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An investigation based on interviews with domain experts

Bias and discrimination risks in skills-based recruitment

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Contents

1 Introduction

Skills-based recruitment is fostered in the Netherlands by various initiatives[1]. The skills-based approach aims to create a better fit between those looking for a job (candidates) and those offering a job (employers) by means of focusing on the skills necessary to excel at the job. The assumption is that a focus on skills mitigates discrimination that arises from the traditional recruiting approach using a resume and job posting, both of which are associated with discrimination[2][3].
This report is a result of the project "Skills Matching – Work package Labour–market discrimination". In this context the following research questions were investigated:

1. **How does the transition from traditional to skills-based recruitment relate to bias and discrimination risks?**

And subsequently:

2. **What is the role of AI in the scenario of skills-based recruitment and the related bias and discriminations risks?**

This document summarizes our exploration into these questions by means of interviews with several domain experts. The target audience of this document are the direct and contributing stakeholders of the Skills Matching project. Furthermore, this research serves as a preparation for the work package in the 'Vaardig met Vaardigheden' project that deals with bias and discrimination in descriptions of the CompetentNL skills-ontology.
The layout of this report is the following: In the next section, we elaborate on the methodology of the interviews. This is followed by Section 3 that consists of the interview findings related to the first research question. Section 4 relates to the findings of the second research question and provides possible research directions. Both Section 3 and 4 provide concluding remarks.

[1] Report from Rijksoverheid: "Inzicht in skills, een verkenning van Nederlandse initiatieven", accessible at: https://www.rijksoverheid.nl/onderwerpen/leven-lang-ontwikkelen/documenten/rapporten/2022/02/25/inzicht-in-skills
[2] See https://hbswk.hbs.edu/item/minorities-who-whiten-job-resumes-get-more-interviews
[3] Gaucher, D., Friesen, J., & Kay, A. C. (2011). Evidence that gendered wording in job advertisements exists and sustains gender inequality. Journal of personality and social psychology, 101(1), 109.

2 Methodology

The research questions are answered by means of interviews with domain experts. The following two sections detail the exact approaches that were used to answer the first and the second research questions. The first research question is explored via structured interviews with domain experts from within and external of the Skills Matching consortium. After analyzing the answers of the first research question, the insights were discussed with a smaller and select group of experts within the Skills Matching consortium. These discussions were more informal in the form of open brainstorming.

2.1 Approach for the first research question on bias and discrimination risks

To assess the current perspective of bias and discrimination risks in recruitment six interviews were conducted. We interviewed eight experts with different expertise and backgrounds to get a multi-faceted picture to answer our research questions. We acknowledge, however, that we do not claim that variety of voices we had the pleasure to converse with is exhaustive. We see this as a first step, while certain voices should be actively included in follow-up research, such as job candidates that were discriminated against in recruitment, Human Resources agents or managers and labor market discrimination experts. To provide you with an idea without explicitly mentioning their names nor their affiliations we disclose their expertise as follows:

- One expert is a researcher in the field of the labor market with particular focus on skills;
- Two experts with a social science and legal background who have experience with the influence of digitalization on Human Rights;
- Two experts are researchers with experience in computational language modeling (natural language processing, NLP), fairness, and skills databases;
- One expert is a practitioner in the unemployment agency of the Netherlands;
- One expert in data science who is working at a large recruitment agency;
- Two experts are involved in running a pilot in practice which uses skills-based recruitment.

We conducted each interview via Microsoft Teams, where Powerpoint slides were used as a support tool via screen-sharing. Each interview started with an introduction to the Skills Matching project. Next, we explained the concept of skills-based matching, including an example of how it might be implemented based on the Paskamer from the House of Skills - initiative[4]. We emphasize that our research is scoped from the initial phase of recruitment until the first invitation, as this is where the skills-based matching system replacing vacancies and resumes is positioned (see Fig. 1).

[4] https://www.houseofskillsregioamsterdam.nl/instrumenten/de-paskamer/

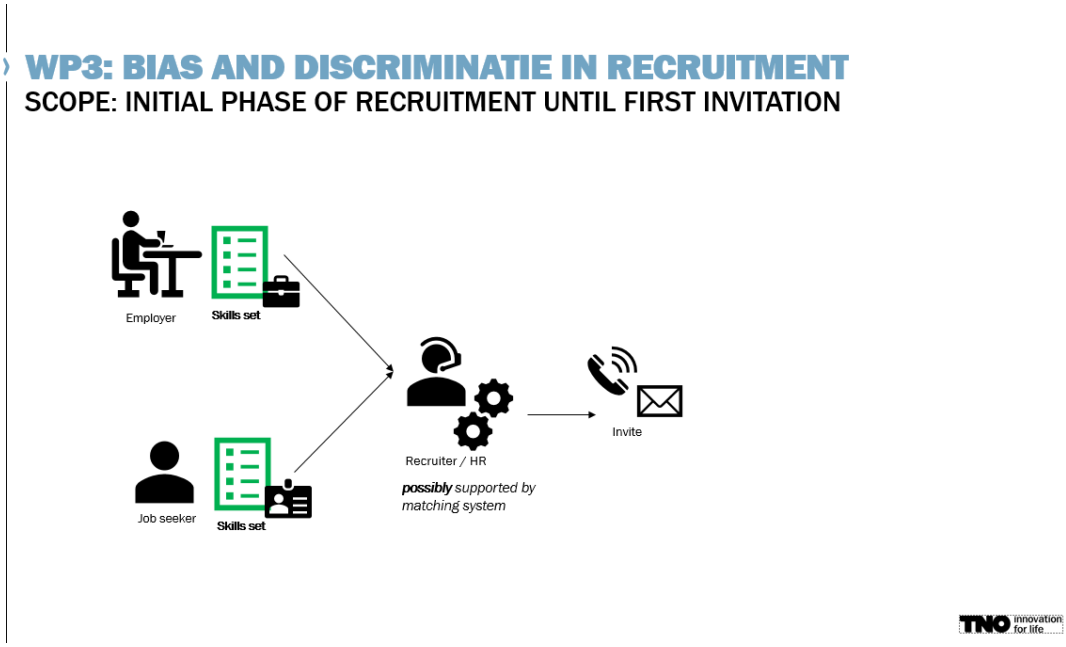

Figure 1: The PowerPoint slide illustrating the scope of our research: recruitment until the first invite.

The introduction was concluded with the goals of the interview:

1. *Identification of possible bias and discrimination risks in skills-based matching*
2. *Identify differences of skills-based matching compared to the current way of recruitment*

Thereafter, we discussed with the interviewees that we have four questions to steer the conversations whilst they are also encouraged to go off-track and discuss anything they find most useful to share.
The four interview questions were the following:

1. *Which bias and discrimination risks do you see in current recruitment?*
2. *Which bias and discrimination risks do you see in skills-based matching compared to the current recruitment process?*
    a. *Which risks are now reduced or absent? What new opportunities does skills-based matching provide?*
    b. *Which risks are still present?*
    c. *Do you see new risks?*
3. *Can the recruiter assess for example the gender of the candidates given their skills?*
4. *Is there a risk that the recruiter might choose skills to attract a certain group (e.g. gender) of people?*

For the first question we mentioned that the goal was to list different risks in the current form of recruitment, rather than to go in depth. The list of risks frames the second question in which we ask how skills-based matching relates to the current form of recruitment. We spent most of the time on the second question. Question 3 and 4 were guided follow-up questions of the second question. In the following section, the answers to the follow-up questions (3 and 4) are incorporated into the answers on Question 2.

2.2 Approach for the second research question on the role of AI

Given the bias and discrimination risks that were identified during the first round of interviews, we conducted four additional interviews focusing on the possible role of AI. The interviews were done with two AI experts already working in the labor market field and two labor market experts with experience in projects on labor market issues that involved AI. First, we presented our insights from the first interview round. Thereafter, a free format brainstorm was conducted in which the interviewee could think aloud how AI can role in bias and discrimination risks related to skills-based matching. After the interviews, all ideas were aggregated and structured as much as possible. Given the free format of the brainstorms the different ideas differ on the level of granularity.

3 Interview findings related to bias and discrimination risks in skills-based recruitment

3.1 Q1: Which bias and discrimination risks do you see in current recruitment?

For Question 1, each expert provided a list of risks for bias and discrimination that are present in current recruitment. We analyzed the risks and gathered the results per aspect in recruitment process. Next to that, the experts also shared additional interesting insights based on their reference point towards discrimination. We have grouped these insights thematically in the following paragraphs on the definition and the challenge of discrimination risks as well as discrimination risks for automated systems.

3.1.1 Defining discrimination risk

Discrimination refers to the (unlawful) exclusion or differential treatment of people based on certain personal characteristics like gender, age or nationality. In Dutch law there are several prohibited grounds of discrimination, including religion, belief, political opinion, ethnicity, sex, nationality, sexual orientation, marital status, disability or chronic illness and age. Discrimination can either be direct or indirect (NL: direct en indirect onderscheid). Direct discrimination refers to a situation where an individual is treated differently directly due to one of the characteristics mentioned above. Indirect discrimination may appear as a seemingly neutral request that does not refer directly to any group or characteristic but may still particularly disadvantage the individuals belonging to that a group. For example: an employment agency that recruits only students may not directly discriminate on the basis of age, but most students are below thirty and older candidates are thus effectively excluded. Direct discrimination is (almost) never allowed. Indirect discrimination can be allowed if there is an objective justification for the differential treatment. For example, the job requirement 'excellent skill in the Dutch language' may indirectly exclude a large group of potential candidates based on their nationality. However, it may be warranted is situations where this is clearly relevant for the job, like for the position of news anchor or teacher[5].

3.1.2 The challenge of discrimination risks

Discrimination that occurs in our current recruitment process is hard to measure. This has to do with the indirect form of discrimination in the law, which is less explicit and often not immediately clear whether a certain group is excluded. Discrimination is only registered when it is reported, or a court case is started. If discrimination comes in court, it is often that the hidden discrimination has become explicit or documented: e.g., a recruiter who has slipped a discriminatory remark in an email or there is a clear historical pattern in an employer.

[5] Equal treatment is obliged by law: "Gelijke behandeling wettelijk verplicht", accessible at https://mensenrechten.nl/nl/subpage/gelijke-behandeling-wettelijk-verplicht#:~:text=Bij%20indirect%20onderscheid%20is%20sprake,in%20het%20bijzonder%20worden%20getroffen.

3.1.3 Discrimination risks with automated matching systems

Next to that, the discrimination in the labor market by means of automated matching system is under documented. There are a few publications which aim provide an overview including Zwart & Wiggers (2022)[6] and Bogen & Rieke (2018)[7]. At a first glance automated recruitment applications, even in support, may seem a step forward as the personal bias of one recruiter is limited. However, systemic bias that is shared between people on the level of society is still embedded in the system. The same applies to bias which arises at the institutional level when policies and workplace cultures serve to benefit certain workers and disadvantage others. Biases can also be internalized by jobseekers themselves, influencing their own behaviors, such as whether or not to apply for a given job [8]. How the team of recruiters have previously matched jobs and candidates forms the basis of the data on which the system is built. The automated system is in turn tasked to find patterns in previous job-candidate matches that were successful. As such, the shared bias of the team of recruiters, e.g., to mainly suggest men for management or IT positions, is a generic pattern the system will learn and perpetrate in its suggestions[9].

3.1.4 Discrimination risks per aspect in the recruitment process

Next to that, the interviews also provided insights specific to certain elements in the current recruitment process: the recruiter, resumes and job vacancies.

3.1.4.1 Recruiter

- Every person, thus every recruiter, exhibits internalized bias due to their background, upbringing and history. The recruiter might exhibit bias, especially in forms of which it is less known that it is not allowed, such as age discrimination.
- Bias is expected to result from moments when the recruiter listens to their gut-feeling, or reasoning like “I know this candidate is good based on my experience, I can just tell”

3.1.4.2 Resumes

- Note the cultural aspect to resumes. It differs per country whether a picture, name and what type of educational history is included on the resume.
- How a resume is written and what is put on it, may easily identify the gender by clear indications such as name or proxies.
- Some groups might overestimate their abilities in the resume, leading to a higher chance of proceeding in the next stage of recruitment process.

3.1.4.3 Job vacancies

- There is evidence that job vacancies appeal more to certain demographics based on the content of the vacancy or the style format[10].

[6] Zwart, H. de & Wiggers, P. (2022). When the machine chooses: diversity and inclusion in artificial intelligence for recruitment and selection, Research group Responsible IT, Amsterdam University of Applied Sciences, https://www.hva.nl/kc-fdmci/shared-content/projects/projects-responsible-it/ if-the-machine-chooses.

[7] Bogen, M. & Rieke, A. (2018). Help Wanted. An Examination of Hiring Algorithms, Equity, and Bias, Upturn, 2018 https://www.upturn.org/work/help-wanted/

[8] Devah Pager and Hana Shepherd, The Sociology of Discrimination: Racial Discrimination in Employment, Housing, Credit, and Consumer Markets, Annual Review of Sociology (2009). They make distinction between institutional, systematic and internalized bias.

[9] The case of the recruitment tool at Amazon, e.g. https://www.reuters.com/article/us-amazon-com-jobs-automation-insight-idUSKCN1MK08G

[10] Gaucher, D., Friesen, J., & Kay, A. C. (2011). Evidence that gendered wording in job advertisements exists and sustains gender inequality. Journal of personality and social psychology, 101(1), 109.

3.1.4.4 Job seeker

The job seeker themselves may also be biased to the types of jobs they regard as suitable. Sometimes job seekers may prefer a job based on a realistic image of the job or the tasks and skills associated with the job. Other times, job seekers may have stereotypical misconceptions about jobs, limiting the job seekers' ability to find suitable work and limiting the employers' ability to find suitable candidates[11].

3.2 Q2: Which bias and discrimination risks do you see in skills-based matching compared to the current recruitment process?

For Question 2, the experts shared their vision on expected bias and discrimination risks for recruitment with a skills-based matching approach relative to the current resume-vacancy approach. We share here the aggregated insights in three subsections: the risks that are reduced, the risks that still remain and the risks that are new with the skills-based matching approach. Notable was that most of the interviewees emphasized that the process of how the skills of the jobseekers are determined plays an important role in answering Question 2. Therefore, we also distinguish 4 different Scenarios to obtain and rate the skill set of the job seeker:

I. The jobseekers report their own skills
II. The skills are determined in conversation with a labor market expert
III. The skills are extracted automatically from the resumes
IV. The skills are determined through assessments

In the next section, we denote any risks that pertain to a particular scenario with a direct reference to Scenario I. – IV. above.

3.2.1 Which risks are now reduced or absent? What new opportunities does skills-based matching provide?

3.2.1.1 Shifted focus towards skills

First, skills-based matching alters the information of the job opening and job seeker that is used in the initial phase of the recruitment process. Describing a job vacancy in terms of skills can provide more detailed relevant information about the occupation. Moreover, looking at a job application in terms of skills forces recruiters to focus on objective aspects related to the content of the work activities, rather than being influenced by subjective aspects such as personal details and hobbies of the applicants. These subjective aspects have strong dependencies on gender, age, ethnicity, and social economic status. Therefore, recruitment based on hobbies and personal details often forms a risk for discrimination as one (unconsciously) prefers candidates to which they can relate[12]. The skills also incentivize recruiters to give objective reasons why a candidate is invited, which can lead to more transparency in the recruitment process. Furthermore, for skills-based matching a standardized list of all possible skills can be used to form the skills profiles for the applicants

[11] Bivens, D.K. (2005). What Is Internalized Racism?, in Flipping the Script: White Privilege and Community Building(MaggiePotapchuck2005),http://www.racialequitytools.org/resourcefiles/What_is_Internalized_Racism.pdf.

[12] Identity,homophily and in-group bias https://www.sciencedirect.com/science/article/ pii/S0014292116300344 ; https://hbr.org/2019/06/how-to-reduce-personal-bias-when-hiring

in either of the four Scenarios. This allows for a more objective comparison between the applicants, instead of comparing diverse self-formulated skills by the applicants in their resumes.

3.2.1.2 Enhanced labor mobility for job seekers

Second, skills-based recruitment has the potential to stimulate labor mobility of job seekers. The focus on skills stimulates the formulation of which tasks the job seekers can perform, instead of diplomas obtained or professional experiences in similar functions in the specific sector. The emphasis on what job seekers can do, relative to what they have previously experienced, allows for more job opportunities (possibly in a new sector) for jobseekers as well as a bigger pool of applicants for employers, especially in bottleneck occupations. Related to bias and discrimination, the focus on skills may have an equalizing impact when job seekers from unprivileged backgrounds may have the relevant skills but have not been given the opportunity to have the traditionally required educational or professional experience. This is especially true for workers with negative learning experiences; they are more inclined to learn on the job than through training [13].

3.2.1.3 Increased productivity and happiness of job seekers

Third and last, the productivity and happiness of job seekers may increase. Previous research has shown that when one's skills are well matched with the job activities, the employees are happier and more productive[14].

3.2.2 Which risks are still present?

3.2.2.1 Skills profiles still based on image of ideal candidates

First, skills profiles, just as job vacancies, are created with an ideal candidate in mind, which comes with the risk of stereotypes and prejudices being embedded in the image of this ideal candidate. The skills profile for a job filled in by the employer can still contain subjective stereotypes about the occupation. For example leaning into the stereotyping that men are more technical and women are better at communicating: there can be a greater focus on technical skills for an occupation with high male presence, while equally important communication skills might be underrated. Furthermore, the skills can still be formulated such that certain groups are more attracted to apply than other groups.

3.2.2.2 Similar formulation and perception risks

Second, there is a risk for bias in the formulation and the level of competence of one's own skills. In Scenario I. and III., some groups (men) are likely to overestimate their abilities leading to an unfair advantage of having a higher chance of proceeding in the next stage of recruitment[15].

3.2.2.3 Similar certification and interpretation risks

Third, there is a risk for discrimination in the fact that the certification and interpretation of skills and competences is subjective. In Scenario II. the labor market expert may bring about

[13] Sanders, J. (2016). Sustaining the employability of the low skilled worker: Development, mobility and work redesign. Maastricht: ROA.
[14] J. A. Vieira Cabral, Skill mismatches and job satisfaction. Economics letters 89(1), 39-47 (2005).
[15] E.g. Confidence gap between men and women in medicine: a systematic review https://journals.lww.com/c-orthopaedicpractice/Abstract/2020/09000/Confidence_gap_between_men_and_women_in_medicine_.13.aspx?context=LatestArticles ; Gender Differences in Self-Estimated Intelligence: Exploring the Male Hubris, Female Humility Problem accessible at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.812483/full

their own bias and may still rely on previous experiences and diplomas to assess the level of competence of the determined skill set. For Scenario IV., skills assessments are also imperfect. Especially when assessing soft skills, where interpretation of the assessors may play a role, the lingering risk of stereotyping can influence the measured competence in the skills.

3.2.3 Do you see new risks?

3.2.3.1 Risk from skills format requiring conceptualization of skills

A new risk for bias may arise due to the necessity of being able to describe one's capabilities in the format of skills. Interviewees have raised two concerns.

First, to partake in the skills-based matching system within Scenario I., jobseekers are required to think conceptually about skills and translate these conceptual skills into adequate formulations that capture these skills. This can unnecessarily exclude certain groups of jobseekers because those two skills are not needed for a lot of jobs such as bricklaying. The fact whether the job candidate is a non-native speaker of the language of the skills is likely to be interrelated as well with the ability to conceptualize and formulate one's own skills. A nuance here is that qualifications described in diplomas may also be difficult to understand, such that the newness of this risk in this example may be disputed.

Second, when the skills-based recruitment approach requires a more advanced technological approach which may discourage older job candidates or those with less access to technology due to lower social economic status or belief system. The issue with describing one's capabilities in skills can be partially resolved through using Scenario II. to obtain the candidate's skills. It is, however, more resource intensive and brings about the risk for bias and prejudice of the labor market expert as mentioned in the previous paragraph.

3.2.3.2 Risk from skills format being restrictive

Next to that, the focus on skills rather than a free format may be experienced as restrictive. For all four Scenarios the move away from a motivation letter and the free format of the resumes decreases the possibility to provide context to some aspects of the application. A strict skills-based format, for example, does not allow the candidate to explain why one does not have the requested skill but is very willing to acquire the skill or has alternative skills which for them has shown to make up for the missing requested skill. Skills-based matching may even be ignorant to the fact that not everyone has the same opportunity to gain a (certified) skill. Moreover, the potential of a candidate to grow is harder to assess when only the current possessed skills are visible to the employer (i.e. for skills-based matching without a motivation letter). We note however that these two factors, the opportunity to acquire a skill and the assessment of potential based on a skill list is likely to still be an improvement with respect traditional recruitment based on resumes. This is because there the even more restrictive opportunity to acquire a diploma and the assessment of potential based on a list of credentials play a key role in recruitment before the first invite. Furthermore, people may not want to be represented by a mere list (of skills), and a number for every element on this list, instead of the more human nuance that a resumes, a vacancy, and a motivation letter provide.

3.3 Conclusion

Bias and discrimination risks are present throughout the current recruitment process. It is however challenging to gauge how much these risks come into effect, as it is under-reported and hard to proof. An automated system for recruitment may limit the personal human bias from an individual recruiter, however, is prone to propagate bias and discrimination that is systemic, institutional or internalized among recruiters.

Skills based recruitment has potential for promising benefits to the labour market. For one thing, the skills-approach is tailored to provide labor mobility, which may result to happier and more productive employees. Another reason is that the risk for bias and discrimination may be reduced as focus is put on skills rather than demographic characteristics that are still implicitly referenced in resumes and vacancies.

However, the skills approach should not be seen as *the* solution for discrimination and bias in the recruitment process since some risks remain. Similar to how the human bias of recruiters and job seekers affects how a job vacancy is written and interpreted, also skills profiles can be affected by perceptions of recruiters and job seekers.

Finally, while gauging the benefits of skills-approach and the potential reduction to known risks for discrimination, innovation should stay open and aware to new risks for bias and discrimination arising. New risks may relate to skills-approach's need for conceptualizing a candidate's capabilities in a list of skills relative to the free format of resumes and job vacancies.

4 Interview findings on opportunities of AI in the skills-based matching approach

In conversation with four experts with expertise in AI and the labour market, two possible directions for the role of AI in bias and discrimination risks have been discussed. The first direction concerns the use of AI as decision support for a recruiter to match job candidates and job offers based on skills profiles. Related to this direction, an investigation of gender discrimination risks of skills based matching algorithms has recently been executed in an affiliated TNO project, called FATE (on **FA**ir **T**ransparent **E**xplainable AI). We briefly summarize the main efforts and results here, but also refer to the poster presentation as well as the virtual demo that soon will be online. The second direction is the use of AI for measuring the skills of job candidates. The insights of the interviews are here grouped into three topics. First, the possibility of AI to tackle the challenge concerning the wide variety of formulations for the same underlying skill. Second, the profiling risks in terms of discrimination, privacy and transparency when AI may be used to measure skills of workers based on behavioral data. Third, the possibility of AI to assess the competency level of skills based on written examples. We emphasize that these sections are summaries of the ideas discussed in the interviews and are not meant as an exhaustive list of possibilities for AI in the setting of skills-based recruitment and labour market discrimination.

4.1 AI as decision support for a recruiter

Within the FATE project, risks for gender bias and discrimination were researched in the potential use of AI decision support for skills-driven recruitment. This research focused on the current gender segregation in occupations (the presence of male dominated and female dominated jobs) and the risk whether use of AI for skills-driven recruitment may exacerbate this segregation. To do this, we first examined language models that form the basis of the AI decision support. In particular, we explored whether the current gender segregation in occupations is also persistent in the language associations of the skills sets pertaining to these occupations. Secondly, we investigated the risk of propagating gender segregation when skills-based matching systems based on these language models give job opening suggestions to job seekers. Our findings indicated that the gender segregation that is currently present in occupations is reflected in both the skills representations of these occupations and suggestions made by skills based matching systems. Hence, the use of AI based on language models to provide job opening suggestions to job seekers require evaluation and monitoring on whether they exacerbate gender segregation. Finally, our exploration resulted to a demonstrator and poster in which we present a possible methodology that allows for a conscious trade-off between performance and propagation of gender segregation, when choosing a skills based matching system[16].

[16] The demo will soon be online on ApplAILabs - ApplAILabs (appl-ai-tno.nl), a demonstration is available upon request. The poster is present in the deliverables folder.

4.2 AI for measuring skills

4.2.1.1 *Bridging the skills language gap between different sectors*

Interviewees have voiced that skills-based recruitment is likely to start with job candidates self-reporting their skills. One challenge is that the same underlying skill may have a wide variety of formulations, as people from different sectors do not share a common language when talking about their skills. This creates an evident challenge to recognize whether the self-reported skills from the candidate match the required skills of the job opening. This difficulty becomes apparent when we apply this scenario to a skills database such as O*Net. To aid job seekers in measuring how competent they are in a skill, O*Net provides practical explanations to illustrate what the different competency levels of a skills mean. These practical explanations are very specific such as *Understand a coach's oral instructions for a sport* for level 4 of the *Oral expression* skill. They can be useful to get a tangible idea of the different levels, but not all people may relate to this explanation to the same degree. Different people can have different interpretations given their background which results to some people overestimating their skill level and others underestimating them[17]. Natural language processing techniques can possibly be used to provide relatable wording of a skill and generate tangible explanations about the different levels *given the background of a jobseeker*. If the jobseeker for example has worked in the medical domain an explanation such as *Understand the doctor's instructions to prepare a surgery* for level 4 of the *Oral expression* skill would be more suitable.

4.2.1.2 *Profiling risk: need for bias, discrimination and privacy checks, and transparency*

Interviewees foresee that AI could be used in tooling that supports the assessment of the level of competence of candidates' skills based on language and video data. One possible way is that the level of competence in a skill is ascertained from the behavior or task performance of a worker or job candidate. This could for example be based on available historic data such as previous online conversations and video footage. AI techniques that may play a role here are conversational AI and process mining. In this scenario, the interviews have signaled three risks and challenges associated with profiling that may come into play.

- The AI system may start to learn *profiles of skilled candidates* based on conversational cues or the appearance of previously skilled candidates that may be related to forbidden sensitive characteristics such as gender, skin tone, ethnicity, nationality. When these profiles are consequently used to assess the skill of a worker, this may in turn have the risk to exacerbate existent labor market inequalities. For example, a female or darker-skinned candidate may score lower just because previous female darker-skinned candidates were less observed in the historic data to be skilled in a certain management skill (as female darker-skinned employees have been historically excluded in management roles).
- Furthermore, current conversational AI models often function by building a knowledge base of each candidate. This candidate-specific knowledge base is likely to contain private information. In that case, privacy risks need also be considered, for which PET (Privacy Enhancing Technologies), such as encryption technologies, can be a potential solution.
- Lastly, it is important to be transparent towards the user and show what the assessment of the skills is based upon. Transparency allows users (those that use the AI tooling to asses skills of candidates) and the job candidates themselves to evaluate

[17] Michael Handel: Handel, M.J. (2016). The O*NET content model: strengths and limitations, *Journal for Labour Market Research* **volume 49**, pages 157–176

the previously mentioned discrimination and privacy risks and provide feedback or contest the system's suggestions when necessary. One opportunity is to use eXplainable AI (XAI) to elaborate to the candidate why a certain skill has been certified with a specific level of competence or why a certain skills profile is provided to the candidate. Although one needs to recognize that AI is aimed to find patterns in large amounts of data that humans cannot comprehend, and that therefore eXplainable AI is not able and should therefore not be expected to provide both a complete and understandable explanation why suggestions are made.

4.2.1.3 Measuring competency levels of skills based on written examples and the effect of confidence

In the short run, skills-driven recruitment is likely to be either based on a method that derives the acquired skills from the skills associated with the obtained education and previous work experience, or based on self-reported skills where candidates score their own skills with a certain competency level score (such as in the Paskamer platform[18]).. Interviewees foresee that in the latter, candidates may need to provide examples (just like we do now in resumes, motivation letters and interviews) that illustrate the chosen competency levels scores. To validate whether the examples relate to the competency level scores, language-based AI may be used to verify whether the candidate's example of skill level 4 relates to other people's examples of skill level 4.
One interesting related aspect to this is the over- and underestimation of candidates in rating their own skills' competence levels, which was also referenced in the interviews for Research Question 1. Interviewees indicate that gender differences may apply and should be considered before AI is applied. There is a rather famous claim that women apply only when they meet 100% of the qualifications, while men already apply when they meet 60% of the qualifications. Although the exact statistics of this claim has been recently disputed[19], there is still indication from research for gender differences in confidence and over/underestimation: e.g. men are more likely to overestimate their competence in skills in masculine contexts[20].

4.3 Conclusion

In skills based recruitment, two uses of AI are foreseen: (1) AI as a decision support tool to match job candidates and job openings based on skills and (2) AI as a tool to support the measurement of a candidate's level of competency in a certain skill.
On one hand, the conversations emphasized that these foreseen uses of AI have risks: such as the risk of propagating gender segregation in occupations due to bias in language models as well as the potential undesired effects of risk profiling when using candidates' behavioral data. On the other hand, opportunities for AI have been voiced: such as the ability of AI to provide domain specific explanations that aid candidates to self-report the adequate rating of their skills.

The different interviewees had diverse thoughts on the topics discussed, ranging from focus on the technical feasibility of what AI can do, to what is needed in the skills-driven labour market and finally to what are known legal risks for AI-based recruitment in practice.

[18] https://www.houseofskillsregioamsterdam.nl/
[19] https://www.bi.team/blogs/women-only-apply-when-100-qualified-putting-received-wisdom-to-the-test/; https://www.bi.team/blogs/women-only-apply-for-jobs-when-100-qualified-fact-or-fake-news/
[20] Beyer, S., & Bowden, E. M. (1997). Gender Differences in Seff-Perceptions: Convergent Evidence from Three Measures of Accuracy and Bias. *Personality and Social Psychology Bulletin*, *23*(2), 157–172. https://doi.org/10.1177/0146167297232005

In short, these first conversations demonstrated that opportunities and risks are both present in the use of AI in skills-based recruitment, and that it takes a diverse multi-faceted discussion to ensure that considerations of AI tooling and research directions receive thorough consideration.

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