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From Want Ads to Mobile Apps

Realizing the Promise of Technology in Labor Market Matching

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The impact of technology on jobs is an issue that has generated no shortage of column inches in recent years. But while economists, policymakers, and journalists debate important questions on the extent to which technology is changing the characteristics or even reducing the overall number of jobs in the economy, less attention has been directed at another way technology is changing one of the most basic functions of the labor market—how employers and job seekers find each other.

Long gone are the days when a job seeker would scour the Sunday paper for want ads, send paper résumés through the post office, and drop by the reception desk of prospective employers to inquire about openings or request applications. At the very least, most of these basic job search functions have moved online, increasing efficiency for both employers and applicants. Moreover, sophisticated technologies are now even removing the old "job description" and "résumé" formats from the process entirely, relying instead on sophisticated algorithms to determine fit based on skills and interests. Other tools are tackling some of the thorniest issues in labor market matching, such as implicit bias in hiring. Many job matches today are still made through friends and family, as has always been the case, but increasingly even these matches are happening online through social networks like LinkedIn.

Technological change is transforming everything from how individuals learn about career options and job openings to how employers find and assess candidates. This matters because finding the right person for the job is a crucial component of business success, employee well-being, worker productivity, and economic health. The consequences

of getting the match wrong are high both for employees and employers. One estimate of the cost of replacing a worker is 60 percent of an employee's annual salary (Allen 2008). In this chapter, we examine the ways in which technology is changing labor market navigation, matching, and the decision making of students, job seekers, and employers.

While holding promise for job seekers and employers alike, many new technologies will need significant improvements to truly transform labor market matching. This chapter explores how the rapid expansion of technological platforms and applications is changing traditional labor market matching interactions, categorizes the five main functionalities of labor market matching technology, and highlights the benefits and limitations of each. Finally, we identify the biggest challenges facing the field and offer some recommendations for how labor market matching technology can create the most benefit for individuals, employers, and economies.

NEW TECHNOLOGY IS CHANGING HOW WORKERS AND EMPLOYERS FIND EACH OTHER

For anyone who has searched for a job in the past decade, it comes as no surprise that the Internet dominates today's hiring landscape. According to a recent Pew survey, the proportion of Americans who used online resources to search for jobs doubled from 26 percent in 2005 to 54 percent in 2015 (Smith 2015). When narrowing down to just those individuals who have sought work in the last two years, 79 percent used the Internet to search for jobs (Smith 2015).

Among employers, particularly large ones, the use of technology-enabled hiring tools is equally ubiquitous. A 2016 survey by the Society for Human Resource Management finds that 84 percent of employers now use social media to recruit job applicants—up from 56 percent in 2011 (Society for Human Resource Management 2016a). And it would be rare today to find a large employer that does not post job openings online or rely on an applicant tracking system to automatically pre-screen incoming résumés.

In many ways, the advantages of this new tech-enabled hiring landscape are clear. Online job boards, such as Monster or Idealist, are often

simply the digitization of job listings that used to be placed on physical job boards or in newspapers. Employers now have the ability to reach a wide audience with just one posting instead of placing multiple ads across regional newspapers, and job seekers anywhere in the world can review and apply to jobs from the comfort of their own kitchen tables.

In addition to improving efficiency, new matching technologies can greatly increase and improve the information available to employers and job seekers by providing real-time data on both in-demand jobs and the skills possessed by the local workforce. One study finds that workers who used the Internet as a search tool were 28 percent less likely to exit their jobs than those who did not (Prakash 2014). This could be because job seekers who use the Internet are able to make more informed decisions about potential opportunities than the job seekers who do not.

Labor market matching technologies can also reduce friction and transaction costs in the market. Expanding the geographic range of a search could benefit low- and middle-skilled workers who live in an area of higher unemployment. The Internet has also reduced many of the costs associated with applying for a job. Companies can now receive many more résumés for each position and use sophisticated algorithms to filter those résumés, potentially increasing the chance of a successful match (Weber 2012). In many cases, job seekers face a streamlined application process and potentially more accurate, up-to-date information.

Finally, labor market matching technologies offer new ways to validate job seekers' skills to employers. This validation can range from demonstrating knowledge and skills in online tests to testimonials by coworkers on social networking platforms. These technologies also create a new opportunity to shift employer thinking to a more skills- and competency-based hiring model due to increased information sharing, which could particularly benefit low- and middle-skilled workers who can lack traditional credentials but possess in-demand skills. At the same time, automatic screening technologies can also serve to perpetuate and even exacerbate the barriers to employment that currently face some groups of workers, such as the long-term unemployed and individuals with criminal backgrounds.

JOB MATCHING TECHNOLOGIES VARY WIDELY IN COMPLEXITY AND UTILITY

For all the reasons outlined above, technology has the potential to strengthen labor markets and improve economic outcomes for workers. But for all its promise, the job matching technologies that dominate the market today face limitations in achieving these outcomes, particularly when it comes to improving matching for low- and middle-skilled workers. In this section, we'll describe the five distinct functionalities that make up existing labor market matching platforms, how each works to improve job matching, and some of the limitations of each.

Job Boards

Online job boards—which include the likes of everything from Craigslist to Monster to Idealist—are collections of job listings that occasionally include résumés from job seekers. Users of job boards can search for candidates or positions based on a number of variables or filters. Some job boards encompass multiple fields and industries, while others are narrower, such as those run by colleges and universities, metropolitan areas, and certain industries.

Job boards are one of the most accessible forms of labor market matching technology available. Together with social media platforms, job boards are often the only interaction that many individuals and small or medium-sized businesses will have with matching technology. No special training is needed to understand how to use job boards properly, enabling employers to swiftly post and collect résumés and individuals to search and apply for jobs based on key words or phrases. A recent survey by LinkedIn finds that, after personal referrals, the most common way that users found their new job was through a third-party website or online job board (LinkedIn Talent Solutions 2015).

Although less sophisticated than other matching technologies, job boards have had a powerful impact on the ways that individuals find jobs and that employers source employees. Job boards allow job seekers to find opportunities in their geographic regions and beyond (Prakash 2014) and allow employers to access a broader and more diverse talent pool. Finally, studies have shown that simply by using basic technol-

ogy such as job boards, individuals are more "content" (Sampson and Obsorn 2013) with their jobs, and experience increased tenure at their place of employment (Mang 2012).

A serious limitation of job boards is that listings can be out-of-date, leading job seekers to waste time applying for roles that have already been filled. Searching through a high volume of listings on job boards can be overwhelming and detract from time that might be better spent engaging in other job search strategies, such as networking. Even knowledgeable job seekers using appropriate search terms or other criteria to sort through listings can be daunted by the quantity of information or miss suitable job openings.

Likewise, employers who post on job boards can be overwhelmed by the number of applicants who apply for a job, leaving them with the challenging task of sorting through more résumés than are feasible to review.

Algorithmic Matching Technologies

Algorithmic matching technologies rely on data science and machine learning to identify potential candidates and make precise matching recommendations (Carroll 2016). While the use of algorithmic matching technology is increasing, it is still far from universal. A study conducted by the Society for Human Resource Management finds that only 26 percent of employers surveyed use automated prescreening tools when assessing candidates (Society for Human Resource Management 2016b).

The majority of the existing platforms in this space focus on identifying individuals with special skills for high-skilled positions, rather than filling low- and middle-skilled openings. One example of an algorithmic matching technology that is attempting to better serve both small employers and middle-skilled workers is WorkFountain, a dynamic matching system that relies on correlated question sets and matching algorithms to connect job seekers and employers based solely on skills, interests, and requirements.[1]

Algorithmic matching technologies are still in the early stages of adoption, and their benefits and risks are still emerging. The use of algorithms has been praised for the potential to diminish implicit bias by recruiters (Feffer 2016) and for resulting in superior matching gener-

ally as judged by workers' job performance (Kuncel, Ones, and Klieger 2014). Moreover, algorithmic matching has great potential for businesses seeking candidates with a particular skill set and experience.

At the same time, algorithmic matching technologies have the potential to exacerbate some of the same issues they attempt to ameliorate. Companies may become increasingly focused on finding the ideal candidate to start with, rather than investing in on-the-job training. Furthermore, employers conducting the search may not be aware that their subconscious idea of "perfect" constitutes someone of a particular race, gender, or socioeconomic background (Lam 2015).

Online Skills Assessments

Skills assessments are used by employers and job seekers to assess an individual's suitability for a particular job or career. The focus of these tests can include job skills, cognitive ability, or behavior, and can range in form from straightforward questionnaires to more detailed games (Needleman 2016). For example, Koru is a predictive hiring platform that works with large employers to assess candidates by attempting to predict an individual's performance before he or she is hired. Job seekers take an online assessment that has been tailored to specific employer needs and company culture, and are evaluated on grit, rigor, impact, teamwork, curiosity, ownership, and polish. After completing the assessment, Koru indicates which candidates are the best fit for the employers based on these metrics.[2]

Employers increasingly use online skills assessments during the application process, with some researchers predicting that soon over 88 percent of employers with over 100 employees will use aptitude and personality tests during the hiring process (Chamorro-Premuzic 2015). Technology has made it easier to distribute tests and assess the results quickly and at lower cost (Weber 2015). Accordingly, their use has grown, and this type of assessment takes place earlier in the application process than it did previously. Between 2009 and 2014 alone, the percentage of U.S. workers who underwent testing as part of their application process increased from 30–40 percent to 60–70 percent (Weber and Dwoskin 2014).

Several studies have found that individuals who use skills assessments experience increased "career decidedness and career maturity"

and "persistence in majors well aligned with career goals" (Karp 2013). And low- and middle-skilled workers may find online assessments particularly useful in identifying how their current skill set could lead to new training or employment opportunities in more lucrative fields. Several sites devoted to low- and middle-skilled workers feature some form of online skill assessment, either one created in-house or a link to an assessment like the Department of Labor's mySkills myFuture tool.

But there are also pitfalls to these assessments. An individual's responses on an assessment may not be a true indication of his or her interests or abilities. Companies that use such assessments must also be careful to ensure that their tests are not discriminatory. In theory, preemployment tests can reduce discrimination by objectively evaluating all applicants on the same set of job-related measures. In reality, however, some questions on personality tests have been accused of violating the Americans with Disabilities Act (Weber and Dwoskin 2014), and others have been shown to be implicitly biased against different genders (DiBernardo 2015).

Skill Building and Career Development Portals

Individuals are able to build their skill set and learn more about potential career paths or vocational opportunities through online portals. Interest assessments to identify potential career matches are frequently a component of these platforms, and platforms often provide information regarding the credentials that are required to obtain these jobs.

For example, petrochemworks.com is a career exploration and development site that helps users tap into career opportunities in the petrochemical industry.[3] Owned and curated by the East Harris County Manufacturers Association (ECHMA) in Texas, the site was created to inform students and job seekers about the petrochemical industry and help them get the education they need to prepare for a long-term career in the industry. The site features a suite of interactive tools to help users better understand the prospects the industry offers, along with the skills and educational requirements they will need to take advantage of those opportunities. Similarly, bankingonmycareer.com was designed by the financial services industry in New York City to inform students and job seekers about opportunities in the industry and orient them toward

training and education that can prepare them for a career in financial services.

LearnUp is another platform that expands on the notion of career exploration by actually connecting users to open jobs.[4] An online recruiting platform that specializes in the retail, food service, hospitality, call center, and customer service industries, LearnUp allows job seekers to take online course modules to learn more about available jobs, build their skills, and receive coaching and support throughout the process. LearnUp provides preinterview training that helps individuals learn more about the job and enables companies like Old Navy and Staples to improve the quality and preparation of their entry-level applicant pool (Cutler 2015).

Skill building and career development portals face many of the same challenges as other technology-enabled labor matching tools. The multitude of platforms and abundance of information can make it challenging for users to determine the best tools for their purposes.

Likewise, platform operators are challenged by a dearth of up-to-date information on employers and the labor market generally, and cannot accurately communicate trends to platform users. Keeping data up to date requires an ongoing investment of time and resources.

Online Social Networks

Online social networks allow individuals to create profiles and build online personal and professional networks. In several respects, they are used differently than other labor market matching technologies. Many users of these platforms are not actively seeking new employment opportunities or potential hires. However, online social networks can have impact when used for labor market matching.

Many individuals still find work through personal connections or referrals (Adler 2015). Despite the increasing prevalence of labor market matching tools, most employers hire from personal networks or employee referrals. Online social networks have the potential to supplement this method of matching.

With these online platforms, individuals can easily find who in their network has connections to a potential employer or field, and employers can search for potential future employees among existing networks. In addition, as a recent World Bank report found, crowdsourced rating sys-

tems such as LinkedIn endorsements "help control quality, build trust, and maintain a live 'résumé'" (World Bank Group 2016).

Although online social networks can aid individuals in developing and maintaining their real-world networks, they are limited in their impact. Online social connections are less effective than real-world connections, in part because individuals can maintain a far larger network online with much less effort (Garg and Telang 2011). For example, a survey of LinkedIn users finds that connections on LinkedIn are most useful for securing interviews and job offers if one knows the connector offline (Garg and Telang 2011). This implies that the benefits of these technologies are limited for those who lack strong real-world connections.

Online social network technologies can also silo users based on demographics, further limiting their utility. LinkedIn, despite efforts to expand its base, is predominately used by high-earning individuals who have college degrees. A survey by Pew finds that while 46 percent of people who graduated from college use LinkedIn, only 25 percent of those with some college and 9 percent of those with a high school degree or less use LinkedIn (Duggan 2015). Partially in response, social networks like WorkHands have been designed to focus primarily on those in the skilled trades (Schwartz 2013).

This demographic stratification of online social network users has worrisome implications for social mobility. If low-, middle-, and high-skilled workers lack opportunities to connect with each other professionally, an additional barrier will exist for those who wish to move beyond their current professional sphere, and for employers who wish to improve diversity.

REALIZING THE PROMISE OF JOB MATCHING TECHNOLOGY WILL REQUIRE ADDRESSING ITS CURRENT LIMITATIONS

Technology may ultimately have the potential to transform labor market matching for the better, but serious challenges in the existing technology remain. We've identified four key challenges and provided recommendations for responding to each.

1) Data Availability, Validity, and Timeliness

As with most technology, job matching tools are only as good as the data on which they rely. And access to quality data on labor market conditions, the nature of skills gaps regionally and nationally, and detailed analyses of occupational data by skill set is currently limited. Many of the technologies we've discussed rely on infrequently updated data libraries derived from federal government sources (like O*NET and the Bureau of Labor Statistics) or state government labor market information data.

In a fluid labor market where the skills needed by employers and the demands of the market shift frequently, stakeholders need to understand both the landscape of the current market and how that landscape will shape the future.

Recommendations:

- Standardize occupational and skills definitions: Stakeholders can ensure accurate and precise data by working collaboratively to improve data collection and standardization. One promising project, led by the University of Chicago with cooperation from the U.S. Department of Labor and other public and private organizations, will create an open-source nationwide database of labor market information and skills definitions. The system will aim to merge public and private data, provide locally relevant and real-time information, and establish the basis for further innovation in labor market matching technology that will benefit all stakeholders.[5]

- Design local tools with local data: Using local data in the design of a labor market matching tool can help ensure that the tool will provide information that is relevant to the local labor market.

- Collect data on long-term outcomes: Documenting job seeker outcomes after using technology tools will help refine tool design and provide further information about the job market, as well as prove the value of these technologies moving forward.

2) The High Burden of Technological Adoption

For small and medium-sized employers, adopting new technology has real costs, both in money and time. Many small and medium-sized

employers rely on human resources generalists to manage operations, or have no designated human resources positions. Moreover, smaller employers may hire only a handful of employees a year. Between limited human resources capacity and a lesser need, these organizations can be slower to adopt innovative technologies like algorithmic matching or human resources information systems. Perhaps it is no surprise then that employee referrals are still the top method for recruitment for businesses with fewer than 500 employees (Society for Human Resource Management 2016b).

Even if new gains are made in the field of labor market matching technology, smaller employers may be reticent to embrace them due to reliance on existing systems, the administrative burden of changing technology, and limited technical expertise. Moreover, technologies can become victims of their own success when unintended consequences lead to negative outcomes.

For example, the comparative ease with which job applications can be submitted electronically after jobs are posted on multiple job boards often means more candidates for open positions. An increased volume of applications, in turn, can push employers to change the minimum requirements for an open position in an effort to narrow the pool of applicants—a phenomenon known as degree inflation. Moreover, due to the ease with which employers can now post positions online, some job seekers find that openings in job boards are not always up to date or may contain other inaccuracies.

Recommendations:

- Intermediaries can help reduce transaction costs: Intermediary organizations that make it easier for employers and job seekers to navigate the labor market can reduce the costs associated with technological adoption. For example, the National Fund for Workforce Solutions supports industry partnerships that gather employers from different sectors to identify needs and provide training for job seekers that will help them meet these needs.[6]

- Platforms should better align and map skills: Technological platforms that better align the skills demanded by employers with the skills job seekers possess would encourage the adoption of skills-based hiring. These platforms make adoption

easier for employers by creating a common language for skills and point job seekers toward the right licenses and credentials to demonstrate skills. Moreover, these platforms can provide feedback to companies and job seekers on the effectiveness of their job postings and applications, potentially making the job matching process more effective and efficient.

- Engage users in design process: By involving both employers and job seekers in the technology tool design process, technology tool designers can make sure that their results are helpful and user friendly for all stakeholders.

- Commit to invest in technology tools and definitions over the long term: Once a piece of technology is created, it requires continued refinement and redesign to align with changing technology standards, data, and best practices.

3) Hiring Bias

Implicit bias on the part of employers and hiring managers continues to disproportionately and negatively impact underrepresented groups. Employers still rely overwhelmingly on employee referrals, with approximately 50 percent or more of jobs gained through "informal channels" such as friends and family (Farrell 2012). These referrals often reinforce the benefits of existing social networks and overreliance on generic credentials rather than merit.

While "blind audition" practices like scrubbing résumés of identifiers may help lesson implicit bias in hiring decisions, some warn that algorithms underlying many labor market matching technologies can be just as bad as human filters. Certain variables may serve as unintended proxies for the type of candidate that a human hiring manager would also have filtered.

Moreover, there is often a difference between who a recruiter or human resources professional thinks is a good candidate and who a hiring manager eventually picks. Facebook has sought to create a more diverse workforce by incentivizing recruiters to identify and elevate candidates from underrepresented groups, but recent results show that hiring managers are still hiring candidates with the same demographic backgrounds as before (Seetharaman and Wells 2016).

Recommendations:

- Increase implicit bias training and awareness: To help improve diversity in hiring by reducing the impact of implicit bias, employers should provide bias training to everyone involved in the hiring process, from those conducting interviews to human resources staff to programmers developing matching software.

- Build blind auditioning and diversity metrics into technology: Technology developers can take an active role in reducing implicit bias in labor market matching by introducing blind auditioning practices into their technologies and emphasizing diversity metrics for job seekers. For instance, job matching platform Blendoor removes the identifying information of job seekers from their job applications to facilitate diversity recruiting, while providing job seekers with information on potential employers' employee resources, inclusion programs, and diversity makeup.[7]

4) Lack of digital literacy and access for low- and middle-skilled workers

Low- and middle-skilled workers face distinct challenges in leveraging labor market matching technologies to their greatest benefit. This is evidenced by the correlation between educational attainment and likelihood to go online during the job search: 65 percent of college-educated adults in the United States said they had looked for job information online, while only 44 percent of high school graduates said the same (Smith 2015).

One challenge is that labor market matching technology exists primarily online, and low- and middle-skilled workers, who typically have wages below the median (Tüzemen and Willis 2013), are disproportionately likely to lack access to computers and the Internet at home. Only 63 percent of those with a household income between $20,000 and $50,000 have access to broadband Internet at home, compared to 80 percent of those with a household income between $50,000 and $75,000 (Horrigan and Duggan 2015).

Low- and middle-skilled workers are also more likely to rely on just their cell phones for Internet access and can face digital literacy challenges (Smith 2015). While job seekers with varying degrees of education use their smart phones for job searching at approximately the

same rate, job seekers who have not attended college are much more likely to use their smart phones to fill out an online job application and create a résumé or cover letter than those who have graduated from college (Smith 2015). Moreover, low- and middle-skilled workers more frequently lack proficiency in using computers and the Internet, making it difficult to navigate labor market matching technology (Smith 2015).

Low- and middle-skilled job seekers rely on external coaches, counselors, and mentors—such as those at American Job Centers—to navigate labor market matching technologies. Often, however, career coaches are underresourced or have a poor grasp of technology themselves. At community colleges, the ratio of guidance counselors to students can be as high as 1 to 1,500, making it difficult to provide quality services to students (Karp 2013).

Finally, underrepresented communities may have trouble seeing themselves in occupations not typically held by those in their social network. Technology can help expand awareness of the universe of job openings, but individuals may still perceive a barrier to applying for a job they have not seen others in their community holding or of which they have no prior knowledge.

Recommendations:

- Incorporate skill building and career latticing into matching platforms: Labor market matching technologies can improve outcomes for low- and middle-skilled workers by helping job seekers learn which skills are necessary for a given job opening and, if necessary, how to acquire those skills through education and training. For example, LearnUp allows job seekers to both find job openings and take online course models that help them build skills and prepare for an interview.[8]

- Use target-audience language: The language used in job postings should correspond to the language skills of the target job seeker. For example, PostingPro, a tool recently launched by Code for America, assesses the grade level of language in job postings to ensure that they match the academic level necessary to be successful in the position.[9]

- Design for mobile optimization: Low-income individuals are more likely to rely on mobile phones for Internet access, mak-

ing mobile optimization of labor marketing tools particularly vital for this population.

- Offer in-person assistance: Because human coaches can have the most impact in expanding access to labor market matching technology and improving outcomes for low- and middle-skilled workers, it is vital to invest resources and training for coaches and counselors. Human coaches who are trained to effectively use job matching platforms can amplify the benefits of these tools for their clients.

CONCLUSION

As technological innovations have boosted data collection and processing capabilities in the past decade, new tools and platforms are changing how job seekers and employers find each other. Combined with overall labor market trends that see workers moving jobs more frequently and increasing demand for specialized skills, these matching technologies will continue to play a critical role in the labor market.

It is clear that technology can both help and hinder, depending on how it is designed and implemented. At its best, technology has the potential to increase the efficiency and quality of matches, while reducing information deficits and transaction costs. But without thoughtful design, tools might merely shift what used to be offline into an online world, creating new and higher access limitations and hiring biases. Unfortunately, that may be the case with many existing matching tools—especially if they do not enable skills-based hiring or provide in-person assistance to complement the primarily online tools.

By ensuring that the data that undergirds the technology is as precise, accurate, and timely as possible, outcomes from these technologies can start to match their promise. Moreover, by enhancing assistance and on-ramps to the technology for low- and middle-skilled workers, stakeholders can work to ensure that technological innovation benefits workers at all skill levels.

Notes

The content in this chapter is adapted from research sponsored by JPMorgan Chase & Co. and conducted by Freedman Consulting, LLC. The research is detailed in the report "Swiping Right for the Job: How Tech Is Changing 'Matching' in the Workforce," and draws on interviews with 45 experts and practitioners in labor market matching technology.

1. See https://workfountain.com (accessed November 2, 2017).
2. See http://www.joinkoru.com/koru-7 (accessed November 2, 2017).
3. See https://petrochemworks.com (accessed November 2, 2017).
4. See http://www.learnup.com (accessed November 2, 2017).
5. See Data at Work, "Open Skills Project," http://dataatwork.org/data/ (accessed November 2, 2017).
6. See https://nationalfund.org (accessed November 2, 2017).
7. See http://blendoor.com (accessed November 2, 2017).
8. See Note 4.
9. See https://www.codeforamerica.org/government-partners/new-orleans-la (accessed November 2, 2017).

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