

## ICT-BASED RECRUITMENT AND SELECTION TOOLS: THE RECRUITERS' PERSPECTIVE

Alicja BALCERAK<sup>1\*</sup>, Jacek WOŹNIAK<sup>2</sup>

<sup>1</sup> Wrocław University of Science and Technology, Faculty of Management; alicja.balcerak@pwr.edu.pl,  
ORCID: 0000-0002-4507-0497

<sup>2</sup> University of Economics and Human Sciences, Warsaw; j.wozniak@vizja.pl, ORCID: 0000-0003-4610-2822

\* Correspondence author

**Purpose:** Earlier studies on the use of ICT-based recruitment & selection tools focused primarily on two perspectives: the organizational (predictive validity of the tool) and the candidate's (fairness of selection process using the tool), leaving aside the third one – recruiter's assessment of different aspects of tool usage. The aim of this study is to investigate this third perspective through studying Polish recruiters' opinions about different aspects of four ICT-based recruitment & selection tools.

**Design/methodology/approach:** On the basis of data collected using an e-questionnaire from 120 Polish recruiters, four hypotheses concerning the assessment of three aspects (functionality, candidate experience, and predictive validity) of various types of ICT-based tools used in employee selection processes were statistically verified.

**Findings:** Recruiters, regardless of the length of professional experience, notice differences in how each of the tools contribute to the three dimensions of the recruiter's role. These dimensions are: the recruiter as a person providing the organization with accurate predictions as to the likely success of the candidate in the job offered; the recruiter as a representative of the organization responsible for the efficiency of recruitment and selection processes; and the recruiter as a person who takes care of the company's image. Recruiters rated competence games and VR as the highest on candidate experience, while they value bots primarily for their functionality.

**Research limitations/implications:** The sample was unrepresentative, as it was created using the snowball methodology. The scales constructed for this study are of a pilot nature and further research is needed to assess and improve their psychometric values.

**Practical implications:** The study suggests that none of the three aspects investigated (i.e. functionality, predictive validity, and candidate experience) should be neglected when new tools are introduced to HR departments.

**Originality/value:** The study is a rare attempt at conducting a multidimensional investigation of acceptance of ICT-based recruitment/selection tools from the recruiter's perspective.

**Keywords:** recruitment, selection, recruiters, ICT-based selection tool, candidate experience.

**Category of the paper:** Research paper.

## 1. Introduction

The use of information and communication technologies (referred to in this article as: ICT) in human resource management, and in employee selection processes in particular, has become a standard of good practice in the 21st century. The reason for this phenomenon is undoubtedly the fact that these applications lead to the automation of many HR activities (reducing implementation costs and at the same time increasing their quality) (Lepak, Snell, 1998). ICT can also effect in changes in HR processes themselves, and thus create resistance as is the case with every innovation. The approaching wave of new ICT-based solutions, especially in the field of Artificial Intelligence (AI), such as Chatbot GTP, raises the question of whether the older ICT-based recruitment tools have been fully accepted, not only by potential employees, but also by employees of HR departments, for whom dealing with new technological solutions may prove to be an excessive challenge.

Research on the use of ICT in employee recruitment and selection processes has been conducted for years (see reviews in: Breaugh, 2013; McCarthy et al., 2017; Woods et al., 2020), but they are currently dominated primarily by two perspectives. Firstly, this is the organizational perspective, understood as determining the usefulness of a specific tool in predicting which of the candidates may succeed at work (Ryan, Ployhart, 2000; Potosky, Bobko, 2004; Van Iddekinge et al., 2016). Secondly, this is candidates' perspectives, understood as attitude to being recruited with these tools (Ryan, Ployhart, 2000; Anderson, 2003; McCarthy et al., 2017; Nikolaou et al., 2019; Balcerak, Woźniak, 2020). The third perspective – namely the attitude of recruiters to the use of these tools – is less frequently present in the scientific literature (Albert, Aggarwal, Silva, 2019; Koivunen et al., 2021; Mirowska, Mesnet, 2021; Ore, Sposato, 2021), although for many years it has been repeated that it is necessary to take this perspective into account (Roth et al., 2013; Black, Stone, Johnson., 2015; Van Iddekinge et al., 2016; Wheeler, Dillahunt 2018; Lu, Dillahunt 2021). We are also not familiar with Polish research on this third perspective, hence the goal of this text is to commence analyses that will start filling this gap.

The aim of this text is to analyze the perception by Polish recruiters of 3 well-known ICT-based recruitment/selection tools, namely: ATS (Applicant Tracking System), i.e. programs for managing a database with applications, the use of computer games to assess the competencies of job candidates, further called competence game, and simple dialogue programs based on decision trees (hereinafter referred to as bots), as well as one solution that is not yet used in recruitment processes in Polish practice, virtual reality systems (hereinafter referred to as VR). On the basis of an e-questionnaire study of a group of 120 respondents working in HR departments of Polish organizations, relationships were verified between chosen personal factors (employment in new technology industries, professional experience) and the assessment of three aspects (functionality, candidate experience, and predictive

validity) of various types of ICT-based tools used in employee selection processes. The hypothesis concerning the convergence of assessments of various aspects was additionally verified. This allowed for the formulation of several practical recommendations and postulates for further research.

The text is structured as follows. The first part discusses the issues of new ICT-based selection tools and the consequences of their relationship to standard tools (interview, job samples) for the assessment of the attitude of three stakeholders of the selection process, i.e. candidates, companies and recruiters. The second part (section 3) presents a preliminary empirical study checking how selected factors affect the acceptance of new selection tools by recruiters. The next sections present the results of the study and their discussion, including a discussion of practical consequences.

## **2. Theoretical background and hypotheses development**

Staffing is a key HR process that enables an organization to fill vacancies, and thus determines its ability to succeed. Scientific research on this process shows that it is subject to constant improvement and is in the center of attention of managers. Filling positions with the right people requires communication with the relevant segments of the labor market and encouraging certain people to apply (the recruitment process), and then assessing candidates' competencies in terms of their suitability for the position to be filled (so-called selection). Recruiters, as the employees of the HR department (or consulting companies who take over some of these tasks when outsourced) who perform these tasks are called, use various tools in these processes. Some of these tools are used to facilitate administrative and communication activities, some to assess the competencies of candidates, and some create communication channels enabling interaction with candidates, including auto-selection. The development of information and communication technologies allows some of these tasks to be fully automated (which reduces their costs while improving quality), and to partly change the traditional methods of carrying out activities in a manner adapted to the expectations of stakeholders.

The selection of employees is a HR process in which the influence of ICT is particularly noticeable (Nikolaou, 2021). Extensive use of data from virtual spaces, such as social networks, as an additional source of information about job candidates, whether in the area of searching for potential people who meet the company's expectations and encouraging them to apply or at the stage of assessing the competence of people applying to the company, has already become a standard (Balcerak, Woźniak, Zbucnea, 2023). However, the use of ICT-based tools, intended to automate several activities carried out in the process of acquiring employees, goes far beyond the analysis of social media content and began before the social media gained any significance.

Historically, the earliest tool commonly used in this area was the ATS (Applicant Tracking System), i.e. programs for managing a database with applications, which grew out of the need for efficient recruitment communication with potential candidates in recruitment portals (e.g. Monster, and in Poland – pracuj.pl) and facilitating data management from collected applications (Fresher, 2016). Currently, tools of this type not only allow you to analyze the applications stored in the database, or handle communication with candidates (in terms of arranging meetings or sending feedback), but they also search for suitable candidates in social media, track signals about their readiness to be activated, and stimulate their willingness to apply to a specific company (cf. review in: Woźniak, 2020). However, Polish companies are most likely dominated by older generations of these tools (cf. argumentation in: Woźniak, 2020). Already at the beginning of the 20th century, data showed that Polish companies were highly saturated with these tools (Woźniak, 2013), so from the perspective of a Polish recruiter, these are well-known tools for managing databases and automating some other activities.

Computer games (competence games) also have been used for years as a recruitment and selection tool. It grew out of the astonishment of people's involvement in playing computer games, and selection processes have used them as far back as 2002 when the US Army created a computer game for the purpose of vocational pre-orientation (and also to improve the image of military work) (Michael, Chen, 2006). The actual inclusion of computer games in recruitment processes took place in 2011, when Marriott made available a computer game for vocational pre-orientation, but combined with the possibility of direct application for a given type of job (Freer, 2012).

Since the early 2000s, there was an expectation that actions during a game could be equivalent to actions in real situations, so that games could replace simulated work samples or even an Assessment Center (cf. Kapp, 2014; Armstrong et al., 2016). One of the authors of this text is an antagonist of the use of computer games in the employee selection (Woźniak, 2013; 2015; cf. arguments in: Woźniak, 2020), and receives invitations from Polish consulting companies to test various games created for the use of HR departments. This allows us to state that the use of games in the employee the selection in Polish large companies is so frequent, that HR employees of such companies know this tool at least by hearsay.

It can also be assumed that dialogue programs built on the basis of decision trees, called dialogue bots, are a similarly well-known tool. They are used to collect preliminary information from candidates in a 7/24 format, but also to provide them with feedback on excessive financial expectations or inadequacy of their qualification profile to the profile of the desired candidate in recruitment. The first programs of this type in Poland were already operating in the second decade of the 21st century and their creators were Budimex (in 2017) and Santander (in 2018) (Woźniak, 2020). They are built on the principles known since the 1960s, when decision trees were searched for a way to reflect potentially possible dialogue

scenarios. In the practice of the selection process, the use of such tools requires recruiters to prepare all texts for the dialogue for the bot (Koivunen et al., 2021). It is worth noting that although bots are typologized more broadly, so that this group includes intelligent assistants such as Apple's Siri (i.e. recognizing content in voice statements thanks to the use of AI), only the simplest bots, the so-called button-bots (also known as menu bots or flow bots), are used in the selection processes in Poland. They are built like a decision tree where the user follows the prepared conversational path by clicking on the options provided by the bot. The use of bots in the selection processes that recognize key words in the written text (e.g. in the analyzed CVs), which have their sources in the ELISA dialog program from the 1960s, is also known to Polish recruiters, but the use of speech recognition programs (which creates the third type of bots after button-based and responding to keywords, an example of which is the aforementioned Siri, and in Poland Max by Orange) is limited in Poland to customer service.

These new types of tools, such as bots that analyze spoken natural language, are already making extensive use of AI-based solutions. Among the tools analyzed here, these AI techniques are sometimes used in the preparation of competency assessment based on activity in computer games, and are particularly visible in the last of the types of ICT use in selection processes discussed here, i.e. VR.

J. Jerald (2015, p. 9) defines VR as “a computer-generated digital environment that can be experienced and interacted with as if that environment were real”. The most common output devices for VR include visual displays (for example head-mounted display), speakers, haptics (devices that stimulate the senses of touch and motion), and motion platforms. In this paper we use the term VR in a broad sense, including not fully-immersive VR systems like augmented reality systems (AR). VR and AR are successfully applied in the entertainment industry, therapy, architecture, education and training. VR prototypes and applications in the selection process include, for example, the identification of candidates with a fear of heights (Winarsim, Amaliah, 2021), or for recognizing the skills of immigrants to work in restaurants despite poor language skills (Kauppinen, Drake, 2020), so they are based on simulated samples work and allow conclusions from candidates' behaviour.

Investments in the development of these programs will soon result in the possibility of implementing a simulated Assessment Center or computer games in which immersion in "physical" reality will reduce the strength of one of the arguments against the adequacy of action in a computer game as an equivalent of action in a simulated sample of work, i.e. the conventionality of the simulated environment. Therefore, potentially greater accuracy of predictions based on "work samples" implemented in VR can be expected, but – as far as we know – they are not yet used for this purpose in Poland. It can be expected that VR will be used for selection interviews earlier in order to increase the range of communication media beyond what is possible through communication via communicators such as Skype. So in Poland, the use of VR in selection is still in the form of postulates and first attempts,

and the value of this tool for selection processes will depend not only on its capabilities as a space enabling a richer communication, but on the selection tools in the strict sense that will use this wealth forms of communication, i.e. an interview or various simulated work samples.

This short presentation of selected ICT-based tools used in the recruitment/selection process was intended to bring the reader closer to the tools covered by the study, but also to indicate what level of everyday familiarity with them can be expected from Polish recruiters. It should be clearly emphasized once again that a recruitment/selection tool is understood here more broadly than in the literature on employee selection, where it is usually identified with a tool for assessing the candidate's competencies in a certain way (Listwan, 2010; Woźniak, 2013). Out of the 4 tools analyzed here, only competence games and bots are selection tools in the narrower sense. Bots collect data from candidates and reject some of them on the basis of criteria previously prepared by the recruiter, while games can verify chosen competencies based on simulated work samples. VR and ATS are recruitment/selection tools in this more general sense (referred to below as “broader sense”), because they facilitate the implementation of activities by recruiters as they use other selection tools (in the narrow understanding). E.g. with VR (as a broader tool) – recruiters can use selection interviews or simulated work samples, and with ATS – mainly documentation management (ATS is “invisible” from the candidate's perspective, hence it will be excluded from candidate experience analyses). Hence, some of the conclusions from the research on the perception of selection tools by candidates will be based on inference by double analogy, not only as inference about the opinion of recruiters from the results of the candidates' opinion, but also as inference from the opinion about selection tools in the narrower sense, to the opinion about selection tools in the broader sense. In addition, one of the tools in the broader sense (ATS) is widespread, while the other (VR) is not. A summary of the characteristics of the tools presented above and a specification of the aspects of their assessment is presented in Table 1.

**Table 1.**

*Characteristics of the examined ICT-based recruitment and selection tools*

<b>Tool</b>	<b>Type of selection tool</b>	<b>Widespread use in Polish HR</b>	<b>Technical complexity level</b>	<b>Tool evaluation dimensions (studied in this paper)</b>
Applicant Tracking System	the broader sense	very large	low	Functionality
Competence game	the narrow sense	large	high	Functionality, predictive validity, candidate experience
Bot (bottom-down)	the narrow sense	large	low	Functionality, predictive validity, candidate experience
VR systems	the broader sense	small	high	Functionality, predictive validity, candidate experience

Studies on the reception of ICT-based selection tools indicate that candidates familiar with a given type of tool (Snyder, Shahani-Denning, 2012) or having their own experience with a similar tool (Woźniak, 2019; Balcerak, Woźniak, 2020) have a more favorable attitude towards using this tool in the selection processes. It can therefore be expected that a similar mechanism applies to recruiters – good past experience with the use of a specific tool (or a tool of a given type) will favor its use in the future, but also a good opinion about a given tool.

The starting point of our study is the statement that the assessment of a specific tool depends not so much (or only) on the tool as such, but on the aspect that is assessed in the use of this tool. From the perspective of the recruiter's role as a person carrying out the tasks assigned to him by the organization, the decision which of selection tools should be chosen requires taking into account several – unrelated – criteria: predictive validity of a given tool, effectiveness and efficiency of its use, and the image-related consequences that the use of a given tool in the selection process leads to. They result from the various roles that the recruiter performs: he/she is to select the right employees for the organization (the role of the recruiter in the strict sense), he/she is to do it effectively (the role of a corporate employee) and he/she is to do it in a way that maximizes the good image of the company, i.e. taking care of the quality of candidate experience (marketing role of a person who cares about the company's image). In our study, we will take into account the three aspects mentioned above in terms of which the recruiter must evaluate a given selection tool in order to make a difficult choice which tool to choose for selection, i.e. predictive validity, effectiveness and efficiency of using a given tool (estimated by evaluating the functionality of this tool i.e. the presence of attributes that make a tool useful for its intended purposes), and candidate experience.

The interpretation of effectiveness (including cost-effectiveness and efficiency) adopted in the study requires a few words of comment. We assume that if the tool has already been purchased for the organization and is functional, i.e. useful for its intended purposes and user-friendly, then its use contributes to streamlining the recruitment process, saving time and costs. It should therefore be expected that well-known tools with known benefits from their use, i.e. ATS and bots, should be rated higher due to their functionality than tools that are more complicated, less known and with less known benefits.

An argument for this order may be the results of the study, which showed that the more technically complex the tool, the worse its assessment – by students as a job candidate – as a useful tool for assessing the suitability of a job candidate (Schick, Fischer, 2021). Since ATS and bots should be included in the lowest complexity group, and games and VR in the higher group, it should be expected that their evaluation in terms of functionality will correspond to this order (i.e. ATS and bots will be rated higher than games and VR).

On the other hand, a number of earlier studies indicated that the attitude towards ICT-based selection tools depended on the directly or indirectly measured computer competence. Previous research has shown that ICT familiarity sometimes promotes higher

acceptance of its applications in selection processes (Langer et al., 2019), but sometimes it works the other way around (Langer, König, Fitali, 2018; Zacny, Kania, Sołtysik, 2019; Woźniak, 2019; Langer, Landers, 2021). We will test the differences in the perception of various aspects of the impact of these 4 tools due to ICT familiarity measured by respondent's employment in companies from the new technologies sector, as 1/3 of the HR employees surveyed by us work in companies from the new technologies sector. So, we formulate a clause in hypothesis 1 that introduces a difference assessment of tools as to their functionality by the respondents employed in the new technology industries.

***Hypothesis 1.*** *Respondents employed in new technology industries will assess the functionality of the surveyed tools similarly. Others will rate the functionality of less technically complex tools (ATS and bots) higher.*

The second criterion that recruiters must take into account when choosing a tool is the effect of its use on candidate experience. Candidate experience – understood in recruitment research along the lines of customer experience studied by marketing – is a broader concept than just assessing the fairness of the selection process, and is sometimes defined as “an applicant's overall cognitive and affective perceptions based on multiple interactions with a hiring organization over the course of the entire recruitment and selection process” (McFarland et al., 2022, p. 5). This means in particular that recognizing a specific tool as unfair obviously evokes negative feelings (candidate experience), but this construct will also include other factors, e.g. considering the company using a given recruitment tool as modern.

However, the main source of scientific findings in this area is still the 30 years tradition of research on the perception of fairness of selection tools (Steiner, Gilliland, 1996; Ryan, Ployhart, 2000; Anderson, 2003; McCarthy et al., 2017; Balcerak, Woźniak, 2020). It brought several well-established findings regarding candidates' perception of particular tools, which brought practical recommendations for recruiters. Candidates better accept (assess it more fair) selection that uses tools that are understandable for them and related to the job they are to perform, and give them the opportunity to present themselves in contact with the recruiter (Truxillo, Steiner, Gulliland, 2004). In practice, this means that it is more desirable for recruiters – who fulfill their professional role as an employee of the company who cares about its image – to choose tools that are the best equivalent of those that candidates evaluate the highest on the fairness scale, i.e. selection interviews and work samples (Anderson, Witvliet, 2008; Anderson, Salgado, Hülshager, 2010; Woźniak, 2013; 2019), wherever they carry sufficient information to predict success at work in a given company. Research on tools analogous to traditional selection tools, but being their ICT-based equivalents (Woźniak, 2019; Balcerak, Woźniak, 2020; 2021; Woods et al., 2020), confirms these findings, so the more an ICT-based tool resembles an interview or (simulated) work sample the more it is accepted by candidates as fair (although it is usually rated lower than an analogous traditional tool – Woźniak, 2019; Balcerak, Woźniak, 2020; 2021). In this sense, all three tools (without ATS) analyzed here belong to one group from the fairness perspective, and they differ only in



the way they are implemented and in the richness of communication channels that are used for dialogue, or in accuracy and fidelity of simulated “work sample”. This suggests that the fairness dimension in relation to the three tools that will be analyzed here can be considered not very differentiating, i.e. their use should not – in accordance with current scientific findings – have a significantly different impact on the candidate experience by shaping the company's image and the recruitment process as not very honest.

However, from other studies, i.e. studies on communication channels (Potosky, 2008), it is known that communicating with a candidate in a richer communication channel increases his/her satisfaction with the selection process. It should therefore be assumed that communication-rich tools, i.e. competence games and VR, should be rated higher (assuming *ceteris paribus*) in terms of candidate experience than bots – a more well-known but with poorer communication (still assuming that they have the same level of fairness). This means that it is possible to formulate a hypothesis that in terms of candidate experience, bots will be rated the lowest, while competence games and VR will be rated higher.

One of the components of the assessment that forms the candidate experience measure is the recognition of the company as modern, thanks to the observation of the tools used by recruiters. The importance of using modern selection tools for recognizing a company as modern and innovative was confirmed in early scientific research, which indicated that – at a time when ICT-based recruitment and selection tools were still novelties – their use was conducive to assessing the company as modern (Blacksmith et al., 2016).

This component probably has a different weight in the overall assessment, depending on the company candidates aspire for – the more technologically sophisticated the company, the more important this factor may be. Hence, there should be differentiation due to the respondent's belonging to the group employed in the new technology industries, because employees of such companies should pay more attention to the aspect of modernity and innovativeness than employees of traditional organizations. From this perspective, respondents employed in the new technology industries should rate competence games and VR higher than respondents from other companies. This allows us to formulate the second part of Hypothesis 2.

It should be remembered that there is currently no data that can objectively measure the impact of the use of a given type of tool on the opinion of a company as modern and innovative, although it can be assumed that more well-known tools, i.e. competence games and bots, will be rated lower in this respect than VR, which is not only technologically more demanding, but has also been publicized by the significant investments of Meta (Facebook) in this ICT segment (Jamroz, 2022). Therefore, it can be said that the order of setting the tools in companies that highly value modernity, as proposed here, may be different, as it can be assumed that competence games will be treated by respondents employed in the new technology industries as tools whose candidate experience level is the same as bots.

On the other hand, one should remember about candidates' reluctance to be assessed using AI (Zacny, Kania, Sołtysik, 2019; Mirowska, 2020). Therefore, it can be suspected that also for candidates for new technology companies, the use of AI – which is necessary to create VR – may negatively affect the evaluation of candidate experience caused by using this method, and thus the entire candidate experience (which makes hypothesis 2 not trivial in this matter).

**Hypothesis 2.** *In terms of perceived candidate experience bots will be rated the lowest. Respondents employed in the new technology industries will rate candidate experience of competence games and VR higher than others.*

Another aspect due to which recruiters should evaluate each tool used in employee selection is its predictive validity, i.e. the ability to separate people who will succeed at work in a given position from others. The recruiters' opinion about this aspect is always the result of experience with specific representatives of a given class of tools and/or conclusions from scientific research on a given class of tools, and – or maybe even above all – the effects of marketing activities of consulting companies.

Being aware of this multiple impact on the formation of recruiters' opinions, we believe that competence games will be rated the highest in terms of predictive validity as tools that are closely related to work samples, enabling the examination of many competences and for years being the object of many promises of consulting companies as an ideal tool for diagnosing competences. Bots, although undoubtedly more widespread than games, are better known as pre-selection tools (and self-selection carried out by the candidate), but they examine qualifications, not competences. Since recruiters tend to base selection on competencies rather than qualifications, it should be assumed that games will be rated higher than bots in terms of predictive validity.

VR, as a tool in the broader sense, not very popular and little researched, should be rated definitely the lowest in this respect, unless the opinion on predictive validity is influenced (through the "halo effect") by opinions on its other advantages, such as a positive impact on building image of a modern company. Nevertheless, we formulate the third hypothesis as follows:

**Hypothesis 3.** *Perceived predictive validity will be the highest for competence games, lower for bots and the lowest for VR.*

As we have already mentioned, the distinction between the three aspects of the assessment, or the criteria on the basis of which recruiters should evaluate a given selection tool when deciding on a particular method of assessing candidates, is clearer in theory than in practice. These three perspectives adopted by recruiters may not be so clearly separated in the minds of a single recruiter. The influence of the halo effect cannot be ruled out either – the assessment of one aspect can be transferred to the others. This effect is even more likely for less experienced recruiters. Therefore, we formulate the following hypothesis:

***Hypothesis 4.** Evaluations of individual tools in three examined aspects (functionality, candidate experience, and predictive validity) of respondents less experienced in work in the HR area (working at most 5 years in this area) will converge. The evaluation of more experienced employees will vary.*

### **3. Method**

#### **3.1. Respondents' characteristics**

The study was conducted using an online questionnaire posted on a discussion forum for HR employees, i.e. mainly LinkedIn, supplemented by personal invitations in private social media by Mrs. M. Kisiel – an employee of the HR department and the data was made available to the authors for the purposes of this article. A snowball sampling method was used and 120 responses were obtained from people operating in the HR area. The respondents were experienced HR employees, only 12% of them worked for less than 1 year in this department, and another 27% of the respondents had an internship of 1 to 5 years. 33% of the respondents had more than 11 years of service.

The group was also diverse in terms of age: 18% of the respondents were under 25, 38% were aged 26-35, 44% were aged 36-45, and only 16% of the respondents were over 46 years of age. Due to the type of work, higher education prevailed among the respondents: 68% had a full master's degree and the rest had a bachelor's degree and were still studying, and for the same reasons women constituted 3/4 of the sample. 52% of people worked in companies with more than 500 employees, and only 13 people in companies with less than 50 employees (the others worked in companies with 51-500 employees). 37.5% of the respondents worked in the new technology industry (industry based on new technologies, services based on new technologies and technology companies in the area of ICT and biotechnology) – the rest were classified as working in traditional industries.

The study used a questionnaire consisting of 4 blocks of questions concerning each of the 4 tools, each of which was preceded by a short definition of a given tool. The definition was followed by a series of detailed statements rated on a 5-point Likert scale (1 – totally disagree; 5 – totally agree). Questions that make up different measures have been mixed to minimize response bias.

#### **3.2. Measures**

**Functionality** i.e. a set of attributes that make a tool useful for its intended purposes was measured differently for each tool, because for each of them there was a different set of key attributes. Sample questions include (Cronbach's alphas in brackets):

- For ATS: *ATS connected with the recruiter's calendar make arranging appointments much easier. Generating reports from the ATS system allows for ongoing and effective monitoring of processes (0.89).*
- For competence games: *A competence game enables the appropriate selection of tasks for testing the competences needed for a given position. A competence game enables a personalized selection of tasks for assessing the candidate's competencies (0.74).*
- For bots: *Bots doing pre-interviews do it faster than a human. The use of bots and chatbots shortens the implementation of selection processes (0.81).*
- For VR systems: *VR reality allows a person to experience situations almost in line with real ones, thanks to which the assessment of the candidate's behaviour is more reliable. Virtual reality allows candidates to be shown their future work environment (0.81).*

**Candidate experience** (understood in recruitment research as the equivalent of a comprehensive assessment of the customer service process, i.e. on the model of customer experience) of VR, competence games and bots was measured using six items:

- *[This tool] makes candidates more involved in the recruitment process.*
- *[This tool] makes candidates more satisfied with the recruitment process.*
- *[This tool] makes candidates believe that the selection tests in this process give a good assessment of suitability for the job being filled.*
- *[This tool] makes candidates less likely to drop out during the selection process.*
- *The use of [this tool] contributes significantly to a positive candidate experience.*
- *The use of [this tool] in recruitment and selection processes builds the company's image as a modern one.*

The current state of scientific knowledge is based on such ad hoc scales (McFarland et al., 2022), and factor analysis showed that the scale proposed in our study creates one factor. Cronbach's alpha was 0.91.

**Perceived predictive validity** of VR, competence games and bots was measured using five items:

- *[This tool] makes it possible to accurately predict whether a candidate is able to perform only some tasks within the scope of duties for a specific position.*
- *[This tool] makes it possible to accurately predict whether a candidate is able to perform all tasks within the scope of duties for a specific position.*
- *[This tool] makes it possible to accurately predict whether a candidate is a suitable candidate for the job being filled.*
- *[This tool] makes it possible to accurately predict whether a candidate has the appropriate social and interpersonal skills to work in the position being filled.*
- *[This tool] makes it possible to accurately predict whether a candidate is a suitable candidate for cooperation with the manager of the position being filled.*

Cronbach's alpha was 0.87.

**Technical complexity** of the tool was a dichotomous variable with a value of 0 for ATS and bots, and a value of 1 for Competence Games and VR.

IBM SPSS Statistic software (ver. 28) was used to conduct all statistical analyses. The criterion for statistical significance was set at 5%.

## 4. Results

Table 2 presents the means, standard deviations, and correlations among the variables used in this study.

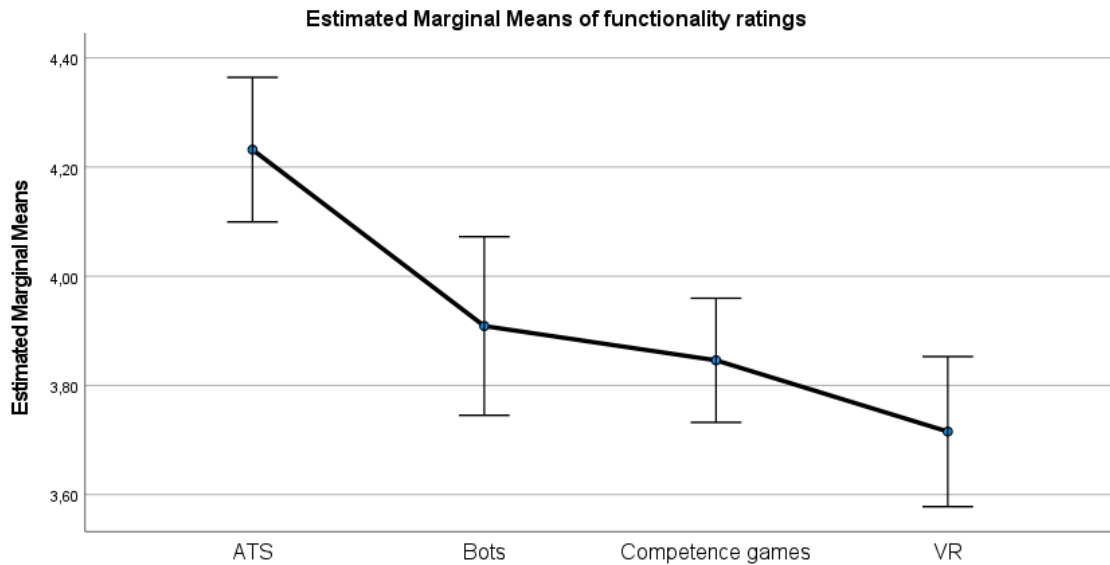
**Table 2.**  
*Means, standard deviations and correlations*

Measure	M	SD	Correlations								
			1	2	3	4	5	6	7	8	9
<b>Functionality</b>											
1. ATS	4.23	0.71									
2. Competence games	3.83 <sup>A,B</sup>	0.61	0.61								
3. Bots	3.91 <sup>A</sup>	0.87	0.73	0.48							
4. VR	3.72 <sup>B</sup>	0.73	0.68	0.44	0.75						
<b>Candidate experience</b>											
5. Competence games	3.96 <sup>C</sup>	0.69	0.66	0.85	0.55	0.56					
6. Bots	3.29	0.90	0.56	0.45	0.72	0.59	0.51				
7. VR	3.96 <sup>C</sup>	0.86	0.63	0.51	0.70	0.80	0.60	0.62			
<b>Predictive validity</b>											
8. Competence games	3.49 <sup>D</sup>	0.70	0.60	0.73	0.49	0.43	0.81	0.54	0.57		
9. Bots	2.93	0.99	0.54	0.50	0.66	0.59	0.57	0.81	0.66	0.63	
10. VR	3.39 <sup>D</sup>	0.75	0.48	0.43	0.62	0.62	0.47	0.60	0.62	0.45	0.77

Notes. Means with the same superscript are not significantly different at the 0.05 level. All correlations are significant at the 0.05 level

To investigate differences in functionality ratings, a two-way repeated measures ANOVA with one between-subject factor (employment in the new technology industry) was performed. Because of sphericity violation (Maluchy's  $W = 0.785$ ,  $p < 0.001$ ), and Greenhouse-Geisser  $\epsilon = 0.852$ , Huynh-Feldt correction was applied. Levene's statistics (based on means) for all functionality scores are nonsignificant ( $p > 0.05$ ), so the assumption of homogeneity of variance is met.

The analysis indicated that interaction effect tool x (employment in the new technology industry) is not significant ( $F_{(2.64, 311.49)} = 0.698$ ,  $p = 0.536$ ). The main effect of the between subjects factor (employment in the new technology industry) is also not significant ( $F_{(1, 118)} = 0.057$ ,  $p = 0.811$ ). The main effect of tool (a within-subjects factor) is statistically significant ( $F_{(2.64, 311.49)} = 25.801$ ,  $p < 0.001$ ) and large (partial eta-squared = 0.179). Estimated marginal means of functionality ratings are presented in Figure 1.



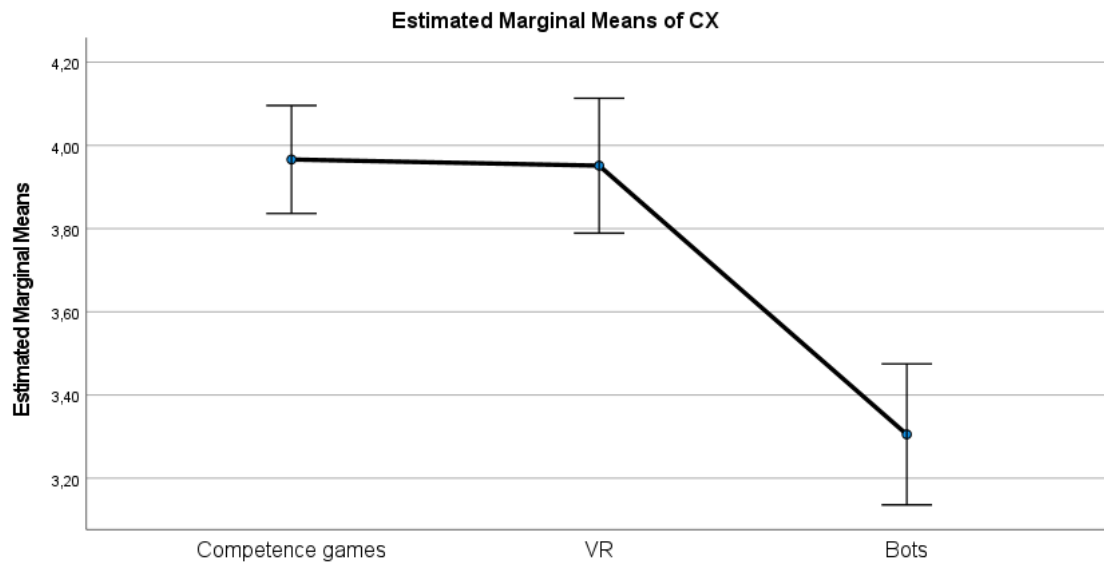
**Figure 1.** Estimated marginal means of functionality ratings of ATS, bots, competence games, and VR systems.

The pairwise comparisons with Bonferroni correction revealed that perceived ATS functionality is significantly higher rated than functionality of games ( $p < 0.001$ ), boots ( $p < 0.001$ ), and VR ( $p < 0.001$ ), functionality of bots are significantly higher rated than functionality of VR ( $p = 0.004$ ), and differences between ratings of games and bots, and between ratings of games and VR are not significant. This results indicate that the first hypothesis is partially supported.

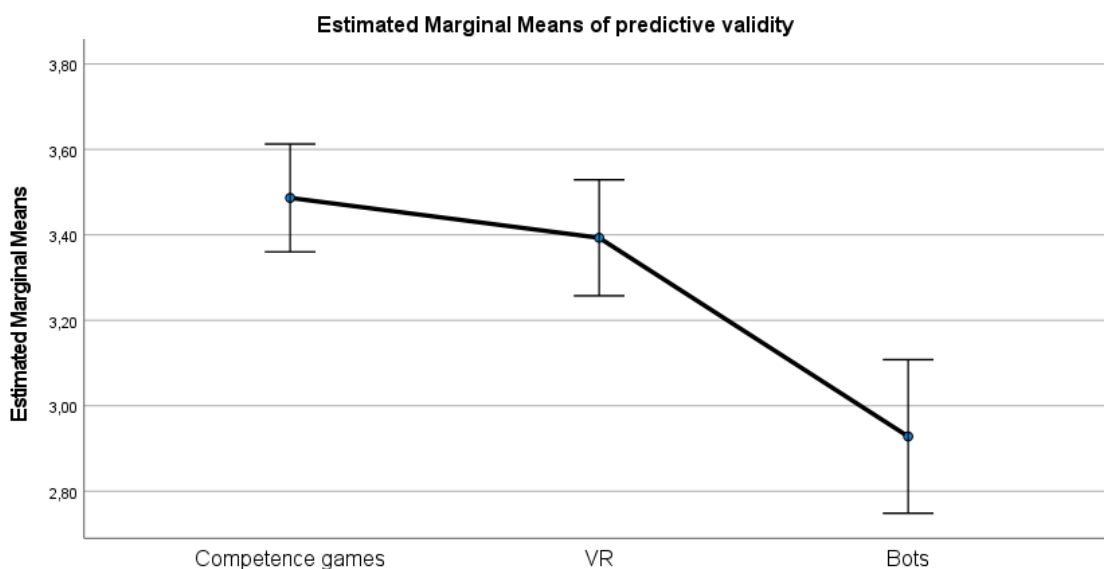
To investigate differences in candidate experience ratings, a two-way repeated measures ANOVA with one between-subject factor (employment in the new technology industry) was performed. Sphericity assumptions was met (Maluchy's  $W = 0.978$ ,  $p = 0.267$ ). Levene's statistics (based on means) for all candidate experience scores are nonsignificant ( $p > 0.05$ ), so the assumption of homogeneity of variance is met.

The analysis indicated that interaction effect (tool) x (employment in the new technology industry) is not significant ( $F_{(2, 236)} = 0.303$ ,  $p = 0.739$ ). The main effect of the between subjects factor (employment in the new technology industry) is also not significant ( $F_{(1, 118)} = 0.026$ ,  $p = 0.871$ ). The main effect of tool (a within-subjects factor) is statistically significant ( $F_{(2, 236)} = 54.157$ ,  $p < 0.001$ ) and large (partial eta-squared = 0.315). Estimated marginal means of functionality ratings are presented in Figure 2.

The pairwise comparisons with Bonferroni correction revealed that candidate experience of bots is significantly lower rated than candidate experience of competence games ( $p < 0.001$ ), and VR systems ( $p < 0.001$ ). The differences between perceived candidate experience of competence games and VR systems are not significant. This results indicate that the second hypothesis is also only partially supported.



**Figure 2.** Estimated marginal means of candidate experience ratings of competence games, VR systems, and bots.



**Figure 3.** Estimated marginal means of predictive validity ratings of competence games, VR, and bots.

To investigate differences in perceived predictive validity, a repeated measures ANOVA was performed. Because of sphericity violation (Maluchy's  $W = 0.939$ ,  $p = 0.025$ ), and Greenhouse-Geisser  $\epsilon = 0.943$ , Huynh-Feldt correction was applied.

The analysis indicated that there were significant differences in perceived predictive validity ratings ( $F_{(1.915, 227.881)} = 40.68$ ,  $p < 0.001$ ). The main effect is large (partial eta-squared = 0.255). The pairwise comparisons with Bonferroni correction revealed that perceived predictive validity of bots is significantly lower rated than predictive validity of VR ( $p < 0.001$ ), and games ( $p < 0.001$ ), although difference between predictive validity of games and of VR is not significant ( $p = 0.551$ ). Estimated marginal means of predictive validity ratings are presented in Figure 3. The third hypothesis is confirmed only with respect to the highest scores of predictive validity of competence games.

To investigate differences in ratings of three aspects (functionality, candidate experience, and predictive validity) regarding competence games, bots and VR systems three two-way repeated measures ANOVAs with one between-subject factor (professional experience) were performed. Because of sphericity violations and Greenhouse-Geisser  $\epsilon > 0.75$ , Huynh-Feldt corrections were applied. The ANOVAs' results are given in Table 3. The analyses indicated that interaction effects (aspect) x (professional experience) as well as the main effect of the between subjects factor are not significant. The differences between ratings of three investigated aspects are significant. Predictive validity was the lowest rated aspect for all three types of tools. The highest were rated: candidate experience (in the case of competence games and VR systems) and functionality – in relation to bots.

**Table 3.**

*Differences in ratings of functionality, candidate experience, and predictive validity – the results of ANOVAs and pairwise comparisons with Bonferroni correction*

Tools	Tests of effects			Significant pairwise differences
	interaction	between-subjects	within-subjects	
Competence games	$F_{(1.858, 219.23)} = 0.024$ ; $p = 0.97$	$F_{(1, 118)} = 0.171$ ; $p = 0.68$	$F_{(1.858, 219.23)} = 72.923$ ; $p < 0.001$ ; partial eta-squared = 0.38 (large)	CX > Funct. > PV
Bots	$F_{(1.844, 217.26)} = 0.758$ ; $p = 0.46$	$F_{(1, 118)} = 0.48$ ; $p = 0.49$	$F_{(1.844, 217.26)} = 120.135$ ; $p < 0.001$ ; partial eta-squared = 0.50 (large)	Funct. > CX > PV
VR systems	$F_{(1.810, 213.542)} = 2.176$ ; $p = 0.121$	$F_{(1, 118)} = 1.309$ ; $p = 0.255$	$F_{(1.810, 213.542)} = 44.336$ ; $p < 0.001$ ; partial eta-squared = 0.27 (large)	CX > Funct. > PV

Abbreviations: Funct. – functionality, CX – candidate experience, PV – predictive validity.

## 5. Discussion of the results

The first three hypotheses, which were partially confirmed, show the scale of expectations that recruiters associate with the two latest tools, i.e. competence game and VR. As the data in the charts above show, both in terms of predictive validity and candidate experience, they are rated higher than the tool well-known to recruiters, which is the bot, despite the highest rating of this tool from the perspective of its functionality. Assuming that the respondent's assessment of these two latest tools is based not so much on personal experience of using them, but rather it was influenced by media opinions and the image they were formed in the recruiters' environment, it can be assumed that the surveyed Polish recruiters are open to new solutions based on ICT.

As expected, well-known tools are rated as highly functional, but it may come as a surprise that the bots score is clearly weaker in this respect (insignificantly different from the ratings of the functionality of competence games) in relation to ATS. Such an assessment



of bots may result from the perception of their obsolescence; Polish recruiters, as consumers on the Polish market, have their own experience with bots of the 3rd generation, i.e. they dialogue relatively freely in the colloquial spoken language, compared to which traditional button-down bots do not look modern.

The relatively low – in comparison with other tools – assessment of the functionality of bots could also be caused by the need to spend a lot of work on the construction of texts for the decision tree, but also the need to establish strict qualification criteria for rejecting candidates for a number of positions. It can be concluded that the benefits of using bots based on dialogue trees are the highest for very large companies that conduct mass recruitment for several similar positions, and for smaller companies – which clearly prevail in our sample and on the Polish market – then the benefits of saving the labor of HR employees are smaller. Therefore, we cannot rule out that the low assessment of the functionality of bots is partly an artifact resulting from the nature of the companies from which the respondents come (i.e. not carrying out mass recruitment during which millions of candidates must be rejected using the qualification criteria), and is not an assessment of the low functionality of bots as such.

The collected data do not allow to determine whether the reason for the result obtained here is the specificity of recruitment conducted by the surveyed recruiters or poor knowledge of the usefulness of bots in Poland, which indicates the need for further research in this area. It can be assumed that the first bots used in Poland before the pandemic actually had mainly image purposes and were supposed to increase candidate experience, and were not primarily used to automate the process of assessing qualifications or rejecting people with unrealistic financial expectations. Stopping mass recruitment in most industries during the pandemic could therefore cause bots to be associated more with a tool for building the company's image than with an authentic tool for automating repetitive tasks in the selection process, with which ATS is undoubtedly associated.

As expected, predictive validity ratings for all tools are the lowest, regardless of the recruiter's professional experience. The relatively high rating of predictive validity of VR systems may be surprising, as a tool practically absent in recruitment and selection practice. The average predictive validity of bots ratings is as expected low. Also in line with expectations are the high candidate experience ratings obtained by competence games and VR systems and this rating is maintained even when the component of assessing the company as modern is removed from the candidate experience rating (calculations omitted in the text). This confirms the analogy of the situation on the Polish market of selection among ICT-based selection tools, which was diagnosed at the beginning of the 20th century in the USA – the use of new ICT-based solutions was conducive to good candidate experience and recognition of the company as modern.

The analysis of the order of values of each tool showed that bots are appreciated due to their functionality, and more precisely, that all other bot ratings are lower than the one regarding functionality. From this perspective, it can be concluded that, according to the respondents, bots have ceased to perform primarily an image function, or rather – that in the image function they are even weaker than as a tool facilitating the recruiter's work. Referring to the above reservations regarding the possibility of an artifact related to the nature of the study group, it can be said that recruiters are not very favorable towards the use of bots in the practice of the selection process. In order to decide between these two explanations, further research is necessary, which is important because the first explanation emphasizes rather poor awareness of the role of the recruiter as a representative of the company, and the second – poor management supervision over the work of the HR department, and thus should result in different corrective actions.

From the practical perspective and further research, an interesting result is the lack of differences in ratings between recruiters from high technology companies and from traditional ones. This may result from the nature of the sample obtained with the snowball technique, but it may also be a feature of Polish recruiters as a relatively homogeneous group, regardless of the nature of the company in which they perform their roles.

## **6. Conclusions**

In the 21st century, the use of ICT in the recruitment/selection has become a standard of good practice and a significant area of scientific research. However, earlier studies focused primarily on two areas: analyzing the conditions in which data collected using a specific tool can predict the success of a given person in the job being offered, and candidates' perception that the use of a specific selection tool leads to a fair selection process. Relatively little is known about recruiters' attitudes towards ICT-based selection tools, and this study is one of the first steps to reduce this knowledge gap.

The study analyzes recruiters' opinions concerning three aspects of how ICT-based recruitment and selection tools are evaluated. The assessment of candidate experience and predictive validity of competence games, bots based on a previously prepared dialogue tree and VR systems were examined. The assessment of the third aspect – functionality – included additionally ATS (Applicant Tracking System). On the basis of an e-questionnaire study of a group of 120 respondents working in HR departments of Polish organizations, it was found that the assessments of these three aspects are different. This means that recruiters, regardless of the length of professional experience, notice differences in how each of these tools contribute to the various dimensions of the recruiter's role. These dimensions are: the recruiter as providing the organization with accurate predictions as to the likely success of the

candidate in the job offered; the recruiter as a representative of the organization responsible for the effectiveness and efficiency of recruitment and selection processes; and the recruiter as a person who takes care of the company's image. There were also no differences in detailed assessments between recruiters from technology companies and other recruiters concerning perceived candidate experience.

Recruiters were also shown to rate competence games and VR the highest due to the candidate experience they bring, while they value bots primarily for their functionality.

The study supplemented existing scientific knowledge and allowed us to formulate several practical recommendations and postulates for further research.

In the Polish literature this seems to be the first time that in one study the three aspects of the role of the recruiter in the organization were so clearly separated, and a questionnaire tool was proposed to directly measure these different aspects of the recruiter's role. It has also been shown that these three separate aspects are not only theoretically different, but also recruiters make independent assessments of them.

The study presented the opinions of a diverse group of Polish recruiters on these aspects of the usefulness of chosen ICT-based selection tools, which is a step in scientific research on taking into account the perspective of this actor in the recruitment process. Previous research on the perception of ICT-based selection tools by recruiters used data from small groups of professionals collected through interviews (Albert, Aggarwal, Silva, 2019; Koivunen et al., 2021; Mirowska, Mesnet, 2021; Ore, Sposato, 2021), which did not allow for the verification of quantitative hypotheses.

The most important result of the study is that recruiters assess each of the three aspects of a tool independently. Hence, the results of this study suggest that in future research on the perception of selection tools by recruiters, these three aspects should be taken into account and measured independently, because each of them is treated in this way by recruiters and each of them affects the recruiter's attitude to the usefulness of a given tool in a selection process.

The need for further research results primarily from the limitations of our study, which do not allow more specific conclusions to be drawn for practice. Firstly, the sample was composed of employees of HR departments of Polish companies, but it was unrepresentative, as it was created using the snowball methodology. Secondly, the selection tools chosen for the study were ICT-based ones relatively well described in the media, but not all tools that may already be available to Polish recruiters were included. Since opinions on the usefulness of a given tool may be partly formed in context (i.e. against the background of other tools described in the questionnaire), it is worth expanding the list of the examined ICT-based tools, as well as making a comparison with traditional IT tools on which these tools are based. It can therefore be said that when constructing the questionnaire, we made a compromise between its length (which makes it a nuisance for the respondent) and important research questions, but we remain partially dissatisfied with the decisions taken and encourage further

research. Thirdly, the scales constructed for this study are of a pilot nature and further research is needed to assess their psychometric values and improve them.

Therefore, bearing in mind all the limitations that make it difficult to generalize the results, it is worth pointing out the potential practical recommendations that result from this study, provided that its results are confirmed in subsequent tests.

Firstly, the research showed that recruiters' favor new selection tools for candidate experience. This suggests a relative readiness to reach for new ICT-based solutions, regardless of whether they solve the difficult problem of predicting how successful the recruitment process is, or only improve candidate experience.

Secondly, the results suggest that recruiters are aware of the differences between the three aspects and therefore, none of these aspects should be neglected during the introduction to HR departments of new tools that recruiters are to use in the process of selecting employees.

Although the study was intended as an attempt to describe the multidimensional nature of the acceptance of ICT-based solutions facilitating the process of selecting employees by Polish recruiters, it allows us to suggest several new directions of scientific research.

Widely conducted research on customer experience is gradually reflected in research on candidate experience (McFarland et al., 2022), but scientific knowledge on the diversity of factors determining candidate experience in different types of companies or industries is small. Our study has tried to take some steps in this direction. Undoubtedly, the starting point in such research should be the construction of a tool for assessing the factors shaping candidate experience, for which the starting point may be the proposal contained in this work.

In our opinion, an indication for new research is also the need to consider the hypothesis that the actors of social life, whose opinions we study, see the categorization of the elements that make up their duties differently than it results from the classification made in scientific research. Focusing research on a selected aspect of the recruiter's role may lead to artifacts if recruiters' opinions show cognitive bias such as the halo effect, or their awareness of a specific aspect of the role is low.

## References

1. Albert, L., Aggarwal, N., Silva, N. (2019). Demographic differences and HR professionals' concerns over the use of social media in hiring. *e-Journal of Social & Behavioural Research in Business*, 10/1, pp. 1-9.
2. Anderson, N. (2003). Applicant and recruiter reactions to new technology in selection: A critical review and agenda for future research. *International Journal of Selection and Assessment*, 11(2-3), pp. 121-136. <https://doi.org/10.1111/1468-2389.00235>.

3. Anderson, N., Salgado, J.F., Hülsheger, U.R. (2010). Applicant reactions in selection. Comprehensive meta-analysis into reaction generalization versus situational specificity. *International Journal of Selection and Assessment*, 18, pp. 291-304. <https://doi.org/10.1111/j.1468-2389.2010.00512.x>.
4. Anderson, N., Witvliet, C. (2008). Fairness reactions to personnel selection methods: An international comparison between the Netherlands, the United States, France, Spain, Portugal, and Singapore. *International Journal of Selection and Assessment*, 16(1), pp. 1-13. <https://doi.org/10.1111/j.1468-2389.2008.00404.x>.
5. Armstrong, M.B., Ferrell, J.Z., Collmus, A.B., Landers, R.N. (2016). Correcting misconceptions about gamification of assessment: More than SJTs and badges. *Industrial and Organizational Psychology: Perspectives on Science and Practice*, 9(3), pp.671-677. <https://doi.org/10.1017/iop.2016.69>.
6. Balcerak, A., Woźniak, J. (2020). Process favorability for different types of selection methods, In: K.S. Soliman (Ed.), *Education excellence and innovation management: A 2025 vision to sustain economic development during global challenges* (pp. 14832–14842).
7. Balcerak, A., Woźniak, J. (2021). Reactions to some ICT-based personnel selection tools. *Economics and Sociology*, 14(1), pp. 214-231. <http://dx.doi.org/10.14254/2071-789X.2021/14-1/14>.
8. Balcerak, A., Woźniak, J., Zbucnea, A. (2023). Predictors of fairness assessment for social media screening in employee selection. *Journal of Entrepreneurship, Management and Innovation*, 19(2), pp. 97-123. <https://doi.org/10.7341/20231923>.
9. Black, S., Stone, D., Johnson, A. (2015). Use of social networking websites on applicants' privacy. *Employee Responsibilities and Rights Journal*, 27, pp. 115-159. <http://dx.doi.org/10.1007/s10672-014-9245-2>.
10. Blacksmith, N., Willford, J.C., Behrend, T.S. (2016). Technology in the employment interview: A meta-analysis and future research agenda. *Personnel Assessment and Decisions*, 2(1), pp. 12-20. <http://dx.doi.org/10.25035/pad.2016.002>.
11. Breaugh, J.A. (2013). Employee recruitment. *Annual Review of Psychology*, 64, pp. 389-416. <https://doi.org/10.1146/annurev-psych-113011-143757>.
12. Freer, T. (2012). Social media gaming—a recipe for employer brand success. *Strategic HR Review*, 11(1), pp. 13-17. <http://dx.doi.org/10.1108/14754391211186269>.
13. Fresher, R. (2016). *Evolution of the Applicant Tracking System*. Retrieved from: <https://thrivetrm.com/evolution-applicant-tracking-system/>, 30.04.2023.
14. Jamroz, M. (2022). *Meta inwestuje 10 miliardów dolarów w rozwój VR!* Retrieved from: <https://android.com.pl/news/493842-meta-inwestuje-w-rozwoj-vr/>.
15. Jerald, J. (2015). *The VR book: Human-centered design for virtual reality*. Morgan & Claypool.

16. Kapp, K. (2014). *Using games and gamification for employee screening*. Retrieved from: <https://karlkapp.com/using-games-and-gamification-for-employee-screening/>, 20.06.2023.
17. Kauppinen, R., Drake, M. (2020). Virtual reality in competence recognition for immigrants. In: L. Gómez Chova, A. López Martínez, I. Candel Torres (Eds.), *INTED2020: 14th International Technology, Education and Development Conference*, (pp. 5578-5582). Valencia: IATED Academy. DOI: 10.21125/inted.2020.1515.
18. Koivunen, S., Ala-Luopa, S., Olsson, T., Haapakorpi, A. (2022). The march of chatbots into recruitment: recruiters' experiences, expectations, and design opportunities. *Computer Supported Cooperative Work*, 31, pp. 487-516. <https://doi.org/10.1007/s10606-022-09429-4>.
19. Langer, M., König, C.J., Fitali, A. (2018). Information as a double-edged sword: The role of computer experience and information on applicant reactions towards novel technologies for personnel selection. *Computers in Human Behavior*, 81, pp. 19-30. doi:10.1016/j.chb.2017.11.036.
20. Langer, M., König, C.J., Sanchez, D.R.-P., Samadi, S. (2019). Highly automated interviews: Applicant reactions and the organizational context. *Journal of Managerial Psychology*, 35(4), pp. 301-314. doi:10.1108/JMP-09-2018-0402.
21. Langer, M., Landers, R.N. (2021). The future of artificial intelligence at work: A review on effects of decision automation and augmentation on workers targeted by algorithms and third-party observers. *Computers in Human Behavior*, 123, 106878, <https://doi.org/10.1016/j.chb.2021.106878>.
22. Lepak, D., Snell, S. (1998). Virtual HR: Strategic human resource management in the 21st century. *Human Resource Management Review*, 8(3), pp. 215-234.
23. Listwan, T. (2010). *Zarządzanie kadrami*. Warszawa: Beck.
24. Lu, A.J., Dillahunt, T.R. (2021). *Uncovering the promises and challenges of social media use in the low-wage labor market: insights from employers*. CHI 2021: Conference on Human Factors in Computing Systems. New York: ACM Press, pp. 1-13.
25. McCarthy, J.M., Bauer, T.N., Truxillo, D.M., Anderson, N.R., Costa, A.C., Ahmed, S.M. (2017). Applicant perspectives during selection: A review addressing “so what?”, “what’s new?”, and “where to next?”. *Journal of Management*, 43(6), pp. 1693-1725. <https://doi.org/10.1177/0149206316681846>.
26. McFarland, L.A., Ployhart, R.E., Shepherd, W.J., Ward, M.M. (2022). The collective Candidate Experience: Theory and business unit consequences. *Journal of Management*. <https://doi.org/10.1177/01492063221139422>.
27. Michael, D., Chen, S. (2006). *Serious games: games that educate, train, and inform*. Boston: Thomson.
28. Mirowska, A. (2020). AI evaluation in selection: Effects on application and pursuit intentions. *Journal of Personnel Psychology*, 19(3), pp. 142-149. <https://doi.org/10.1027/1866-5888/a000258>.

29. Mirowska, A., Mesnet, L. (2022). Preferring the devil you know: Potential applicant reactions to Artificial *Intelligence evaluation of interviews*. *Human Resource Management Journal*, 32(2), pp. 364-383. <http://dx.doi.org/10.1111/1748-8583.12393>.
30. Nikolaou, I. (2021). What is the role of technology in recruitment and selection? *The Spanish Journal of Psychology*, 24, e2. <http://dx.doi.org/10.1017/SJP.2021.6>.
31. Nikolaou, I., Georgiou, K., Bauer, T.N., Truxillo, D.M. (2019). Applicant reactions in employee recruitment and selection. In: R.N. Landers (Ed.), *The Cambridge handbook of technology and employee behavior* (pp. 100-130). Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781108649636.006>.
32. Ore, O., Sposato, M. (2022). Opportunities and risks of artificial intelligence in recruitment and selection. *International Journal of Organizational Analysis*, 30/6, pp. 1771-1782. <https://doi.org/10.1108/IJOA-07-2020-2291>.
33. Potosky, D. (2008). A conceptual framework for the role of the administration medium in the personnel assessment process. *Academy of Management Review*, 33(3), pp. 629-648. <http://dx.doi.org/10.5465/amr.2008.32465704>.
34. Potosky, D., Bobko, P. (2004). Selection testing via the internet: Practical considerations and exploratory empirical findings. *Personnel Psychology*, 57(4), pp. 1003-1034. <https://doi.org/10.1111/j.1744-6570.2004.00013.x>.
35. Roth, P.L., Bobko, P., Van Iddekinge, C.H., Thatcher, J.B. (2016). Social media in employee-selection-related decisions: A research agenda for uncharted territory. *Journal of Management*, 42(1), pp. 269-298. <https://doi.org/10.1177/0149206313503018>.
36. Ryan, A.M., Ployhart, R.E. (2000). Applicants' perceptions of selection procedures and decisions: A critical review and agenda for the future. *Journal of Management*, 26(3), pp. 565-606. [https://doi.org/10.1016/S0149-2063\(00\)00041-6](https://doi.org/10.1016/S0149-2063(00)00041-6).
37. Ryan, A.M., Ployhart, R.E. (2014). A century of selection. *Annual Review of Psychology*, 65, pp. 693-717. <https://doi.org/10.1146/annurev-psych-010213-115134>.
38. Schick, J., Fischer, S. (2021). Dear computer on my desk, which candidate fits best? An assessment of candidates' perception of assessment quality when using AI in personnel selection. *Frontiers in Psychology*, 12, 739711. <https://doi.org/10.3389/fpsyg.2021.739711>.
39. Snyder, J., Shahani-Denning, C. (2012). Fairness reactions to personnel selection methods: A look at professional in Mumbai, India. *International Journal of Selection and Assessment*, 20(3), pp. 297-307. <https://doi.org/10.1111/j.1468-2389.2012.00601.x>.
40. Steiner, D.D., Gilliland, S.W. (1996). Fairness reactions to personnel selection techniques in France and the United States. *Journal of Applied Psychology*, 81, pp. 124-141. <http://dx.doi.org/10.1037/0021-9010.81.2.134>.
41. Truxillo, D.M., Steiner, D.D., Gilliland, S.W. (2004). The importance of organizational justice in personnel selection: Defining when selection fairness really matters.

- International Journal of Selection and Assessment*, 12(1), pp. 39-53.  
<http://dx.doi.org/10.1111/j.0965-075X.2004.00262.x>.
42. Van Iddekinge, C.H., Lanivich, S.E., Roth, P.L., Junco, E. (2016). Social media for selection? Validity and adverse impact potential of a Facebook-based assessment. *Journal of Management*, 42(7), pp. 1811-1835. <https://doi.org/10.1177/0149206313515524>.
  43. Wheeler, E., Dillahunt, T.R. (2018). *Navigating the job search as a low resourced job seeker*. CHI 2018: Conference on Human Factors in Computing Systems. New York: ACM Press, pp. 1-10. <https://www.semanticscholar.org/paper/Navigating-the-Job-Search-as-a-Low-Resourced-Job-Wheeler-Dillahunt/b187c02c0bb93e6d2a402733f9215e42f6b91f3a>.
  44. Winarsim, R.V., Amaliah, Y. (2021). *Virtual Reality-based height simulation with method multimedia development life cycle*. 3rd International Conference on Cybernetics and Intelligent System (ICORIS). IEEE, pp. 1-6.
  45. Woods, S.A., Ahmed, S., Nikolaou, I., Costa, A.C., Anderson, N.R. (2020). Personnel selection in the digital age: a review of validity and applicant reactions, and future research challenges. *European Journal of Work and Organizational Psychology*, 29(1), pp. 64-77.
  46. Woźniak, J. (2013). *Rekrutacja—teoria i praktyka*. Warszawa: PWN.
  47. Woźniak, J. (2015). Grywalizacja w zarządzaniu ludźmi. *Zarządzanie Zasobami Ludzkimi*, 2(103), pp. 11-33.
  48. Woźniak, J. (2019). Akceptacja różnych form narzędzi selekcyjnych – przegląd literatury i wstępne wyniki badania. *Zarządzanie Zasobami Ludzkimi*, 5(130), pp. 11-39.
  49. Woźniak, J. (2020). *Zarządzanie pracownikami w dobie Internetu*. Warszawa: Wolters Kluwer.
  50. Zacny, B., Kania, K., Sołtysik, A. (2019). Stosunek potencjalnych kandydatów do wykorzystania danych z mediów społecznościowych i narzędzi AI w procesie rekrutacji. *Zarządzanie Zasobami Ludzkimi*, 5(130), pp. 39-56.