expect the use of AI hiring to solve existing problems in Korean hiring practices. In the following chapter, we briefly describe Korean hiring practices and several problems associated with them.

2. AI hiring to mitigate hiring problems in Korea

For the last several decades, Korean firms have been using an organization-wide hiring system with annual hiring sessions (Bae and Rowley 2001). In this hiring system, applicants are hired without any agreement related to job assignment or responsibilities, and jobs are subsequently assigned. Firms hire employees once a year, and thus, applicants who fail to receive a job offer have to wait another year. For this reason, the cost of not being successful in securing a job is very high for job seekers in this system. In addition, competition to secure better jobs is becoming increasingly intense. According to Korean labor statistics, the unemployment rate for young adults in South Korea was between 10% and 15% in the last five years (Ministry of Employment and Labor of South Korea 2019). Moreover, there is a general trend in which many young adults turn down job offers from small to medium-sized firms to seek a better job at a large firm. Thus, it is important for job seekers to experience fair selection procedures while job seeking.

However, larger problems lie in the actual hiring process in Korean firms, and job seekers experience unpleasant and unfair incidents. Specifically, job seekers frequently become the target of uncivil behaviors by interviewers (JobNJoy 2019). For example, some interviewers ask uncomfortable questions that are considered very private and not related to future job performance. Additionally, many firms engage in unfair hiring procedures. A few years ago, many Korean banks were accused of unfair hiring cases in favor of the family members of highly influential people in Korea (Hankyoreh Daily 2018). The investigation showed that this type of unfair hiring fraud has existed for a long time. Finally, the validity of hiring tests is also in question. Although firms use multiple employment tests, these tests measure general mental ability or common knowledge, which are closely linked to job performance. Thus, test results are not well accepted by many applicants. All these factors combine to increase job seekers' psychological distress and their negative perceptions of hiring practices.

However, negative perceptions are not limited to job applicants; firms are experiencing many problems as well. Because many Korean firms hire a large group of new employees once a year (Bae and Rowley 2001), HR departments struggle to cope with extremely large workloads during the hiring seasons. This makes HR jobs very labor-intensive and prevents HR professionals from engaging in the more strategic functions of business management, causing serious physical and psychological problems for HR practitioners. Moreover, the increasing number of applications looking for better job opportunities causes firms to invest more resources in the acquisition of HR. The low validity of frequently used selection tests such as unstructured interviews, bio data, reference checks, etc. (Schmidt and Hunter 1998) is also a problem for employers.

We believe that these problems are severe because they cause serious psychological distress to both job seekers and HR professionals, lower the utility of HR, and provide applicants with a motive to leave local labor markets in pursuit of better job opportunities. However, the use of AI hiring systems might be useful to address these problems. Specifically, we expect that AI systems would not behave uncivilly toward applicants and that the use of such systems could reduce the workload of HR departments. However, it is uncertain whether applicants would feel uncomfortable about being judged by a computer system. Moreover, employers and applicants are unsure of the accuracy of AI-driven assessment. In the following section, we present exploratory investigations of these issues.

III. Field investigations of labor market reactions

1. Method

For this study, we conducted field investigations by carrying out online surveys and a series of expert interviews. To develop insights about AI hiring, we performed a series of interviews with three HR experts (two HR managers and one practitioner) from three large Korean companies and two experts in competency assessment, i.e., Assessment Center (AC) experts. The HR managers and the practitioner had at least 10 years of experience in the HR field at multiple companies. They possessed operational knowledge of AI hiring because their firms had been using AI hiring systems. One AC expert had more than 25 years of field experience, and both experts had a basic understanding of AI hiring. The research team visited the organizations that these interviewees were affiliated with. Before the interviews, the general features of AI hiring systems and the purpose of the current study were explained to the interviewees. The average interview duration for the research team was approximately 30 to 45 minutes. The interview findings were summarized in subsequent discussions.

For the online survey, the subjects were current or potential job applicants who would soon be entering the job market. Specifically, they were either current senior college students, recent graduates looking for a job, or active job seekers with or without a current job. Although more firms are adopting AI hiring, it was not easy to find job applicants with experience applying under an AI hiring system. To find those applicants, we used several online community groups that support job hunting through information sharing and group-based learning. Additionally, students enrolled in classes offered at a large private university located in Seoul were recruited for the survey. In total, 162 people responded to our survey, and 10 responses were determined to be unusable for the current study.

The final sample included 152 usable responses, and 29.6% of the respondents had experience with AI hiring. Although the number of respondents with AI hiring experience was small, the data were valuable given the great difficulty of finding such applicants. Among the respondents, 39.5% were male, and the average age was 26.39 years. Regarding educational background, 90.8% were attending or had graduated from 4-year universities, 2% had the equivalent of a high school diploma or less, 0.7% were attending or had graduated from a 2-year college, and 6.6% had education levels equivalent to or higher than the graduate level. A total of 61% of the respondents had work experience, mostly through internships. With the completion of the survey, we conducted a series of descriptive analyses and compared the mean levels of several meaningful variables.

2. Results

(1) Responses of HR professionals

We conducted interviews with three people currently working in HR positions (HR manager or practitioner) at large Korean firms. The interview included questions regarding the motivations for adopting AI hiring systems, benefits and limitations of these systems, and operational usage of these systems in the hiring process.

There are several potential motivations for adopting AI hiring systems. In Korea, the unemployment rate for young adults is higher than 10% (Ministry of Employment and Labor of South Korea 2019). Thus, applicants apply to multiple companies when job hunting. In fact, one job seeker submits approximately 18 to 36 applications per year (Chosun Daily 2016). Even employed individuals return to the job market to seek better jobs. In other words, job competition is very intense among young adults in Korea. As a result, HR professionals at large firms must find better ways to deal with the tremendous number of applications they receive. For example, an HR professional working for Company C stated the following:

There are more than tens of thousands of incoming applications at the end of each year. Dealing with

these applicants is like “hell” for HR professionals. Usually, they cannot even think about leaving work before 10 p.m. Some of us cannot even go back home for a few days in a row.

One way to address this problem is to use technology to effectively make the first cut without losing good applicants and while maintaining fairness as much as possible. In this case, AI hiring systems seem to be good tools that meet the expectations of many HR practitioners.

Naturally, the current hiring practices in Korea can result in high expenses related to employee acquisition, and the use of computing power instead of a reliance on human labor is one way to effectively control increasing costs. Another motivation for AI hiring is related to organizational efforts to shape a positive image of a firm in the labor market. Our survey conducted with job applicants was somewhat supportive of this claim. The survey items “I think AI hiring is innovative” and “I think AI hiring is future oriented” had mean scores of 3.39 and 3.60, respectively, out of a maximum of 5.00. In addition, the adoption of AI hiring can gradually solve problems of high workload and cost. In fact, the use of AI hiring has started to reduce workload to some extent.

Despite these benefits, HR professionals are also concerned about the validity of AI hiring, and this concern represents the single most important issue affecting the transition of traditional hiring practices to AI hiring. In short, HR professionals believe that AI hiring systems do not offer strong prediction power for future job performance. Specifically, an HR professional working for Company S voiced this concern as follows:

In fact, we do not think AI hiring systems offer high predictive validity. To test whether we can rely on AI hiring, we conducted concurrent and predictive validity studies with our current employees and job applicants (newly hired). In both tests, AI hiring could not pick high performers. Our high performers turned out to be low performers under an AI hiring system, whereas our new employees (hired for their high scores under an AI hiring system) turned out to be extremely low performers afterwards.

This statement highlights the limitations of AI hiring in predicting job performance. This HR professional also mentioned that the company chose to return to their previous hiring practices. An interviewee from another large Korean firm stated that they did use AI, but in conjunction with their traditional hiring systems. In such contexts, AI hiring systems are used only to screen cover letters at the early stage of the selection process. However, the previous experience with the shortfalls of AI hiring systems does not mean that no AI hiring systems can be used to identify high performers or that there is no hope for improvement. AI hiring clearly seems to have both benefits and limitations in its current stage of development. For this reason, firms need to be careful in adopting and implementing AI hiring.

(2) Responses of competency assessment experts

We also interviewed AC experts. In an AC (Heneman et al. 2003), applicants are examined for their suitability for an employment opportunity in terms of their skills, knowledge, ability, and personality through multiple tests such as in-basket, case analysis, and group discussion. Given that various tests under AI hiring heavily overlap with the tests that ACs use to examine applicant qualifications, it is considered useful to include the opinions of AC experts.

According to these experts, both AC and AI interviews can be used to measure aspects of applicant behavior, and these data are used to judge the applicant’s suitability for a certain position. However, the AC experts’ greatest concern regarding the use of AI hiring was related to the validity and precision of the assessment results derived from AI-based tests. They stated that AI hiring systems rely merely on simple information to make judgments and that this limitation inhibits the accurate assessment of applicants’ true

competency. Specifically, one expert made the following comment:

Competency assessment requires a lot of in-depth questions following initial questions. Moreover, the suitability of these questions and the validity of the answers to these questions vary depending on the situation. Thus, leaning on simple information cannot generate accurate assessment. Specifically, the mechanism through which AI hiring collects information does not capture dynamic information and cannot produce strong predictions of abilities such as problem-solving and effective communications for real-world business.

Another major problem of AI hiring, as we found in the interviews, is the problem of customization. If a firm uses its AI hiring system developed in-house, this problem should not arise. However, most firms do not have the time and resources to develop their own systems, and consequently, they purchase a commercially available product. For this reason, the unique organizational context, including the company culture, values, goals, and organizational structure, cannot be considered in AI hiring. However, in traditional ACs, reflecting the organizational context is relatively easy. This point was also articulated in the interviews with HR managers.

(3) Responses of job seekers

The administration of a survey of job applicants was a critical part of this study because job applicants are the most important players in the hiring process. We thus examined applicants' perceptions of and satisfaction with traditional hiring practices as well as their reactions to AI hiring systems. If applicants' perceptions of traditional hiring systems are sufficiently positive, then the adoption of AI hiring may merely be for the sake of employers, with fewer benefits of the new hiring practices for job applicants. Thus, we present job applicants' perceptions of traditional hiring practices first. Then, we describe four different aspects of applicants' reactions to AI hiring. For all items, the scale ranged from 1 (not at all) to 5 (very likely).

Table 1 shows applicants' reactions to traditional hiring practices across firms in Korea. In total, nine items were included in the survey to examine three different dimensions. The first two dimensions examined whether applicants developed positive attitudes toward traditional hiring practices in Korean firms, and the last dimension examined the negative aspects of traditional hiring practices. The first dimension concerning the "effectiveness of the traditional hiring practices" showed a mean value of 3.17 (2.86–3.50), which was slightly above 3 (the median value of the scale). The second dimension regarding the "fairness of traditional job interviews" showed a mean value of 2.96 (2.79–3.13), which was below the median and the value of the first dimension. However, the dimension regarding the "ineffectiveness of the traditional hiring practices" showed a mean value of 3.63 (3.56–3.70), which was above the scale median.

At the item level, the items "effectiveness of personality/aptitude tests" and "fairness of Q&A opportunities" showed the lowest values (2.79 and 2.86 for each) among the nine items. In summary, these results indicated that the applicants had somewhat negative rather than positive reactions to the traditional hiring practices of firms in Korea. Specifically, the applicants appeared to perceive problems with the "fairness of the interview method." However, they responded that interviews are the most effective among the three hiring methods, namely, application assessments, personality/aptitude tests, and interviews.

We also examined applicants' attitudes toward AI hiring systems. For this purpose, four dimensions and one single item dimension were included in the survey. The questions sought to determine perceptions of 1) the ability of AI hiring systems to replace traditional hiring systems, 2) the trustworthiness of AI hiring systems, 3) resistance to the use of AI hiring, 4) attitudes toward the use of AI hiring by organizations, and 5) applicants' intention to apply to organizations using AI hiring. Except for the trustworthiness of the AI hiring dimension, all the questions examined whether applicants were open to this new hiring system and willing to accept its

Table 1. Applicants' reactions to traditional hiring practices

Dimension	Mean	SD	Question Item	Mean	SD
Effectiveness of the hiring system	3.17	0.70	Effectiveness of application assessments	3.15	0.92
			Effectiveness of personality/aptitude tests	2.86	1.02
			Effectiveness of interviews	3.50	0.83
Fairness of interviews	2.96	0.77	Fairness of interviews	3.13	0.92
			Fairness of Q&A opportunities	2.97	0.97
			Fairness of interview evaluation criteria	2.79	1.00
Ineffectiveness of interviews	3.63	0.72	Interviewer seemed tired	3.63	0.89
			Interviewer rated applicant's appearance	3.70	1.00
			Interviewer did not concentrate on interview	3.56	0.92

Source: Compiled by authors.

Note: N=152, SD=standard deviation

use. In total, 13 questions were asked for this purpose.

The survey results showed that the “trustworthiness of AI hiring” dimension showed the lowest score (mean 2.49, 2.29–2.60) among the four dimensions. Moreover, the item “help to understand the job and work context” scored the lowest (2.29, SD=1.12) among the 13 items. For the dimension regarding the ability of AI hiring to replace traditional hiring systems (mean 2.94, 2.69–3.14), personality/aptitude tests showed the highest score (3.14, SD=1.12) compared to those of application assessment and interviews. The dimension measuring “opposition to the use of AI hiring” had a relatively high score (mean 3.04, 2.97–3.11). The mean value of this dimension was higher than 3 (the median of the scale). The final dimension showed a mean value of 2.88 (2.80–2.96), which was lower than the median. However, the intention to apply to organizations using AI hiring was high, with a score of 3.73. The findings generally showed that the applicants had negative perceptions of AI hiring but were still highly likely to apply firms that use AI hiring.

In the analyses above, we examined job applicants' perceptions of the newly adopted AI hiring systems. Although these analyses provide useful information, applicants' reactions to AI hiring might have been influenced by several other factors, such as their experiences with AI hiring and acceptance/rejection of their job applications. We presumed that applicants' perceptions could change after experiencing the AI hiring process because they would feel more comfortable with it once they better understand it. To test this presumption, we compared the means of the two groups (the group with AI hiring experience and the group without this experience) by using a test of statistical significance.

We compared the two groups in the three dimensions (replacement of traditional hiring systems, opposition to the use of AI hiring, and intention to apply) examined in Table 2. We were unable to compare the groups in the other two dimensions (trustworthiness of AI hiring and positive attitude toward organizations with AI hiring) because we did not collect information from applicants who did not have AI hiring experience. To conduct the analysis, we formed a composite variable of the replacement of the traditional hiring system by averaging the values of the three items (application assessment, personality/aptitude tests, and interviews). For the dimension of opposition to the use of AI hiring, we formed a reflective measure. The reliability value (Cronbach's alpha) was 0.61. Although this value was not sufficiently high, it was acceptable given that only three items were used to measure this variable, and the sample size was small. The intention to apply was measured with one item.

Table 3 shows the mean comparison results for the three variables. Before the comparison, the homogeneity of variances was checked. For all three variables, this assumption was fulfilled. In the mean comparisons, the

Table 2. Applicants' attitudes toward AI hiring

Dimension	Mean	SD	Question Item	Mean	SD
Replacement of traditional hiring systems	2.94	0.93	Can replace traditional application assessments	2.97	1.10
			Can replace personality/aptitude tests	3.14	1.15
			Can replace interviews	2.69	1.11
Trustworthiness of AI hiring	2.49	1.03	Clearly related to job requirements	2.58	1.08
			Measure factors that lead to high performance	2.49	1.199
			High score on AI hiring test means high performance	2.60	1.27
			Help understand job and work context	2.29	1.12
Opposition to the use of AI hiring	3.04	0.80	Cannot effectively measure my competency	3.11	1.04
			Cannot accept that AI evaluates me	2.97	1.15
			Think AI will discriminate	3.05	1.01
Positive attitude toward organizations with AI hiring	2.88	1.01	Feel positive about this organization after experiencing AI hiring with this organization	2.80	0.99
			Feel I want to work here after experiencing AI hiring with this organization	2.96	1.15
Intention to apply			Will not apply to organizations that use AI hiring (reverse coded)	3.73	1.13

Source: Compiled by authors.

Note: N=152, SD=standard deviation

two groups showed statistically significant mean differences for the replacement of traditional hiring practices ($t = -2.76, p < .01$) and intention to apply ($t = 1.95, p < .05$). Specifically, applicants with AI hiring experience were less likely to believe that AI hiring could replace traditional hiring practices (experience group mean=2.62, no-experience group mean=3.07). However, applicants with AI hiring experience showed a stronger intention to apply to organizations that use AI hiring (experience group mean=4.14, no-experience group mean=3.61). Together, these findings suggested that in general, 1) applicants do not believe that AI hiring can replace traditional hiring systems, but 2) they are more likely to apply to organizations that use AI hiring once they have had experience with it themselves. However, the two groups did differ significantly in their opposition to the use of AI hiring.

We also compared applicants' attitudes in terms of their job application results. We expected that an applicant would develop positive attitudes toward organizations that extend a job offer in response to their application. Applicants who do not succeed in securing a job could attribute their failure to the AI hiring systems that their target firms used for selection. For this reason, we compared the means of the three variables examined in Table 3 between two groups (accepted group and declined group). The analysis (Table 4) showed that there was no statistically significant difference between the two groups for the three variables. However, the accepted applicants seemed more likely to agree that AI hiring could replace traditional hiring practices (accepted group mean=3.12, declined group mean=2.86). The result was not significant at the level of 0.10 ($p=0.14$). Given that a two-tailed test was used for significance, this finding cannot be disregarded. In terms of intention to apply, the accepted group showed a stronger intention to apply to organizations using AI hiring systems (accepted group mean=3.86, declined group mean=3.68). Regarding opposition to the use of AI hiring, the mean values were very close between the two groups.

Table 3. Comparing applicants' attitudes based on AI hiring experience

	AI hiring experience			No AI hiring experience			95% CI of the mean difference	t	df	sig.
	N	Mean	SD	N	Mean	SD				
Replacement of traditional hiring practices	45	2.62	0.98	107	3.07	0.88	-0.77, -0.13	-2.76***	150	0.00
Opposition to the use of AI hiring	45	3.07	0.91	107	3.03	0.75	-0.25, 0.31	0.23	150	0.82
Intention to apply	22	4.14	1.13	77	3.61	1.11	-0.01, 1.06	1.95**	97	0.05

Source: Compiled by authors.

Notes: 1. Two-tailed test, *** $p < .01$, ** $p < .05$, * $p < .10$, N=number of samples, SD=standard deviation.

2. The sample size for intention to apply is smaller since this item was added later in the survey administration process.

Table 4. Comparing applicants' attitudes based on the result of job applications

	Accepted			Declined			95% CI of the mean difference	t	df	sig.
	N	Mean	SD	N	Mean	SD				
Replacement of traditional hiring practices	38	3.12	0.86	106	2.86	0.97	-0.08, 0.61	1.49	142	0.14
Opposition to the use of AI hiring	38	3.05	0.86	106	3.04	0.77	-0.29, 0.31	0.08	142	0.94
Intention to apply	22	3.86	1.04	76	3.68	1.17	-0.37, 0.73	0.65	96	0.52

Source: Compiled by authors.

Notes: 1. Two-tailed test, *** $p < .01$, ** $p < .05$, * $p < .10$, N=number of samples, SD=standard deviation.

2. The sample size for intention to apply is smaller since this item was added later in the survey administration process.

IV. Discussion

Hiring systems are important not only for employers but also for job seekers in the labor market. Competition for better jobs is increasing, and the unemployment rate has been very high in many countries (e.g., South Africa, Greece). In South Korea, the unemployment rate for young adults has been higher than 10% for the last few years (Ministry of Employment and Labor of South Korea 2019). For this reason, many job applicants believe that hiring procedures should be fair, but the reality seems somewhat different. According to a recent poll, job seekers had very negative perceptions of the hiring practices of Korean firms (JobNJoy 2019). Specifically, job seekers responded that they did not have opportunities for fair competition and that their abilities were undervalued. The current hiring system is a very large problem in many ways. For instance, it causes serious psychological distress to job seekers and results in society not taking advantage of some valuable HR.

In this study, we conducted an exploratory study of labor market reactions to the use of AI hiring systems. Specifically, we examined the reactions of job applicants, HR professionals, and AC experts by conducting a survey and a series of interviews. The results indicated that applicants in general are concerned about the use of AI hiring systems. Although job seekers are not satisfied with and have somewhat negative perceptions of the traditional hiring practices of firms in Korea, they also do not welcome the adoption of AI hiring. This finding was interesting but also problematic. Interestingly, despite their feelings about such systems, applicants still intend to apply to firms that use AI hiring. However, this result does not indicate that firms need not care about applicants' preferences. When the working population starts to shrink rapidly, job seekers will avoid firms that are less concerned about (potential) employees.

One HR professional answered that the motivations to adopt AI hiring include the employer's intention to develop an innovative image of the firm in the Korean labor market. In fact, the use of AI hiring is effective for achieving this goal. According to one survey item (not included in the analyses), job applicants indeed regard firms that use AI hiring as innovative and future oriented. Notably, applicants view those firms as innovative even though they do not like AI hiring. Thus, this finding needs to be interpreted carefully because applicants do not want to be a scapegoat of AI hiring, even though the firms that use AI hiring appear to be innovative. In fact, one of our survey questions asked whether applicants prefer AI hiring or traditional hiring practices. The results showed that applicants prefer traditional hiring systems (AI hiring: 24.3%, traditional hiring 50%, no preference: 25.57%).

One major problem of AI hiring is its low predictive validity. We found that job seekers, HR professionals, and AC experts are all seriously concerned about the predictive validity of AI hiring. According to the information published by one AI hiring system vendor that currently dominates the pertinent market in Korea, the predictive validity of the AI hiring system is approximately 0.40. A research study on the effectiveness of various selection methods on employee job performance showed predictive validity values (correlations) ranging from 0.13 to 0.68 (Beardwell et al. 2004). According to the researchers' findings, the predictive validity of AI hiring was equivalent to that of the personality test ($r=0.38$). In another study, the predictive validity of biodata (resume) assessment showed rather similar levels of predictive validity (Pilbeam and Corbridge 2006). Hence, AI hiring is not better than biodata assessment or, at best, is not better than a personality test.

Fairness is another major issue in AI hiring. In fact, some responses to our open survey questions indicated that job applicants are concerned about losing job opportunities because of their appearance (i.e., not looking good). They stated that AI hiring decisions should not be based on applicants' appearance. However, some other issues need investigation in future studies. Given that AI also collects information about facial expressions, voice, eye contact, etc., we cannot be sure that AI hiring does not use this information in a discriminatory way. According to a developer of an AI hiring system, this information is used to determine the overall attractiveness of applicants. However, we are uncertain where to draw the line between good appearance and attractiveness. In fact, this problem is related to other types of discrimination based on gender, race, academic background, etc. For example, Amazon decided to cease AI hiring because its AI hiring system continuously engaged in gender discrimination (Reuters 2018), and racial discrimination is a well-known problem of COMPAS (AI) (New Scientist 2018). Moreover, the psychological test results of applicants can be misleading, as some AI systems, such as Norman, are biased (BBC 2018). These cases indicate that AI hiring can also be biased in that regard.

V. Suggestions for employers and policy makers

1. For employers

Our field investigation showed that AI hiring may have some limitations. However, AI hiring has some advantages and will soon be part of the employee selection procedure in many organizations. Thus, it is wise to find ways to more effectively use AI rather than avoid using AI. In this spirit, we offer several suggestions for employers to effectively use AI hiring systems. First, it is urgent to improve the predictive validity of AI hiring. There are multiple sources of the low predictive validity of AI hiring systems. However, we believe that judgment regarding the future job performance or job-person fit (Kristof-Brown 2000) of an applicant is complicated and requires more than a personality test (which is a major part of the AI hiring system) or applications of neuroscience. We believe that effective selection procedures require many different types of information and multiple raters with different viewpoints rather than a single highly sophisticated algorithm. A more complex system is needed because an individual cannot be summarized in a few sentences and because

his or her psychological condition, attitudes, and behaviors can change in different contexts.

One potential solution is using AI hiring along with other traditional hiring practices. Combining multiple selection tests offers the highest predictive validity in multiple studies (Kavanagh et al. 1971; Schmitt and Stults 1986). In fact, one of our interviewees stated that his company was using AI hiring in this way and that it was more useful than relying solely on only one approach. Employee selection can benefit from the use of many different types of information and multiple raters, as described above. This approach has been shown to be effective in many previous studies on the multitrait multimethod (MTMM) approach (Campbell and Fiske 1959). Along with the use of this approach, the decomposition of the variance explained by AI hiring would be useful as well. At this point, it is unclear whether AI hiring alone explains the variance or whether variance can be explained by other test methods. More sophisticated analytical studies of AI hiring systems would be useful.

Using both AI hiring and traditional hiring practices helps improve the negative perceptions of job seekers. As some applicants are fearful of being inaccurately judged regarding their qualifications under an AI hiring system, the use of both approaches can signal a fairer and more accurate selection process. In fact, this can help to improve perceptions of HR professionals as well. Using AI hiring makes HR professionals uncomfortable, even though it reduces their workloads and costs associated with hiring in the long term. This is because HR professionals generally do not have a clear understanding of AI hiring and the necessity of its use. If HR professionals are not convinced of the benefits of the use of AI hiring, they cannot convince others.

Additionally, employers need to try to communicate with applicants about what AI hiring systems do. Job seekers feel insecure because they do not know what these systems do and how to secure a job under such a system. Some applicants might have developed misunderstandings about AI hiring. For this reason, many people are forming online communities to share information and tips, which are not proven to be useful for preparing for AI hiring. In fact, some companies have started to offer consulting services that are aimed at training job seekers to succeed in the context of AI hiring. Thus, employers need to communicate with applicants about what AI hiring systems do and inform them that AI is not replacing traditional hiring systems but rather only addresses some limitations. It would be useful for firms to publish a booklet or brochure to help applicants in this way, thus reducing their anxiety.

AI can be biased depending on the data used for (machine or deep) learning. Given that AI uses the internet to collect information and that most information on the web is generated by people, we cannot avoid bias in AI. In addition, the training data that an AI system designer feeds into the AI system can be biased, either intentionally or unintentionally. In other words, not only data collected from the internet but also data from other sources can lead to bias in AI. Consequently, AI hiring systems can lead to a biased employee selection mechanism. The belief that AI uses entirely objective coded algorithms is false, and people who design the systems and the internet can misguide it (Reuters 2018). For this reason, employers can potentially be responsible for employment discrimination even when it is not intended.

To address this problem, it is advisable that firms initiate audits of AI-based HR (i.e., AIHR audits) and conduct them regularly. AIHR audits would be similar to the HR audits that many companies have conducted. However, for an AIHR audit, firms need to incorporate AI-related components into their traditional HR audits. Specifically, firms need to set goals and plans for employee selection and revisit hiring outcomes regularly. If there is a gap, firms need to check the AI algorithm, the soundness of the data used for machine learning, etc. Additionally, companies need to review any updates in laws and regulations in hiring and determine whether their AI hiring systems fulfill those legal requirements.

2. For policy makers

Policy makers have roles as well. Job seekers fear AI hiring because they know little about AI (or AI hiring) and are not trained for these new hiring tests. Thus, it is necessary for the government to redesign its

national education and job training policies to reflect these changes in hiring. To do this, policy makers must develop a good understanding of AI hiring. Specifically, it is necessary to know the differences between AI hiring and traditional hiring practices along with the additional features involved in AI hiring. We believe that students, job seekers, and working employees need to learn about and receive training for AI hiring. Some experts say that performance on AI hiring tests does not improve with experience. We are unsure whether this claim is valid, but AI hiring would naturally be associated with discrimination issues if it is designed to test something that people cannot learn via training.

Regarding the matter of discrimination, the most demanding issue is laying the legal groundwork for the use of AI hiring (and AI in general). In fact, the provision of the legal basis for AI use should occur in conjunction with the provision of related laws such as those on labor, education, information and communication, and basic human rights. For example, the collection and use of individual information in an AI-based platform involves potential problems associated with breaching information security. Given that electronic information travels quickly, multiple threats to information security exist. For example, firms could use information in opportunistic ways that are not prohibited by law. For this reason, it is necessary for policy makers to establish a firmer legal groundwork for applicants and employers in using these systems.

To make these legal changes effective and protect both employers and applicants, we believe that a government-level agency or committee should enforce these new legal requirements. By establishing an institution that oversees employment selection procedures using AI hiring systems, policy makers can implement these changes more effectively. It might also be useful to publish a guidebook explaining fair employee selection procedures in AI hiring. Employers and applicants are using AI hiring somewhat blindly, without effective guidelines. Such a guidebook could be useful not only for applicants but also for employers. The guidebook could include information regarding the collection and use of data in AI hiring systems, applicants' rights for information requests, verification of the accuracy of AI assessment, a list of prohibited key words in analyzing text, etc.

VI. Conclusion

AI-based hiring systems are rapidly diffusing across many companies in most advanced economies, including South Korea. As traditional hiring practices have shown many problems in Korea, expectations of the potential benefits of AI hiring systems are particularly high among Korean job seekers. In this study, we introduced the general features of AI hiring systems and explored labor market reactions to these new hiring systems. By analyzing both qualitative and quantitative data acquired from surveys and interviews, we found that job applicants are concerned about the use of AI hiring systems. Specifically, job seekers show low levels of trust in AI hiring in terms of its predictive validity and perceive that AI hiring cannot replace traditional hiring systems, a result that is not satisfactory but is consistent with the concerns and opinions of HR professionals and AC experts from our field investigations. However, we also found that the results differed between job seekers with experience with AI hiring and those without such experience. The analyses also revealed gaps in opinions about AI hiring between accepted and rejected applicants. Given that the use of AI will be unavoidable in most business functions in the near future, using AI hiring systems wisely is the expected path forward. For more effective implementation, employers and policy makers should identify potential issues and subsequently determine how to cope actively with them.

References

- Bae, J. and C. Rowley. 2001. "The Impact of Globalization on HRM: The Case of South Korea." *Journal of World Business* 36(4) 402–428, [https://doi.org/10.1016/S1090-9516\(01\)00064-5](https://doi.org/10.1016/S1090-9516(01)00064-5).
- Barrick, M. R. and R. D. Zimmerman. 2005. "Reducing Voluntary, Avoidable Turnover Through Selection." *Journal of Applied Psychology* 90(1) 159–166, <https://doi.org/10.1037/0021-9010.90.1.159>.

- BBC News. 2018. "Are you scared yet? Meet Norman, the psychopathic AI," June 2, 2018, <https://www.bbc.com/news/technology-44040008>.
- Beardwell, I., L. Holden and T. Claydon. 2004. *Human Resource Management: A Contemporary Approach*. Harlow: FT Prentice-Hall.
- Campbell, D. T. and D. W. Fiske. 1959. "Convergent and Discriminant Validation by the Multitrait-multimethod Matrix." *Psychological Bulletin* 56(2) 81–105, <https://doi.org/10.1037/h0046016>.
- Cappelli, P. 2019. "Your approach to hiring is all wrong." *Harvard Business Review* 97(3) 48–58, <https://doi.org/10.1162/99608f92.440445cb>.
- Cascio, W. F. 2006. "The Economic Impact of Employee Behaviors on Organizational Performance." In *America at Work*, edited by E. E. Lawler and J. O'Toole, 241–256, NY: Palgrave Macmillan.
- Chosun Daily. 2016. "Job seekers, 18 applicants in the second half of the year," November 18, 2016, http://news.chosun.com/misaeng/site/data/html_dir/2016/11/17/2016111702886.html.
- Chosun Daily. 2018. "AI interviewer's preference.... More loads for job seekers," October 17, 2018, https://news.chosun.com/site/data/html_dir/2018/10/17/2018101700101.html.
- Coppin, A. 2017. *The Human Capital Imperative: Valuing Your Talent*. Springer International Publishing.
- Ekwoaba, J. O., U. U. Ikeije, and N. Ufoma. 2015. "The impact of recruitment and selection criteria on organizational performance." *Global Journal of Human Resource Management* 3(2) 22–33, <https://doi.org/10.5296/jpag.v8i3.13637>.
- Hankyoreh Daily. 2018. "38 charges with hiring fraud at six banks," June 17, 2018, http://www.hani.co.kr/arti/society/society_general/849387.html.
- Heneman, H. G., T. Judge, and J. D. Kammeyer-Mueller. 2003. *Staffing organizations*. New York: McGraw-Hill.
- JobNJoy. 2019. "80% of job applicants with unpleasant experiences," April 25, 2019, http://www.jobnjoy.com/portal/job/hotnews_view.jsp?nidx=276506&depth1=1&depth2=1&depth3=1&utm_source=dable, accessed Sept 14, 2019.
- Kavanagh, M. J., A. C. MacKinney, and L. Wolins. 1971. "Issues in Managerial Performance: Multitrait-multimethod Analyses of Ratings." *Psychological Bulletin* 75(1) 34–49, <https://doi.org/10.1037/h0030412>.
- Kristof-Brown, A. L. 2000. "Perceived Applicant Fit: Distinguishing Between Recruiters' Perceptions of Person-Job and Person-Organization Fit." *Personnel Psychology* 53(3) 643–671, <https://doi.org/10.1111/j.1744-6570.2000.tb00217.x>.
- Ministry of Employment and Labor of South Korea. 2019. *Employment and labor statistics*, <http://laborstat.moel.go.kr/>.
- New Scientist. 2018. "Discriminating algorithms: 5 times AI showed prejudice," April 18, 2018, <https://www.newscientist.com/article/2166207-discriminating-algorithms-5-times-ai-showed-prejudice/>.
- Pilbeam, S. and M. Corbridge. 2006. *People resourcing: Contemporary HRM in practice*, 3rd ed. Essex, England: Prentice Hall.
- Podsakoff, N. P., S. W. Whiting, P. M. Podsakoff, and P. Mishra. 2011. "Effects of Organizational Citizenship Behaviors on Selection Decisions in Employment Interviews." *Journal of Applied Psychology* 96(2) 310–326, <https://doi.org/10.1037/a0020948>.
- Reuters. 2018. "Amazon scraps secret AI recruiting tool that showed bias against women," October 11, 2018, <https://www.reuters.com/article/us-amazon-com-jobs-automation-insight/amazon-scraps-secret-ai-recruiting-tool-that-showed-bias-against-women-idUSKCN1MK08G>.
- Russell, S. and P. Norvig. 2010. *Artificial Intelligence: A Modern Approach*, 3rd ed. NJ: Prentice Hall.
- Schmidt, F. L. and J. E. Hunter. 1998. "The Validity and Utility of Selection Methods in Personnel Psychology: Practical and Theoretical Implications of 85 Years of Research Findings." *Psychological Bulletin* 124(2) 262–274, <https://doi.org/10.1037/0033-2909.124.2.262>.
- Schmitt, N. and D. M. Stults. 1986. "Methodology Review: Analysis of Multitrait-multimethod Matrices." *Applied Psychological Measurement* 10(1) 1–22, <https://doi.org/10.1177/014662168601000101>.



AUTHORS

Jaewan YANG (Presenter)

Associate Professor, College of Business, Hankuk University of Foreign Studies.

Minjae IM

College of Business, Hankuk University of Foreign Studies.

Seunghwan CHOI

College of Business, Hankuk University of Foreign Studies.

Jangil KIM

College of Business, Hankuk University of Foreign Studies.

Dong Hyun KO

College of Business, Hankuk University of Foreign Studies.