Understanding Decision-Making in Recruitment: Opportunities and Challenges for Information Technology

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Although the composition of individuals can strongly affect the success of professional collaboration, organizations often struggle with their so-called social matching decisions. For example, when recruiting new people to an organization, the decision-making is often reduced to intuitively matching individuals based on vague descriptions of projects or positions. The role of technology in recruiting is typically confined to gathering and presenting simple candidate profiles. We argue that many issues in recruitment boil down to lack of understanding the process of decision-making from social matching perspective, covering aspects like identification of relevant selection criteria and choice of the most suitable candidate. To better understand the appropriate roles of information technology (IT) in this domain, we interviewed 21 expert matchmakers, such as HR specialists and headhunters. Based on qualitative analysis of their experiences, we provide a bottom-up framework of the decision-making stages in recruitment, focusing on the pertinent challenges from the perspective of social matching. The findings indicate that, particularly, the epistemic asymmetry between the recruiter and candidates regarding the expected qualities calls for deliberation throughout the decision-making process. Matchmakers also struggle between contradictory ideals of agility and holistic decision-making. Based on the findings and relevant literature, we propose six roles that IT could play in social matching decisions in recruitment.

1 INTRODUCTION

In modern knowledge work, collaboration is considered as a universal dogma to reach high levels of innovativeness and performance in organizations. A key question in enhancing collaboration relates to the social composition of individuals: the mutual compatibility of individuals has been found to significantly affect the performance and well-being of both individuals and organizations [51]. In organizations, this question is typically addressed through recruitment and headhunting, that is, at the time of acquiring new personnel. Unfortunately, however, organizations seem to be struggling with their recruitment decisions and the tools they use in the process [11,48].

In Human-Computer Interaction (HCI), the question of optimal social composition has been considered through the concept of *social matching* [52], or simply *matching*, which refers to ways of identifying and facilitating new social connections between people—with or without computational aid. Different computational approaches have been envisioned to support the matching processes in different areas of life. For instance, matching similar profiles at work places to encourage new encounters [17], people recommender systems to find relevant users in social media services [20], online dating systems [60], as well as peers for learning [43]. Contextualizing the general notion of social matching to professional life, a recent paper introduces *professional social matching* as an umbrella term that covers a plethora of vocational matching activities, related to partnering, grouping, mentoring and networking in professional contexts [37]. The authors provide directions for the development of computational approaches to this area, outlining approaches for computer scientists to design for matching.

From a management science perspective, Weller and others [56] define matching as the "process by which individuals are dynamically aligned with roles, jobs, situations, and tasks within organizations". They stress the complexity of matching, considering it as a multilevel and multidimensional process with heterogeneous groups of individuals and organizations and dynamic circumstances that greatly affect organizational performance. We further argue that the importance of choosing suitable

collaborators and partners is ever increasing as co-creation chains tend to become more complex and cross organizational boundaries through, for example, ad hoc freelancer groups, micro-entrepreneurship, crowdwork and piecework [1].

Building on the aforementioned two conceptual groundings, this paper considers recruitment as a social matching activity that certain decision-makers, such as HR specialists and managers, perform in organizations. Employee recruitment typically refers to the overall process of attracting, appointing and managing suitable candidates for jobs within an organization, regardless of how and by whom the process is carried out, hence also covering the so-called third-party head-hunting activities [6]. Consequently, as recruitment covers various managerial and administrative activities, the concept of matching provides a more focused perspective to the *selection* of individual(s) to a certain organizational context or activity. In this paper, we use the term *matchmaker* to refer to the key actor from the matching perspective.

While the matching choices are typically made by human decision-making, various applications of Information Technology (IT) are increasingly being used to support such processes, making this an interesting space for HCI research. Prior research on e-recruitment [53] has provided some insight into the decision-makers' use of specific tools, such as online job boards, job ad aggregators, employer websites, mobile recruiting and social media in their matching practices [13]. Recently, the newest wave of computational tools has been strongly criticized [11]. To provide a fresh perspective, we argue for a lack of more general and holistic understanding of the decision-making in relation to matching, which is also acknowledged by Weller et al. [56]. We argue that better understanding of the decision-making process of matching and the challenges therein would be beneficial for developing more appropriate and effective IT solutions for recruitment.

Consequently, the research question driving this study stands: What are the characteristics of the decision-making process and the related challenges of social matching in the context of recruitment? We conducted 21 in-depth interviews with experts who frequently perform matching as part of recruiting activities in organizations. We studied their current practices, different aspects and perceived ideals in the decision-making they perform, and, in particular, the challenges they face in pursuing good decisions.

The analysis revealed a variety of relevant perspectives to decision-making that can be characterized as a process with four distinct stages, each with their specific challenges. For example, the participants were found to often struggle with balancing between contradictory ideals of agility in decision-making and reaching a holistic understanding to allow making thought-through choices. Matching decisions in organizations are considered very delicate, context-dependent and dynamic, and, in the studied sample, such decision-making was found to be suboptimally supported by IT. The decision-making processes in matchmaking remain to be primarily human-based and tend to be driven by intuition. This calls for careful consideration of the optimal roles of IT in assisting the matching processes at different stages.

This paper offers (i) qualitative insight about decision-making in the empirical context of recruiting, focusing on expert matchmakers' perceived challenges, (ii) conceptualization of the decision-making process, and (iii) considerations on what are appropriate roles for IT systems to support matchmakers' work in recruitment.

2 RELATED WORK

HR processes have undergone significant changes due to recent technological advances. Particularly in recruitment, technology is extensively utilized for posting jobs, collecting resumes, and communicating with the pool of candidates. In the following, we discuss prior research perspectives regarding the role of technology in facilitating recruitment practices. As we consider recruitment as a social matching decision that involves various phases, we also provide an overview of theoretical foundations of decision-making in recruiting.

2.1 Optimistic vs. Critical Perspectives to E-Recruitment

Relevant HCI and CSCW research has aimed to understand the role of technology in hiring and job search processes. The "war for talent" [35] and challenges in managing a large number of job applications have motivated the development of various e-recruitment systems. IT-based systems are intended to solve issues in HR management, allowing to target a broad audience of candidates with lower costs, assisting in the analysis of rich CV data, and screening job applications [2]. In general, there seems to be a variance with respect to what kind of agency IT is given in such activities and how optimistic vs. critical mindset the developers and authors take.

The work that we consider to represent the optimistic end of the spectrum looks at the advantages of IT in computational hiring, and hence contributes to e-recruitment or *digital recruitment*, which has been argued as a strategic imperative that organizations should aim for [40]. Thus, IT solutions are seen to serve as a bridge between job-seekers and organizations. The design solutions are typically based on existing organizational, social and personality theories (e.g., [41,59]). Recent examples include sophisticated semantic job-applicant matching techniques [19,28,42] and matching resumes of candidates to job descriptions using machine learning techniques [31,57] . In addition to headhunting services, online workspaces such as GitHub have proved to play an essential role in hiring decisions [32]. The transparency and rich activity traces in such interactive workspaces help decision-makers to infer verifiable signals of practical abilities and passion for working.

The more critical stance tends to highlight the adverse effects of recruiting technologies. Even though there are various services that aim to fulfill the needs of both the recruiters and the job-seekers, evidence illustrates high unemployment rates and organizations' arguments regarding challenges in reaching the right audience for jobs [8]. For instance, Cappelli [9] concluded that hiring processes are poorly optimized due to lack of experience-based training and education of job-seekers as well as overly demanding requirements and expectations of organizations. Such mismatch in demand and supply on the labor market further was found to be fostered by existing hiring technologies that typically utilize overly simplified filtering and screening methods, thus disregarding actual merits in the evaluation of job applicants [49]. To this end, HCI research has particularly investigated the so-called disruptive job technologies [15] that foster inequality of access and use of IT by low-resourced and disadvantaged job-seekers [16,26]. Overall, it seems that many problems in relation to recruitment persist and that the current technological tools suboptimally support the processes and decision-making in recruitment.

Furthermore, it is noteworthy that prior research mainly takes the viewpoint of job seekers aiming to understand their needs and approaches in finding jobs (e.g., [10,25,39]). The recruiters' perspective was taken in regard to facilitating the fast pace of hiring processes via technology, which is typically confined to conveying information about potential matches [21]. At the same time, experiences, practices and decision-making challenges of recruiters remain understudied. Majority of design-oriented HCI research aims at increasing the effectiveness of job-person matching before even knowing matchmakers needs that are worthy to be solved or optimized with IT. In fact, along with advantages, existing job technologies have been found to bring even more issues to the hiring decision-making (e.g., biased hiring, lack of job match quality, cognitive overload) [18], which we also identified in our empirical data. Therefore, more in-depth understanding of the challenges that matchmakers face along the decision-making process can introduce new opportunities for more optimal roles of IT.

2.2 Theoretical Foundations of Decision-Making in Recruitment

The literature on conceptualization and theorization of matching practices is highly segmented across domains of organization research, psychology, and management science. In this paper, we focus on the well-established research area of external employee recruitment. Employee recruitment is defined as a demanding decision-making process consisting of multiple stages including bringing a job opening to the attention of potential candidates, influencing whether the candidates apply, affecting whether they maintain interest during the process and influencing whether the job offer is accepted [6]. As any other decision-making task, matching is susceptible to the limitations of human cognition and bounded rationality, including limited ability to understand the complexity and to sustain logical reasoning [36]. Biases and cognitive shortcuts in decision-making refer to, for instance, the tendency to seek information that confirms existing beliefs and rely on easily available information [27]. In addition, decision-making can be affected by *dualistic perception* discussed by Kahneman [27]: when facing choices, human cognition primarily initiates automated and intuitive selection rather than rational reasoning.

Aiming to assist decision-makers in recruiting tasks, psychology and management researchers have investigated, for example, personnel attraction [12,46] and selection through person-environment fit (P-E fit) theories [50], such as the Attraction-Selection-Attrition (ASA) model [47]. In relation to P-E fit theories, researchers have explored the influence of personality or cognitive qualities in face-to-face hiring decisions, revealing human biases in action [29]. For example, more extraverted applicants are more effective in self-promotion and perceived applicant-interviewer similarity often serves as a determinant factor in hiring decisions. Social factors, individual characteristics, and personality traits also affect the matching of an individual to a group within an organization [33].

A recent review by Weller et al. [56] provides an analysis of the extensive and multidisciplinary literature on matching processes within organizations—covering the life cycle of an employee from recruitment till contract termination. The authors extend the ASA model into a more holistic matching model exploring also selection and adaptation mechanisms. They illustrate the complexity of matching by referring to information asymmetries between job seekers and organizations, heterogeneous nature of labor, and instability of internal and external contexts. The authors address the importance of information flow, organization design and personnel heterogeneity in achieving high-quality matches.

The above-mentioned theories illustrate that behavioral biases are also inherent in decision-making processes within recruitment. Although existing modeling and suitability P-E fit theories contribute to the conceptualization of the recruiting and personnel selection life cycle, they are insufficient to holistically explain what qualities define a good match. The empirical research in this area is often narrowed down either to issues of matching individual characteristics with professional environments or to other specific matching activities, which limits obtaining a general-level understanding of the process of selection and matchmaking. In contrast, this article approaches recruitment from the perspective of decision-makers' experiences by providing an account of perceived challenges in their current practices.

3   METHODOLOGY

To better understand the challenges and practices in recruitment from matchmaking viewpoint, we decided to study the subjective experiences and opinions of people actively involved in the matchmaking process. Qualitatively oriented empirical research based on interviewing was expected to yield a profound understanding of the actual challenges that the central actors

face on a daily basis. Instead of studying the experiences of using specific tools, like in some previous work, we wanted to understand the decision-making process on a more abstract level from the perspective of matchmaking. While the interviews touched also other social matching activities, such as team formation and professional networking, the majority of the discussion revolved around recruitment related tasks, which is also the focus in this paper.

3.1 Interview Procedure

We conducted 21 semi-structured, face-to-face interviews in December 2017–March 2018, with one or two researchers present in the interview. In most cases, the physical context was the interviewee's workplace, which created a relaxed atmosphere and helped them to elaborate on their typical practices and experiences.

The first part of each interview we inquired what kind of social matching activities they are involved in. This was followed by questions related to their current practices and technologies they use. Following our focus on perceived challenges, the central part of the interviews focused on various challenges and risks in their matchmaking activities from the decision-making perspective.

3.1.1 Design Fictions

To enrich the discussion and elicit opinions about possible technological futures, we utilized a design fiction approach [4] and scenario-based design [45]. In practice, we generated scenarios that set out narratives of possible uses of IT in the decision-making related to matching.

We prepared two utopic and two dystopic scenarios with respect to possible ramifications of a technological tool. For each interview, we selected one dystopic and one utopic scenario according to the participant's expertise and professional role, and we gave the scenarios to the participants to read in the latter half of the interview. It is noteworthy that two of the four scenarios covered other matching activities than recruiting (i.e., finding a mentor, general networking), so this paper only incorporates the discussion on the two scenarios described below.

The utopian scenario on recruitment envisioned a system that is able to recognize lack of specific skills in an organization and recommend a new position to be filled. This was envisioned to lead to improved well-being at work. Figure 1 illustrates in what form the scenario was presented to the participants. The dystopian scenario is about a system that identifies an ideal team of four people to be recruited to a startup company. Unfortunately, the highly performing team becomes culturally isolated from the rest of the company, which creates social conflicts and leads to drastic personnel changes.

The scenarios were presented in original language. The scenarios were presented as 2-page comic strips with images and text. They helped the participants to envision how the use of information technology in social matching might positively or negatively influence individuals or organizations. Exploring possible futures helped the participants to better articulate their present practices, challenges and to move beyond the familiar towards an imaginative space.
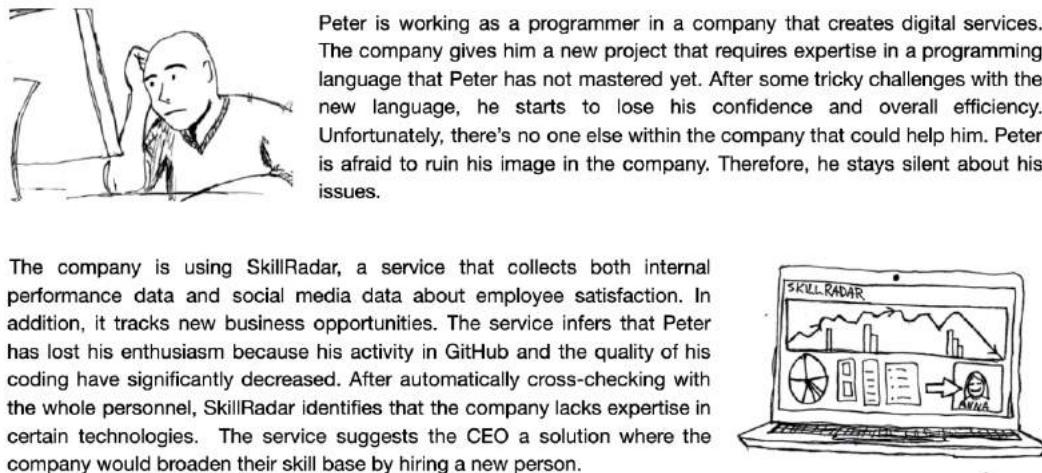

Peter is working as a programmer in a company that creates digital services. The company gives him a new project that requires expertise in a programming language that Peter has not mastered yet. After some tricky challenges with the new language, he starts to lose his confidence and overall efficiency. Unfortunately, there's no one else within the company that could help him. Peter is afraid to ruin his image in the company. Therefore, he stays silent about his issues.

The company is using SkillRadar, a service that collects both internal performance data and social media data about employee satisfaction. In addition, it tracks new business opportunities. The service infers that Peter has lost his enthusiasm because his activity in GitHub and the quality of his coding have significantly decreased. After automatically cross-checking with the whole personnel, SkillRadar identifies that the company lacks expertise in certain technologies. The service suggests the CEO a solution where the company would broaden their skill base by hiring a new person.

Fig. 1. An excerpt from a utopian scenario on recruitment. The text is translated from the original language.

3.2 Participants and Recruitment

To gather a relevant sample of participants, we first identified candidates from various local organizations and relevant social media forums in Finland. We were explicitly seeking HR experts, people in leading positions, people in charge of teamwork, and other people that are involved in recruitment decision-making within organizations. In addition, we targeted organizations that are interested in matching in general (see Table 1) to be able to discuss the topic also beyond their personal experiences. We

inspected each candidate's work profile, social media profiles, as well as approachability for a face-to-face meeting. As a result, we invited 50 relevant people to the interview study via email and, eventually, 10 females and 11 males agreed to participate.

Table 1. Participants' background information.

ID	Gender	Experience (years)	Role
1	F	22	Startup CEO, developing recruiting apps
2	M	2	Startup CEO, developing recruiting apps
3	M	4.5	Startup CEO, analyzing social media
4	M	1.5	Organizer of a student job fair
5	F	1	HR consultant, a job fair organizer
6	M	1.5	Project manager, event organizer
7	M	4	Strategic resourcing and recruiting expert
8	F	8	Head of recruitment and employer branding
9	F	13	HR manager
10	M	2.5	Recruitment consultant
11	F	3	HR consultant
12	F	11	Recruitment team leader
13	F	2	Sales, recruiting and team leader
14	M	17	Journalist, team leader
15	M	2	Responsible for a digital infrastructure
16	F	1.5	Project manager in a mentoring program
17	M	8	Account manager, consultant
18	F	10	People development consultant
19	M	16	User experience team leader
20	F	3	Community manager, career counseling
21	M	7	Social media recruitment trainer

At the time of the study, all the participants were residents of Finland, and the interviews were held in their native language. Their ages varied from 22 and 48 (median 33). On average, they reported having 6.7 years of experience in their current role (in any organization), minimum being one year and maximum 22. In general, we were able to reach a diverse sample in terms of occupation and expertise (see Table 1).

3.3 Data Analysis

All interviews were audio recorded and later transcribed in verbatim. The average length of one interview was 73 minutes, and the total word count of the combined transcription file was 146,880. This provided us with a rich textual data set. We conducted bottom-up coding with the Atlas.ti software. In the coding process, we first employed attribute coding and structural coding, dividing the data roughly into four main categories: current practices in matching, attitudes towards technology-supported matching, ideals in matching decisions, needs for technology, and problems and risks. Then we read data in each category line-by-line and created individual codes with descriptive open coding. After that, we formed larger themes with pattern coding and axial coding and started to look at the structure from different perspectives, one of them being challenges. The analysis was carried out in the same language that the interviews were conducted and the findings were translated into English when preparing the publication.

Throughout the process of data collection and analysis, we utilized the critical interpretation method [4], which allowed us to focus more on gathering experiential heights of individuals rather than on typical or representative experiences. This method was also helpful in expanding our sense regarding feasible versus demanded design opportunities for IT-based solutions. Furthermore, to ensure the credibility of the analysis, we followed a collaborative qualitative coding method with two responsible analysts, first coding independently then cross-checking each other's categorization and emerging topics, and one senior scholar challenging and enriching the analysis process.

4 RESULTS

We organize our findings according to a temporal framework that is synthesized from relevant literature as well as the analysis of the interview data. We unpack the process of decision-making, including stages that could be identified in employee recruitment: (1) establishing requirements for a match, (2) identifying and attracting alternatives, (3) comparing alternatives, and (4) selecting the most optimal match. The process elaborates the ASA theory for recruiting [47], however, shaping it into a more generally applicable process for decision-making. In the following, we identify epistemic decision-making challenges at each stage.

4.1 Stage 1: Establishing Requirements for a Match

This stage relates to the identification of what would make a good match in the given situation (for example, for the task at hand) and what kind of qualities are sought. The importance of this stage increases in long-term, high-risk commitments such as team formation and recruitment. However, it is noteworthy that none of the participants brought up the use of any information systems to facilitate the discussion on and definition of the requirements for a good match.

4.1.1 Unclear Matching Goals and Requirements

A recurrent theme in the interviews was that the goal of matching is often unclear. In recruitment, it is hard to know what an organization needs in the long term. Hence, decision-making processes tend to represent iterative and opportunistic explorations of emerging options rather than the determination of clear criteria and objectives.

The reasons behind the limited understanding about matching needs are manifold. Several participants pointed out that a general goal is to find as innovative and talented people as possible in order to drive company growth. Such generic qualities are, however, not easy to measure and often surface only after several discussions. Participant 20 said that sometimes vague requirements lead to mismatches that affect, for instance, the coworkers the candidate is going to work with. We continue on this aspect in section 4.3.1.

> "There have been a few cases where I have asked the client if they have any specific wishes and how we could really emphasize that and try to find that out during the process (of matchmaking) ... Because it is hard to go back to the drawing board and start the process again. It is a puzzle that affects all stakeholders." (P20)

> "You have to be careful when defining the requirements ... we think about that a lot and how much it affects the direction the discussion (with the candidate) goes ... instead of thinking what problems we are supposed to solve, it is tempting to start thinking about the solutions and then we end up developing all kinds of solutions. We don't even start to think if we are asking the right questions." (P20)

An organizational reason is that the people who create and publish job ads are not familiar with the actual work. In the country where this study was conducted, the matching process was mentioned to be often delegated to HR people who are not involved in the work in question. This lack of clarity was mentioned to lead to very opportunistic recruitment, which can lead to further issues related to mismatch of duties and skills of a recruited person. Time pressure was another persistent issue. A participant whose company is developing an application to match job seekers with a job described this challenge in relation to the pressure of time and competition that recruiters face:

> "If you are not [as a matchmaker] absolutely certain and want to spend more time to learn about the candidate [you get from our service]... that gives someone else time to hire the candidate. We encourage doing decisions fast, and we even send automatic replies to remind that 'first come, first served.'" (P1)

To dodge the lack of clarity of matching goals, one participant mentioned having started to utilize informal essay assignments. The applicants' answers might provide insight about personality characteristics, attitudes and general ways of thinking, and thus allow room for unexpected qualities to surface. This can be seen as a strategy to externalize the definition of requirements to the applicants. However, such qualitative insight and criteria are hard to employ when having a high number of options or having several people to make the matching decision.

> "Someone who is experienced, eager to try new things and can show that s/he has produced some ideas and tested them in practice – those are the qualities we are looking for. Our application process is simply a short essay where we ask for opinions on what is the biggest trend that is going to affect our lives. There we can see how they perceive the world." (P20)

Furthermore, the most important qualities can be hard to identify not only by the matchmakers but also by the people who might be relevant candidates. This lack of knowledge boils down to the typical issue of epistemic asymmetry: neither side knows the needs or is even aware of the existence of the other side.

4.1.2 Lack of Flexibility Causes Compromising and Mismatches

One participant indicated that if the requirements emphasize a few attributes too strongly, it might be that there are no realistic options to fulfill the need. Sticking with the overly demanding primary criteria can hence result in watered-down compromises. At the same time, readiness to change the requirements could have yielded fruitful results. A recurring story in the interviews was that an unsuccessful matching case was preceded by a decision-making process that was far from well thought or systematic. Recruitment decisions are often made under intense time pressure and the decision-making power is limited to a few central people in the organization using merely their own knowledge.

> "The company basically went straight to the interviews and when one candidate quickly seemed like a good employee, the company hired the person then and there. However, the match didn't work out. The work assignment was not suitable and some things from the person's background were found that didn't suit the organization." (P10)

A typical example of a mismatch is when the parties are epistemically too far from each other. One participant was serving as a matchmaker who makes educated guesses on who could benefit from each other in terms of consultancy and information sharing (i.e., recruitment for short-term collaboration). Speaking of results of unclear requirements and lack of flexibility, he gave the following example of a mismatch:

"We match organizational needs and academic excellence. However, academic knowledge is not always understandable for the organizations. Once, I set up a training for nuclear plant workers and I picked a great professor to train them for a few days about very theoretical stuff [...] It turned out to be a bad situation for everyone, the professor felt that it is impossible to make it simpler and the workers felt that this kind of expertise was not needed." (P17)

Furthermore, participant 1 wanted to remind that taking time to find a new member to a team after someone has left is an opportunity to re-evaluate what the organization needs. Unfortunately, the opportunity is rarely used; several participants stressed that the ordinary, everyday needs of the team to be productive create pressure to recruit a worker that has skills similar to the previous employee.

"Probably the first thing you should do is to take your time and search, because it is such a wonderful opportunity... Of course, it is a bummer that someone leaves but it is a great opportunity to figure out if we need different kind of skill profile for the next challenge." (P1)

4.2   Stage 2: Identifying and Attracting Alternatives

After defining goals and requirements, stage 2 covers the identification of organizations or individuals who would meet the requirements. Furthermore, as one side or a stakeholder typically initiates matching, it is crucial to ensure that the potential counterparts become aware of and interested in the opportunity, leading to a discussion on possible collaboration.

As an individual's social network is increasingly valuable social capital, the analysis consolidated the idea that managers and entrepreneurially-minded people tend to network very openly and opportunistically. However, many of the participants found the opportunistic strategy time-consuming. The opportunistic approach was often contrasted with more predefined searching-based strategies to identify matches.

"I'm opportunistically browsing the data and read a lot of things that are not in any way directly linked to me. It takes a lot of time. Then again, a more efficient way is to actively look for people and companies from our own data [...] However, doing that, I have to first decide what I'm looking for and might leave something out when I make decisions." (P3)

4.2.1   Current Systems Lack Features of Opportunistic and Flexible Matching

The use of IT was discussed particularly in relation to identification of candidates. With IT systems it was easy to conclude that the more info, the better. However, a fundamental real-life challenge relates to selecting and finding the type of information that is the most relevant in the given case, thus keeping the amount of data practically manageable.

"There are certain prescreening categorizations [in our system] which we use to apply certain keywords and select the most interesting applicants. It is possible to include only those who have a graduate degree, for example." (P9)

It was noted that agile, opportunistic matching decisions during face-to-face encounters are very different from computer-supported processes. In e-recruitment services, the attraction of candidates is typically not a real-time process. Additionally, if a service uses matching algorithms, like in some of the scenarios the participants read, the decision-making logic about the relevancy of candidates might not be considered transparent and trustworthy. After reading the scenarios, a participant was worried that digital solutions that aim at efficiency and simplicity might drastically narrow down the population of suitable candidates:

"This kind of service is often probably made in Tinder style, like: here's a match for you, take it or leave it. The spectrum of alternatives is easily forgotten."
(P14)

Not surprisingly, LinkedIn was considered as one of the key channels for headhunters to identify potential employees, although some also felt that various social media groups on specific topics are being increasingly utilized. However, what is interesting is that many considered that the users have to cleverly adapt to the way the service works, depending on the openness of personality and practical availability for matching. A few participants further pointed out that the IT system should avoid setting limitations for inputting information and, preferably, give more freedom in building a profile.

"In LinkedIn, the profile the service provides, gives quite one-sided picture about your skills. For a job seeker, a service where you could introduce yourself with YouTube videos and other content would make more sense" (P11)

"Something is done correctly when, instead of forcing you to a promoter format, both the employer and the worker can very informally tell about themselves. Then the [employer and the worker] can maximize their visibility and hit rate." (P3)

"Skilled workers don't fit into boxes, and the message that you don't have to fit into a box is what they love." (P1)

4.2.2   Competition Makes It Challenging to Search for Experts

With a big responsibility to find the best people available, participants noted, usually after reading design fictions, that the most suitable people are often already occupied. The ongoing competition between organizations to get the best professionals has forced to create efficient ways for attracting candidates and collaboration partners.

"Work life is going to a direction where, even if you find suitable persons, it's ever harder to attract them. If we think about recruitment software, the systems often address the matching [of suitable skills], while the challenge is actually to attract good candidates. Sorting candidates is not the challenge but to get anyone at all to work for you is." (P12)

If the identified experts are already occupied, the job of a matchmaker increasingly resembles that of a salesperson. The outcome of matchmaking strongly depends on how transparently and attractively one is able to communicate the benefits of potential collaboration to the candidates. Besides, matchmakers often lack a holistic understanding of jobs they try to sell to candidates, which makes the recruiting process even more challenging. Unclear responsibilities and indifference from the matchmaker might also delay the decision-making process.

> "The hardest thing has probably been that no matter how good your tools are and how good you are in your job, the head hunter must often also be a good salesperson. [...] You contact the person who has never heard of you and say that you should come to work for us. [...] For sure very skilled workers can be found in this way but the big question is whether they are interested in what you are offering." (P21)

4.3 Stage 3: Comparing Alternatives

In case of having many options, there might be a prequalification where some of the alternatives are ruled out. Nevertheless, comparing the remaining few alternatives typically takes plenty of effort and involves various pitfalls.

4.3.1 Narrow View to Individuals' Qualities

Drawing from both their real-life experiences and the design fictions, the participants were worried that, with or without digital solutions, candidates are not always able to provide relevant information about themselves and, therefore, it is challenging to find the most suitable matches. For example, it was mentioned several times that comparisons are often based on oversimplified information, such as job titles or personal impressions about suitable people. Participants were concerned that the vast potential in people is not visible in simple lists of names and titles:

> "Currently we define ourselves largely through titles. To me, it is actually the least interesting thing when I recruit people. Something else from your background can be much more interesting to me because it shows that you can bring a unique, new perspective to the discussion." (P20)

> "We use this service that shows all construction projects and people responsible for them [...] however, it is limited only to representation of people in charge. So there are many people who are not nominally responsible of a project but could be really good [for a position]." (P5)

Many existing human resource management systems do not support extensive capture of skills, knowledge, experience and other qualities that a person or an organization has. This might rule out people that have different, complementary qualities, such as experience from another field. The most obvious skills, especially skills related to technology, are underlined while little information is presented regarding the qualities or skills that could make more unique matches or give an advantage in the competition with other people.

Furthermore, even though working in teams has long been a rising trend in knowledge work, it seems that, from the decision-making point of view, more weight is given to individuals' qualities as opposed to teams' qualities. Many participants addressed the need for better means of forming teams, giving more attention to facts about the team as a whole rather than the individuals separately. For instance, the company of participant 18 had been offered to recruit a whole team at once but, so far, their focus has been strictly on individuals:

> "For example, our culture and recruitment focus heavily on individuals. His/her interests, enthusiasm and all other things are the base for virtually everything with us." (P18)

4.3.2 Seeing through Impression Management

Another common theme was that individuals tend to have different faces in different contexts, which complicates gaining a holistic picture of a person. Notably, for an individual who is far from routine matching decisions, the cognitive load of analyzing, comparing and interviewing several candidates one after another can be overwhelming, resulting in mixing individuals and their features. As participant 7 stated, social matching is primarily grounded in impressions people give about themselves, overlooking the fact that one can adjust the impressions because of different interests:

> "There are all kinds of impression management. How credible is the information job seekers provide? For a job seeker, it is usually important to get the job. [...] People are aware that there are criteria that the selection is based on. Understandably many people are tempted to adjust the impression accordingly." (P7)

A project manager who analyzes application letters to form actor-mentor pairs felt strongly that the matching process with such importance needed a human operator who, for instance, could understand the hidden messages between the text lines. In fact, one of the difficulties in her job is to find out if people actually mean what they are writing:

> "You can pretty well sense what they need. Sometimes there are surprises [...] It depends a lot on what the applicants are ready to tell about themselves in the application phase. Some people might think that they have to sound better than they feel just in case because they are used to create job applications where they have to be perfect." (P16)

4.3.3 Need for Readiness to Revise the Requirements

When there are only a few candidates to choose from, it can be hard for the decision-maker to see which one would be the best option. Scenario work and risk analysis were some of the mentioned ways to make a more systematic selection in a seemingly even situation. However, the case of comparing two candidates with very different strengths was considered particularly challenging and required revisiting the original criteria:

"One thing that we have often discussed is comparing a digitally very capable and innovative person with an experienced domain expert; they can be contradictory in terms of requirements." (P7)

For a matchmaker, contradictory goals cause difficulties in optimization. The originally defined requirements can also change during the process, so another issue at this phase is that one might not be flexible and wise enough to notice that the requirements are indeed not those that were initially set.

"It is possible that you need to select, at the same time, the most skilled worker, an equal number of young and old applicants and someone who is best at marketing. Therefore, the criteria are not always coherent. It creates challenges to optimize matches." (P7)

4.4 Stage 4: Selecting the Most Suitable Match

Following the challenges in comparing alternatives, the participants pointed out that selection rarely represents a deliberate and well-informed decision.

4.4.1 Need for More Iterative Selection Process and Trial Periods

According to the participants, the matching decisions are often made quickly, for reasons such as lack of time or pressure from the management. There seem to be two contradictory 'forces' in the decision-making process: the need to react to the dynamism of the operational environment and the need for making well-thought decisions. One participant exemplified that the match is more likely to fail when the recruitment is accomplished in one go. The risk decreases if there are more than one interview or pre-tasks but, in turn, this is deemed to take a lot of time:

"So, the company had basically gone straight to the interview process and when the applicant seemed decent, the company gave the contract straight away. Then the match had not worked out well. The job assignment was not what was expected or something was found from the person's background that did not fit to the organization. With personnel assessment, we try to prevent those kinds of things." (P10)

Participants who complete matching assignments for clients pointed out that the qualification requirements might change before the selection. The separation of responsibilities to search for suitable person/s on the one hand and to make the final decision on the other was seen to increase the risk for rejection and need to restart the process.

"It happens quite often that we make significant effort to find someone and after we find the person and think that s/he is perfect for the position, the employer or the client thinks after the interview that s/he is not suitable at all." (P5)

"The situation changes all the time... There might have been several months since we have gone through a client's situation, that they want this and that skill. But things go forward so fast that when I go to offer a good prospect, the situation has already changed and now they want different skills." (P13)

Our impression from the interviews consolidated the general trend towards people and organizations being more flexible in terms of doing freelance or part-time work. This brings a growing need to make quick matches for small tasks. Participant 8 even suggested a system that would allow organizations to treat people as a resource, enforcing more flexibility to move between job assignments. This would enable a more on-demand approach to matching and decrease the organizations' financial risks of making a bad choice. However, in reality, the decision-makers seemed to struggle to attract full-time employed people that would be open for new opportunities. Therefore, they seem to be forced to settle for suboptimal matches.

4.4.2 Balancing between Diversity and Similarity

Interestingly, many participants seemed to share the need for diversity in teams or organizations but said that it is often practically challenging. A few participants noted that sometimes they try to make non-obvious matches to bring fresh viewpoints, for example, to support growth or shift to traditional ways of working. For instance, participant 15 said that he typically aims to find surprising combinations. More generally, the participants considered that introducing diversity might have negative consequences in short-term, but, at the same time, noted that growth does not come without investment in facilitating change, as participant 7 describes below.

"Sometimes, on purpose, we recruit 'troublemakers' who represent the future we have envisioned for this community. Then the person comes here and starts to railroad change by force. There is going to be bruises but it helps us; the reactions help us to make the transition." (P7)

In the other end of the continuum, a team leader gave a concrete example of how people in his surroundings have a representative similarity; e.g., being roughly the same age, or having biased gender distribution. Friends of a professional are in many cases from the same professional field. He had realized that getting personal recommendations from familiar people may lead to hiring even more people that are similar in that way, basically representing the homophily bias.

"There is a risk that soon all of us are a little under 40-year-old white males with glasses. That is a big risk I have noticed [...] We currently have five teams [...] In three of them, all look like me. I have talked about this with our HR." (P14)

Furthermore, the cultural fit was mentioned to be of equal importance as personal skills and qualities. A recruitment team leader (P12), for instance, described how an interview is an opportunity to test if there is a cultural match and, if a person is

incompatible, the recruiting process can stop straightaway. One participant argued that cultural matching is, however, understood incorrectly, as it is not equal to hiring similar people.

"Cultural matching doesn't mean that you want to hire similar people every time. On the contrary! It's a bad thing if you get clones, people who always think the same way and have similar backgrounds. In the end, that kills the innovativeness. Cultural matching should mean that the sought person is different enough from the people you already have but s/he shares the values, culture and certain personality, for instance. Things like communication, ability to create content, take criticism, and be constructive." (P21)

5 DISCUSSION

We start with a summary and reflection on the key findings in relation to earlier work. This is followed by a discussion on design considerations about what kind of IT solutions would appropriately support the decision-making process and its specific stages. Finally, we discuss the methodological limitations of the study.

5.1 Summary and Reflection on the Key Results

While such qualitative research can yield a variety of insights for different readers, in the following we highlight aspects that we consider the most important from the matchmaking perspective. Our findings are organized according to a process that elaborates the ASA theory for recruiting [47]. However, in contrast to ASA and the work by Weller et al. [56], we focused on the more narrow viewpoint of matchmaking, including stages that could be identified and corresponding challenges. Table 2 provides an overview of the stages and some of the key challenges in recruitment.

Table 2. Summary of the stages and examples of challenges in recruitment and team formation.

Stages and definitions	Examples of the decision-making challenges from matchmaking point of view
Establishing requirements: Identifying what would make a good match in the given situation and what kind of qualities are sought for.	Lack of clarity in the goals might lead to very opportunistic decisions and hence suboptimal matches. Identifying what complementary viewpoints or competences an organization might benefit from.
Identifying alternatives: Identifying and attracting individuals who would meet the requirements.	Selecting and finding the information about candidates that is the most relevant yet practically available. The spectrum of alternative matching strategies and different individuals' needs are easily forgotten.
Comparing alternatives: Assessing the alternatives in relation to the requirements and each other.	Evaluating the candidates and their qualities from too narrow perspectives and based on self-reported description. Comparing two individuals who fulfill the minimum requirements but have very different strengths.
Selecting the most suitable match: Making a deliberate and as well-informed decision as possible, considering the goals and available alternatives.	Being forced to make fast-paced, intuitive decisions because of time pressure or managerial practices. Increasing diversity in the organization without disrupting harmony or reducing efficiency.

In establishing requirements for a match, the most generalizable finding is that the goal of matching is often unclear. This leads to problems in identifying relevant actors as alternatives and choosing the most optimal one. Even the explicitly mentioned requirements might not be thought through but the actors are nevertheless unable to revise them. Lack of flexibility and reactivity about the criteria can cause mismatches and issues in the long run.

Regarding the identification and attraction of alternatives, prior research focuses on attraction and search from the perspective of personality traits and abilities assessment [30,50]. In addition, we identify challenges in defining what personal qualities are the most relevant in each case and what kind of data about the individuals would be best to tell about those. In practice, the current IT systems were argued to fail in supporting fast-paced opportunistic searching (e.g., by providing recommendations from a large population of eligible people).

In the comparison stage, matchmakers may struggle because the candidates fail to express themselves meaningfully and truthfully with current IT. In addition, comparisons are often based on oversimplified information, such as job titles or general impressions about suitable people. While IT has reduced the amount of time needed to catalog alternatives, existing systems do not support capturing the candidates' skills, knowledge, and experience very extensively. In opportunistic searches, the decision-makers might look for alternatives with more vague requirements, which results in unpredictable emerging alternatives and challenges in the process of defining the exclusion criteria.

Finally, the selection of the most optimal match is where the risks of unclear requirements or an opportunistic strategy in finding actors typically actualize: the selections might remain arbitrary and be based on intuitive impressions rather than deliberate reasoning. For instance, hiring with gut feeling against algorithmic recommendations is associated with worse hires,

yet matchmakers believe themselves to be better judges of applicants' suitability [22]. Additionally, Rivera [44] found that emotional reactions to applicants are meaningful contributors, in contrast to stances that consider recruiting to be driven primarily by applicant characteristics, such as cognitive skills, social capital, and demographic characteristics.

Overall, matching often brings about conflicts between making deliberate decisions and the available time and ever-changing requirements. In other words, matchmakers struggle between contradictory ideals of agility and holistic, rational decision-making.

5.2 Roles for Systems Supporting Decision-Making in Social Matching

To refine the findings into design considerations for the HCI community, we highlight six potential roles of IT to support matchmaking in recruitment, based on our empirical results as well as prior literature. The identified roles underline central needs and opportunities, and, when possible, suggest computational approaches to support matchmakers to tackle the challenges. In Table 3, we categorize the considerations into two primary categories, which relate to either *cognitive* or *managerial and cultural* decision-making challenges, and map them to the stages of the matching process.

Table 3. Potential roles of IT in relation to the decision-making stages.

	Roles of IT	Stage 1	Stage 2	Stage 3	Stage 4
Managerial & Cultural	1. Increasing awareness of the various criteria.		X	X	
	2. Enabling multi-dimensional matching.		X	X	
	3. Facilitating transparent and democratic decisions.	X			X
Cognitive	4. Bridging different forms of epistemic asymmetry.	X	X	X	X
	5. Helping make sense of and learn from the data.			X	
	6. Finding the balance in diversity and similarity.				X

Our sample of matchmakers had a cautious attitude toward technology that would decrease human interpretation and contemplation in the matchmaking process. The design fictions we presented or the IT systems they had been using in the recruitment process raised questions regarding the appropriateness of the technology. The important aspect regarding the role of technology in the future of matchmaking has not yet been a popular discussion topic in HCI. We believe that IT could assist human matchmakers in several ways: through different kinds of decision support systems (e.g., to reach consensus on the criteria); by providing targeted information on the UI (e.g., using advanced visualizations to highlight various features of people); by being more proactive in giving recommendations about relevant and timely matching opportunities; and ensuring that the stakeholders have up-to-date information and a possibility to revise the criteria in every stage.

5.2.1 Increasing Awareness of the Various Criteria

Making a well-informed decision necessitates seeing how the candidates' qualities are in line with the original requirements, the new requirements that might emerge in the process, and the qualities of the people that are connected to the intended collaboration. Especially in cases where the process lasts long, IT could periodically check if the interests of the candidates, the decision-makers, and the actors who set the original requirements are still coherent. The conventional solutions for online profiling have been proven to fail in delivering up-to-date and contextually relevant information about the candidates [34]. To this end, a system could highlight candidates with incomparable unique qualities that might, for instance, compensate for lacking work experience.

5.2.2 Enabling Multi-Dimensional Matching

Although prior research [28,42] has addressed the need for utilizing more sophisticated and deep-level attributes [5] of the candidates (e.g., personality traits, values, and attitudes). In practice, matchmaking tends to consider mainly surface-level qualities like previous job titles. Key questions are (i) how to find information about the non-obvious but relevant qualities that candidates might have, and (ii) what information is sufficient for a generic profile and with what context-specific profile information should this be enriched in each case. Potential solutions to make the matching decisions more multi-dimensional include, for instance, identification of an applicant's latent qualities through topic modeling of the public documents they have produced in the past and including new, typically relevant factors (e.g., an individual's level of commitment) in the questions the candidates are asked. Previous HCI research has found the need to make applicants' contributions to online services more

accessible because of the limited amount of time the matchmakers can spend on one applicant [32]. Moreover, the findings indicate that computational solutions could better support decision-makers by providing means for assessing the qualities of teams instead of the conventional focus on individual qualities. The importance of assessing teamwork qualities has been acknowledged but there are concerns regarding the validity of the assessments [54].

5.2.3 Facilitating Transparent and Democratic Decisions

Matching often means fitting an individual with everyone in the target team. We argue that employing a democratic decision-making process would be ideal in such group-based settings. Therefore, IT could assist decision-makers by involving different team members and stakeholders in the process, thus considering different perspectives to the selection criteria. Groupware technologies such as e-collaborative systems and group decision support systems [55] could be used to gather opinions anonymously and making more transparent decisions. Having said that, it is noteworthy that this study was conducted in a strongly democratic country with low power distance [23]. However, we argue that democratic practices would serve the complex and multi-dimensional decision-making in HR activities particularly well, not to mention their long-term effects on organization culture.

5.2.4 Bridging Different Forms of Epistemic Asymmetry

Epistemic asymmetry is a general challenge that resides between the various stakeholders relevant to a matching decision and hence touches all the decision-making stages. In the early stages of the process, it relates to that between the candidates and the recruiters, while in the later stages it hampers the decision-making within an organization. Considering the gap between the candidates and an organization, they may not even be aware of each other, which is a key reason for the mismatch between job-seekers and vacancies on societal level [3]. Furthermore, they rarely know much about the various qualities and interests of the other party. Our findings imply that IT should support more active interaction and automatic exchange of information between the matching parties and allow expressing oneself in free format rather than forcing to use predefined forms. However, to be able to exchange relevant pieces of information calls for better utilization of existing competence taxonomies as well as development of more specific vocabularies of relevant features in certain domains or professions.

5.2.5 Helping Make Sense of and Learn from the Data

In matchmaking, conventional data sources include, e.g., CVs and portfolios, social media data, and organizations' internal information resources. Interpreting these data to create relevant and manageable representations of competences might become challenging. As the amount of data and number of alternatives increase, the abstraction level tends to raise. To consider how computational methods could help to make sense of the vast data and support decision-making, we underline two data-centric aspects to consider: (i) what is the optimal number of candidates (and amount of information about them) to even consider in each case and (ii) how to analyze the data in a fair way that does not merely optimize for few attributes. Zhou et al., [58] have presented strategies for the decision-maker to be more mindful on when to stop searching, based on the mathematical concept of *optimal stopping*. As stopping early increases the risk of not finding a good applicant and stopping too late the risk of wasting resources, the optimum depends on the organizations' risk tolerance and case-specific criteria. On the question of how to analyze the data, algorithms that often aim to maximize performance have been found to develop unfair biases based on, for example, employee location or gender [14]. This calls for careful consideration on how much responsibility is given to technology and how to avoid such manifestations of *overfitting* in algorithmic solutions. Consequently, the current situation with the tools that are available to recruiters have been argued to be even worse than nothing [7].

5.2.6 Finding the Balance between Diversity and Similarity

The participants seemed to have a collective ideal about being mindful about diversity while making matching decisions. Previous research in the GROUP conference has addressed mainly gender diversity by proposing ways to design for inclusion at the team level [24]. At the same time, in many cases adding diversity is practically challenging and might result in a collision with the practices or culture of a team or the organization, therefore making it risky to pursue. Some organizations have started to consider nonconventional alternatives, such as people beyond retirement age and passive job-seekers, when trying to find people for hard-to-fill positions [38]. Identifying the similarities in the existing work community and seeing how they compare to the potential arrivals would be beneficial for the matchmakers, especially by helping them to explore in which qualities the community would benefit of increasing diversity. Our findings imply that the decision-makers would value a mechanism to recognize candidates who have a unique quality that is not yet present in the organization. Particularly, identifying qualities of candidates who could positively disrupt the existing community could be valuable in various knowledge work activities.

5.3 Methodological Limitations

Understanding the subjective experiences of matchmakers' calls for a rich qualitative account. Thus, the research objectives and practical limitations determined the choice to run an interview study. With a qualitative approach, we aimed at producing in-depth descriptive insights of individual cases and people's experiences of matching, and to identify relevant viewpoints and themes to study in more detail in future research.

However, our methodology choice has inherent limitations on generalizability. The participant sample represents a record of experiences from only one western country, which makes the data culture-specific. Moreover, this study approach did not allow revealing a vast spectrum of matching practices and challenges in decision-making across various kinds of organizations. Nevertheless, as this study did not aim at generalizable quantitative information or comparisons according to various background variables, we considered that the downsides are tolerable. It would be beneficial to run more quantitatively oriented follow-up studies (e.g., an online international survey) to assess the prevalence of our findings in various professional domains.

6 CONCLUSION

This paper contributes social matching as an emergent application area of IT, offering a qualitative account of the decision-making process and perceived challenges in recruiting. Our temporal framework suggests that making matching decisions in recruitment activities can be modeled as a sequential process that calls for deliberation at different stages. In practice, the decisions who to team or partner with were often found to be affected by cognitive limitations and human biases and be suboptimally supported by information technology. Based on interviews of 21 matchmakers, we reveal that many challenges revolve around balancing between a well-informed, thought-through and systematic process, and the practicalities regarding time, effort and availability of the alternatives. Based on the findings, we underline opportunities to support decision-making in this domain with various IT based solutions.

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