



New Directions in Employment and Training Research and Evaluation: Digital Employment Tools Created with Approaches from Human-Computer Interaction

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Prepared by MEF Associates
Marisa Putnam (MEF Associates), Tawanna Dillahunt (University of Michigan), and Asaph Glosser (MEF Associates)

Introduction

The Office of Planning, Research, and Evaluation (OPRE), within the Administration for Children and Families (ACF) at the U.S. Department of Health and Human Services, has a long history of supporting rigorous research and evaluation on the broad range of human services programs that fall under ACF’s auspices. Many of ACF’s programs support employment among low-income populations, and, consequently, OPRE regularly supports numerous evaluations of employment and training (E&T) programs for low-income populations. Though many E&T programs for populations with low incomes have historically been heavily influenced by the field of Economics, OPRE looks more broadly for theories and approaches to inform its work.

Two briefs on *New Directions in Employment and Training Research and Evaluation* identify approaches from fields not typically drawn on in E&T that present opportunities to potentially strengthen the design, delivery, and effectiveness of E&T programs through research and evaluation. The briefs were developed through an iterative and exploratory process by the *Next Steps for Employment and Training Research: Roundtable and White Paper* project (see the sidebar on the next page for additional information). An initial literature scan identified seven promising academic disciplines that provide new perspectives and approaches to the field of E&T.¹ A broad scan of research and scholarship between 2010 and 2020 within those disciplines revealed topics and experts with a focus on E&T activities or low-income populations. We then conducted a series of conversations with experts within those disciplines who are advancing research on interventions and approaches related to E&T that could support improved outcomes for low-income and vulnerable populations served by ACF programs.² Two focal topics of those interviews — technology-based support for low-income jobseekers and employer-based interventions to support low-income jobseekers and workers — were selected for further exploration in these briefs.



This brief focuses on digital employment tools created with Human-Computer Interaction (HCI) design approaches.

HCI is a multidisciplinary field focused on the design, implementation, and evaluation of computer technology used by humans. Researchers in HCI seek to understand social problems and to create technological solutions for those problems.

Digital employment tools and technology are embedded in the fabric of the modern labor market but often fail to meet the needs of historically underserved and marginalized communities.³ The design of these tools might perpetuate inequities in the labor market for low-

income jobseekers, like disparities in access to the Internet and digital devices, as well as limited digital literacy.⁴ HCI design approaches can engage jobseekers as designers to create equitable digital employment tools that support job search and skill building.

The remaining sections of this brief provide background on HCI design approaches to develop digital employment tools and potential directions for research and evaluation in this field. This brief begins by describing the role of digital employment tools for low-income populations. It then describes what differentiates HCI design approaches to designing digital employment tools from other approaches to creating these tools. Next, the brief details

ABOUT THIS PROJECT

For the *Next Steps for Employment and Training Research: Roundtable and White Paper* project, funded by OPRE, MEF Associates facilitated a roundtable that served as a springboard for a series of white papers to explore future research topics related to E&T programs for low-income populations. The first white paper discusses the current knowledge gaps and suggested areas for further research on designing effective E&T programs for populations with low incomes (Fishman et al., 2020). The second white paper discusses ongoing trends in the labor market and their potential effects on the nature of work over the next 10 to 15 years for low-income populations (Miller, 2021). These papers underscore the evolving nature of the labor market as well as policy and systems contexts. Exploring these emerging trends and future research areas presents the opportunity to innovate and advance the field of E&T for low-income populations as the labor market and nature of work evolve over time.

¹ The disciplines included: Public Health, Business and Management, Human-Computer Interaction, Sociology, Geography, Psychology, and Anthropology.

² We conducted a small number of conversations with relevant experts and the topics of the conversation were customized to the individual's expertise. These conversations adhered to requirements of the 1995 Paperwork Reduction Act (44 U.S.C. 3501 et seq.).

³ Executive Order 13985, Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, (2021) defines underserved and marginalized communities as "populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life" including Black, Latino, and other persons of color; individual with disabilities; individuals who live in rural areas; and individuals otherwise adversely affected by poverty or inequality.

⁴ Jobseekers are individuals who are unemployed or working in various arrangements while seeking employment or training. Workers include individuals in traditional employer-worker relationships and in nontraditional work arrangements. Workers in nontraditional work arrangements include independent contractors, such as online gig workers; individuals who work via online platforms; offline gig workers; contract workers; individuals working part-time because they are unable to find full-time work; and workers subject to varying and uncertain work schedules. Workers and jobseekers are not necessarily members of mutually exclusive groups.

the phases in the HCI design process of creating digital tools, including relevant research within each phase.

It concludes with a discussion of the implications of this work for E&T research and evaluation.

Low-Income Jobseekers Experience Barriers Accessing and Using Digital Employment Tools

Digital employment tools and technology are key features of the 21st century economy. Evolving technologies increasingly define the job search experience and the broader labor market.

Advancements in technology-enhanced employment like artificial intelligence in a recruitment process, online marketplaces where individuals can find work and consumers can find labor sources, and gig work that often occurs through digital platforms have changed the nature of work. Focusing on innovation in digital employment tools and technologies is an opportunity to support improved equity in employment outcomes for low-income populations.

Low-income jobseekers need access to technology and the skills to use it to fully obtain digital employment and training supports (Bergson-Shilcock, 2020; Dailey, 2010; Dillahunt et al., 2021; Hecker & Loprest, 2019; Miller, 2021). Skills assessments, testing, and college and credentialing curricula used by many public workforce centers and community colleges are increasingly transitioning online (Hecker & Loprest, 2019). Activities like searching, applying, and finding information about jobs as well as training activities require jobseekers to interact with digital platforms (Dailey, 2010; Hecker & Loprest, 2019).

Jobseekers can draw on a variety of existing digital employment tools. Examples include the following (Dillahunt et al., 2021):

- **Traditional job websites:** Jobseekers can use websites, such as Indeed and Career Builder, to search for jobs, find information about jobs, and apply for jobs. Websites like Craigslist also have job listings.
- **Online professional networking platforms:** Platforms, such as LinkedIn, allow jobseekers to connect with employers, search for jobs, find information about jobs, advertise their skills, and apply for jobs.
- **Online and gig platforms:** Online labor marketplaces, such as Amazon Mechanical Turk or TaskRabbit, match jobseekers with small on-demand work tasks.
- **Company websites:** Individual company websites include job postings and application portals where jobseekers can search for jobs, find information about jobs, and apply for jobs.
- **Social networking platforms:** Jobseekers can use websites like Facebook to search for jobs, find information about jobs, advertise skills, and apply for jobs. Jobseekers can use specific groups within the platforms (e.g., Facebook Groups) to get advice and referrals.
- **Web-based coaching platforms** Online platforms, such as TuaPath, can support case managers and Temporary Assistance for Needy Families (TANF) clients in employment activities. Jobseekers can use these tools to engage in job readiness, set and track

personal and employment goals, communicate with employment coaches, and access an E&T resource library on the platform.⁵

- **Online databases of occupations and career paths:** Occupational Information Network (O*Net), sponsored by the U.S. Department of Labor, is an example of online databases of jobs and job descriptions where jobseekers can explore career paths and find information about different occupations.

Existing digital employment tools provide jobseekers with opportunities to engage in the labor market and job-related behaviors. However, these tools provide limited opportunities for underserved and marginalized jobseekers to engage in the job-related behaviors they might prefer. One study revealed that low-income jobseekers want digital employment tools that provide resume feedback, support describing their job skills, and help identifying concrete paths to achieve career goals (Dillahunt et al., 2018).

Historically underserved and marginalized populations experience barriers of access and digital literacy related to digital employment tools. Access and digital literacy are central to a jobseekers' successful use of a digital employment tool. These barriers might exacerbate existing inequities in the labor market for underserved and marginalized populations. Families with low incomes, Black and Hispanic adults, or members of Tribal communities, especially those living in more rural areas, have limited access to the Internet, less ownership of devices with consistent access to the Internet, and limited digital literacy skills (Vogels 2021; Bergson-Shilcock, 2020; Atske & Perrin, 2021; Smith, 2015). The adjacent textbox describes the ways in which the ongoing COVID-19 pandemic underscores inequities in technology access and digital tools.

As E&T activities increasingly rely on digital employment tools, reducing barriers to these tools for low-income jobseekers so they are not excluded from these activities is critical. Creating tools that low-income jobseekers can access and use has

The COVID-19 pandemic's stay-at-home orders and public health concerns have reinforced the importance and inequities of digital employment tools and technology.

During the COVID-19 pandemic, jobseekers have needed increased access to digital employment tools and digital literacy supports. The Internet has provided critical connections to E&T services for low-income populations. Many American Jobs Centers have stopped in-person activities and have offered online trainings, virtual job fairs, and interactions on video-conferencing and social media platforms (National Governors Association; Goger, 2020). However, as available E&T services and activities have migrated online, existing digital employment tools have exacerbated inequalities like limited internet access and digital literacy for underserved and marginalized populations in digital spaces (Bouskill & Harold, 2021; Farry, 2021).

⁵ See for example: Office of Family Assistance, 2018; Pathways Clearinghouse TuaPath Case Study, in progress.

implications for individuals' economic mobility as well as for employers' ability to access the workforce they need.

HCI Design Approaches Help Create More Equitable Digital Tools

HCI is a field that researches how humans use computer technology and designs technology for humans. HCI design uses strengths-based, collaborative, and user-centered approaches to problem solving with a digital tool or technology. These approaches can create tools tailored to jobseekers with low incomes and their specific needs. Digital employment tools created with and focused on jobseekers, the users of these tools, underscore the potential opportunity to advance understanding of which tools work for these populations.

The principles that guide HCI's digital tool design approach are as follows:

- **Focus on end users' strengths, challenges, and needs.** Tools developed using HCI principles center the users' experiences and their goals. This focus creates tools that low-income jobseekers might be more likely to use and that might enhance jobseekers' job-related behaviors. For example, digital tools that help low-income jobseekers draft a resume, but that neither require passwords nor knowledge of how to upload a PDF file, reduce digital literacy barriers while focusing on the job-related behavior a user wants to accomplish. In this way, HCI-designed digital employment tools can help support jobseekers in navigating challenges they experience in the labor market.
- **Acknowledge the historical marginalization of end users.** HCI researchers acknowledge power dynamics experienced by low-income jobseekers throughout the tool design and evaluation process (Erete, Israni, & Dillahunt, 2018; Harrington, Erere, & Piper, 2019). This recognition highlights these individuals as experts about their needs and circumstances, which drives tool design. HCI researchers and low-income jobseekers collaborate at every stage in the development process to design and create tools that adapt to the specific needs of the end users.
- **Center end users as the designers.** Jobseekers are the tool designers, while researchers create the tools, design research studies, and empirically evaluate jobseekers' use of the tool. Jobseekers design the tools by testing them and providing feedback at every stage in the development process.

HCI design approaches are broadly applicable in the development of digital employment tools, but the principles of these approaches are especially well-suited to the design of tools for low-income populations. The HCI design approach challenges the status quo of digital employment tool design that often marginalizes low-income jobseekers

Many digital employment tools developed by government agencies or private companies are designed with a top-down approach that focuses on the needs of the tool creator rather than the tool user. For example, Amazon Mechanical Turk requires a credit card to create an account. This requirement might be a barrier for low-income jobseekers in accessing an online marketplace to engage in on-demand work (Jen et al., 2014).

Employment tools must meet the needs of potential employers as well as jobseekers. However, company websites might be created based on employers' need to share information about their companies or to collect applications but are not designed with all jobseekers in mind. For example, job application websites might ask applicants to upload documents in specific file formats; lower-income applicants might lack easy access to the programs needed to produce documents in the required format.

Jobseekers with low incomes or less education might also experience barriers to using digital employment tools, such as LinkedIn, that were designed for and marketed to wealthy and highly educated populations (Dillahunt et al., 2021). Online professional networking platforms that explicitly state they are for "professionals" might not be perceived as an online space that is for, and inclusive of, low-wage jobseekers (Dillahunt et al., 2021). These approaches often are insufficiently attentive to the unique needs of low-income jobseekers, newer entrants to the labor market, or traditionally underrepresented populations.

Phases of the HCI Design Process

HCI design approaches hold promise for creating more equitable digital employment tools.

The HCI design process includes three phases: 1) understanding user needs, 2) design testing, and 3) implementation and evaluation. The design process is iterative, meaning that phases might be repeated and might build on each other. Stakeholders, such as jobseekers, staff at programs that help individuals find jobs, and employers, provide feedback on the tools. Researchers further refine the tools based on this feedback. This iterative refinement helps ensure that the tools are relevant to a range of stakeholders.

Phase One Understanding User Needs

Jobseekers need tools that meet their needs and address the challenges they encounter in the labor market. The effectiveness of digital employment tools depends on the extent to which a tool is designed to address a user's unique needs and challenges as well as to build on their strengths. In this first phase of the design process, HCI researchers gain an understanding of jobseeker needs

User Needs That Inform Tool Design Guidelines

Social Needs. Social networks provide information on job openings and feedback on resumes interviews; moreover, they can connect people to employment resources.

Personal Needs. Jobseekers must reflect on how their personal life aligns with employment-related demands and must consider their career identity while navigating the job search process.

Societal Needs. Systemic issues such as social and income inequality, transportation scarcity, and racial-, ethnic-, disability-, and gender-based discrimination are examples of societal needs (Darity and Mason, 1998). Societal needs might require improved policy, community, or government-based support rather than technological interventions (Dillahunt, 2014).

through literature reviews and in-depth interviews with low-income jobseekers.

Jobseekers have social, personal, and societal needs (Dillahunt, Lam, Lu, & Wheeler, 2018). HCI researchers have used this categorization, described in the adjacent textbox, to guide the design of digital employment tools, ensuring the tools are relevant and target user needs.

Jobseekers often use their social networks made up of their family, friends, or classmates, among others, to learn about jobs, receive recommendations, and get feedback on their application materials. There is variation in the extent to which individuals' interactions with their social networks can provide benefits or social capital (Abbot & Reilly, 2019).⁶ Specifically, low-income individuals often do not have social networks well-suited to expand their employment opportunities (Hurlbert et al. 2017; Seefeldt, 2016; Smith, 2007).

Online and offline social networks offer fewer opportunities for upward economic mobility for low-income adults compared to higher-income adults (Abbot & Reilly, 2019; Dillahunt, 2014; Smith, 2015). For example, low-income jobseekers are at a disadvantage when using digital employment platforms such as LinkedIn that rely on established connections and reputations for employment opportunities (Jen et al., 2014). Employment tools created with HCI design approaches might be effective at facilitating access to social networks or expanding existing social networks. Such tools might seek to enable social connections among individuals with different income levels who are in the same physical spaces (Dillahunt, 2014), such as libraries, town halls, or other community institutions. Alternatively, this outcome might be realized through building trust between workers who could recommend each other for jobs (e.g., a painter recommends a carpenter [Dillahunt, 2014]) on alternative social media platforms that, unlike LinkedIn, are not specifically designed for job seeking (e.g., Facebook, TikTok).

Research underscores the need for digital employment tools tailored to the personal needs of jobseekers with low incomes, such as tools that identify employment opportunities with flexible schedules or benefits (Hendry, Woelfer, & Duong, 2017; Wheeler & Dillahunt, 2018). Low-income jobseekers report that they are most familiar with traditional job websites like Indeed or general search engines, like Google, to search for jobs (Wheeler & Dillahunt, 2018). However, these tools are often not well-suited to meet the personal needs of low-income populations. Specifically, jobseekers often encounter difficulties accessing complete information about wages, schedules, benefits, or other key characteristics of a position. Jobseekers need this information to understand how a position might map onto their personal needs (Wheeler & Dillahunt, 2018).

As noted in the above text box, digital employment tools are not well-suited to address the structural and systemic problems driving inequity in the labor market. Though the HCI design process can be responsive to some structural inequities in traditional labor market processes, these societal needs likely require broader policy initiatives. For example, poor transportation infrastructure, failure to enforce antidiscrimination and equal employment laws, or limited internet connectivity in certain communities are all societal needs that likely cannot be

⁶ The Office of the Assistant Secretary for Planning and Evaluation (ASPE) has invested resources studying the relationship between social capital and economic mobility (Abbot & Reilly, 2019).

adequately addressed through the development and use of more individualized digital employment tools.

Phase Two: Design Testing

Instead of creating static job search tools, HCI design approaches prioritize rapid development and refinement of technology-based solutions to meet the changing needs of low-income jobseekers. In the design testing phase, researchers seek feedback from stakeholders on early versions of a tool and refine the tool based on this feedback. Prototypes are early versions of tools that researchers create to gather stakeholder feedback and test jobseekers' experiences with the tool. Examples of prototypes include storyboards of a user engaging with the tool or a web-based version of the tool with basic functionality.

This phase helps researchers validate whether the prototypes meet the targeted needs of low-income jobseekers. One way researchers can gather fast, actionable user feedback on a prototype is through an HCI technique called speed dating. Speed dating involves showing stakeholders a series of storyboard prototypes and collecting information on their preferences to refine the concepts for tools (Davidoff et al., 2007; Zimmerman & Forlizzi, 2017). A speed dating study revealed that jobseekers want resume and interview feedback, help explaining how their skills match available jobs, and information about concrete career pathways (Dillahunt, Lam, Lu, & Wheeler, 2018).

If a tool is relevant to other stakeholders, like job developers or employers, those community stakeholders also provide valuable perspectives and feedback on prototypes as part of this step in the design process. One study describes the design of a tool where homeless young adults could be matched to jobs advertised by community members. Community members completed a survey about their familiarity with homeless youth and provided feedback on whether they would use a prototype of this tool to hire homeless young adults for jobs in their homes. Designers planned to incorporate this feedback into the design of a digital employment tool (Hendry, Abokhodair, Kinsley, & Woelfer, 2017).

Phase Three: Implementation and Evaluation

In the third HCI design phase, digital employment tools are finalized and implemented by researchers. Jobseekers use the tools in their E&T activities and provide feedback on their experiences through in-depth interviews and surveys. Researchers evaluate whether the tools address the needs of jobseekers and if they influence their job-related behaviors and attitudes.

Several examples of preliminary digital employment tools created for historically underserved and marginalized jobseekers serve as models for future digital tool development. Below we highlight **three examples of these tools and their initial implementation.**⁷

⁷ Researchers have used qualitative methods to conduct preliminary evaluations of these tools, but they have not yet been rigorously evaluated.

Digital Employment Tool Example: Review-Me

Intervention Description

Review-Me is a web-based digital employment tool that provides low-income jobseekers with resume feedback by connecting them with a network of volunteer resume reviewers. Jobseekers upload the name of their target job and resumes to Review-Me. Volunteers review several dimensions of the resume, including alignment of skills and experience with the job description, formatting, and education. As depicted in Figure 1, volunteers review the resume and assign each dimension of the resume with a 1 to 5-star rating. Reviewers also provide written feedback.

Implementation and Evaluation

Researchers piloted the tool with low-income jobseekers recruited outside a career center and at a library ($n = 17$) and volunteer resume reviewers from the local community ($n = 15$) (Dillahunt, Bose, Diwan, & Chen-Phang, 2016). Results from interviews with jobseekers revealed that digital literacy and document storage were their primary challenges when using the tool. For example, most jobseekers initially did not have a digital resume or had stored their only copy on a USB drive that was lost or stolen. Jobseekers also had trouble remembering the log in and username they created for the tool and some participants had limited digital literacy skills and needed one-on-one support to use the tool. After the pilot, researchers updated the tool so users could upload multiple resume file types, including pictures of a resume, and provided direct technical support to jobseekers.

As part of the iterative design process, researchers developed and tested a revised tool with a new sample of low-income jobseekers ($n = 23$). Participants were recruited through word of mouth and public advertising, including mailings to distribution lists obtained from a workforce development program. Jobseekers used Review-Me, the tool's entry point depicted in Figure 2, as part of their job search for one month and kept a diary of their employment-related activities (Dillahunt & Hsiao, 2020). Jobseekers completed a survey and an in-depth interview about their job search experience before and after using the tool. Survey results revealed increases in participants' job search self-efficacy and interview data suggest this outcome might result from increases in self-reflection after using the Review-Me tool. They also reported they felt socially supported by positive feedback from resume reviewers. Jobseekers suggested they might have benefited additionally from a direct connection to resume reviewers rather than communicating anonymously through the tool.

Figure 1. Review-Me Screenshot of Resume Review and Star Rating

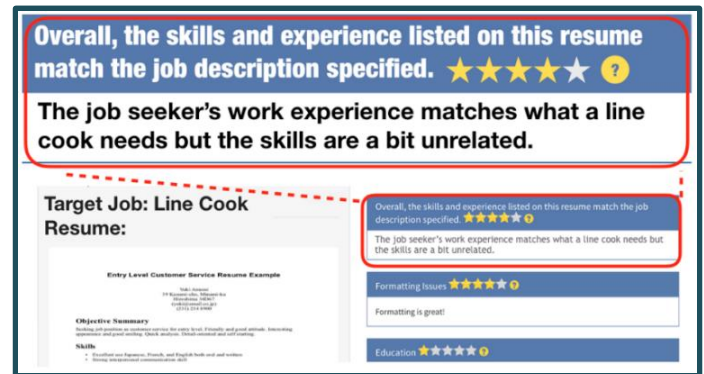
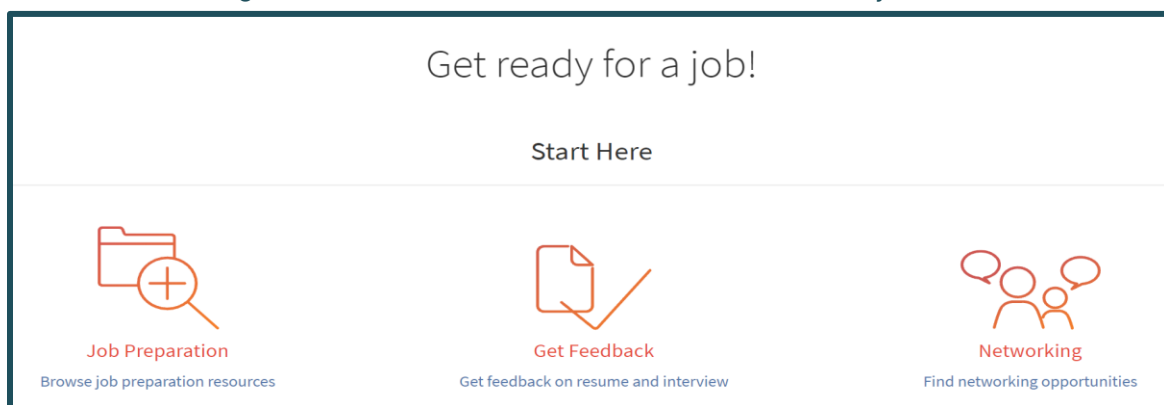


Figure 2. Review-Me Screenshot of Tool's Entry Point



Digital Employment Tool Example: SkillsIdentifier

Intervention Description

SkillsIdentifier is a digital employment tool that helps low-income jobseekers understand their transferable skill sets. It identifies jobseekers' skillsets based on their previous jobs and helps them describe these skills on their resumes (Cherubini et al., 2021; Dillahunt & Hsiao, 2021). As depicted in Figure 3, jobseekers enter the titles of their previous jobs and a desired job into SkillsIdentifier. The tool draws on data from DOL's O*Net database, as depicted in Figure 4, to provide three skills associated with each previous job that are also relevant for the desired job. In addition, SkillsIdentifier populates the jobseekers' previous job titles and skills associated with each position in a resume template where they can manually insert additional information. The SkillsIdentifier prototype was based on previous research on digital employment tools for low-income jobseekers (Dillahunt, Bose, Diwan, & Chen-Phang, 2016). As a result, the tool is compatible with mobile phones and desktop computers and does not require login details.

Implementation and Evaluation

Low-income jobseekers ($n = 20$) used the tool and provided feedback in a 30-minute interview (Dillahunt & Hsiao, 2021). Participants were recruited through social media, word of mouth, and flyers distributed in public spaces and to workforce development program participants. Participants self-reported that the tool increased their awareness of their transferable skills because the skills the tool identified were accurate, concise, and detailed. When using the tool, participants reported that they felt confident and explored possible career pathways in the tool by entering different combinations of previous jobs and desired jobs. However, participants also shared that the tool was too rigid. They disliked entering their past job titles using the same exact terminology in O*Net. Participants also thought the skills generated, like active listening, were too vague. Researchers plan to revise the tool based on this feedback, implement and evaluate the tool with jobseekers, and conduct a longitudinal study of the tool.

"Because a lot of us really don't see what other people see. The SkillsIdentifier would break it down to a point where you could see how one job actually relates to another. I like that. Like you might have good customer service skills. That doesn't mean that that can't work maybe in a law office...I think it motivates you to actually see yourself doing other things..."

- SkillsIdentifier User & Jobseeker (Dillahunt, Lam, Lu, Wheeler, 2018)

Figure 3. SkillsIdentifier Screenshot of Previous Work Experience

Please list up to four previous jobs:

Administrative Assistant

Religious Education Director

Nanny

What job would you like to apply for?

Associate Teacher

Figure 4. SkillsIdentifier Screenshot of Relevant Transferable Skills

Please review the information provided and edit the resume content as needed:

Administrative Assistant
- reading comprehension
- active listening
- speaking

Religious Education Director
- social perceptiveness
- speaking
- reading comprehension

Nanny
- speaking
- social perceptiveness
- monitoring

Copy Resume

Digital Employment Tool Example: Dream Gigs

Intervention Description

Dream Gigs is a digital employment tool that helps low-income jobseekers to reflect on their career goals and to identify knowledge, skills, and abilities (KSAs) needed for their dream jobs. The tool also suggests job and volunteer opportunities that can help develop those desired KSAs. Jobseekers navigate through several pages:

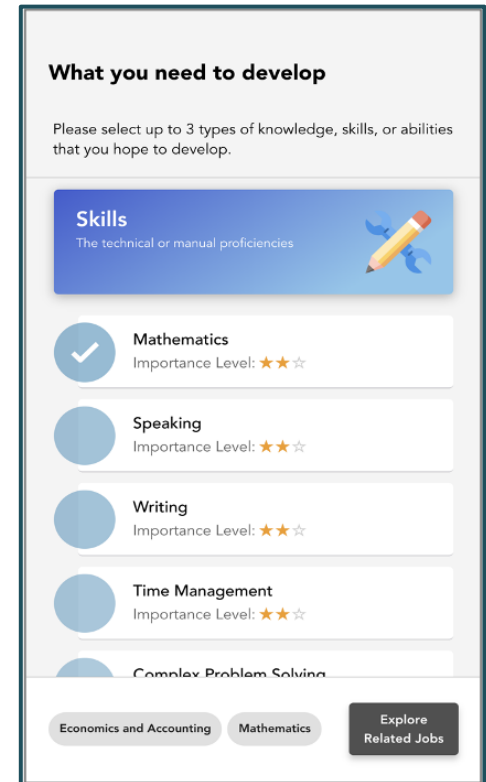
1. **Job title:** Jobseekers enter their most recent job title and the title of a dream job in the webpage's job search tool.
2. **KSAs:** The tool helps jobseekers address the question, "How do I get there?" by listing KSAs required for their dream job (as depicted in Figure 5). These lists are drawn from job and skill databases in DOL's O*Net and DataAtWork, a database of skills and jobs built from public and private data contributors.
3. **Local job and volunteer opportunities.** The next webpage displays a list of occupations in which the jobseeker would be able to build their desired skills. When the jobseeker selects an occupation, the tool populates a list of local jobs and volunteer opportunities. Dream Gigs does not require a log-in and is accessible on a variety of digital devices.

Implementation and Evaluation

In collaboration with low-income jobseekers and community stakeholder social workers, HCI researchers created and tested the tool in three cycles of design, development, and evaluation over five months (cycle 1, $n = 5$ social workers; cycle 2, $n = 10$ jobseekers; cycle 3, $n = 10$ jobseekers, including 5 from cycle 2 and 5 new jobseekers) (Dillahunt & Lu, 2019). Social workers used the app and provided initial feedback about the kinds of opportunities the tool suggested. Next, jobseekers were recruited from nonprofit organizations and past studies, and by word-of-mouth. Jobseekers used the tool and provided feedback about it through in-depth interviews. During these interviews jobseekers expressed a sense of empowerment from participating in the design process. They could see how their feedback was incorporated through the iterative design and development process, as well as how they were helping other jobseekers. Modifications suggested by social workers and jobseekers and implemented by researchers during this iterative process include the following:

- **Requirements lists:** An initial prototype did not include knowledge and abilities participants need for their dream job, in addition to skills. This feedback resulted in the version with lists of KSAs as described above. Participants felt this feature increased their understanding of requirements for a dream job.
- **Opportunity recommendations:** A version of the tool was developed that recommends jobs and volunteer positions from Indeed and VolunteerMatch, two websites that the jobseekers said they trusted to find employment and volunteer opportunities. Jobseekers were aware of scams posted on websites like Craigslist and did not trust those job postings.
- **Tutorial:** Researchers embedded a tutorial within the tool that supports users with lower digital literacy.

Figure 5. Dream Gigs Screenshot of KSAs Required for Dream Jobs



New Directions for Research and Evaluation

HCI holds promise as an alternative approach to designing E&T tools for low-income jobseekers. Through the design process of these tools, jobseekers identify their strengths and tools are designed to build on these strengths as well as just the challenges they face. Given the increasing role technology plays in the job search process, approaches that include end users in the design process will be critical in ensuring that the tools align with the needs of the target population. This approach has implications both for the efficacy of the tools that are developed as well as for addressing some of the structural inequities embedded in traditional labor market practices.

HCI design approaches are a relatively new field and evidence is limited. There has been no large-scale, rigorous testing of HCI design approaches to developing digital employment tools for low-income jobseekers nor the digital employment tools themselves. Wider use of these design principles will concurrently allow for more rigorous research on the effects of using HCI for digital tool development and of the tools themselves. Below we identify potential directions for research and evaluation in this area, with a specific focus on meeting the needs of low-income jobseekers.

Descriptive research on digital employment tools developed with HCI design approaches and embedded into existing E&T programs. Studies exploring the implementation of HCI design approaches in E&T programs can provide insights on how to engage jobseekers and stakeholders through digital employment tools. Researchers can use these design settings to describe how they engage end users as active participants in the design approach and link engagement to the implementation of the tools themselves.

Examples of how existing E&T programs can embed digital employment tools developed with HCI design approaches include the following:

- Job readiness classes could use a tool like Review-Me, rather than rely on case manager feedback, so participants could receive feedback more quickly and from a wider set of reviewers.
- Programs that use online coaching platforms could incorporate a tool like Dream Gigs so participants could explore potential career pathways independently before meeting with their coach.

Comparative impact studies of the effect of HCI-informed enhancements to existing digital employment tools. Digital tools developed to increase access to, and improve the functionality of, existing E&T programs might also improve employment outcomes for low-income jobseekers. This could be pursued through altering a given component of an E&T program using HCI design principles (e.g., the career exploration portion of a community college vocational program) or re-designing a program's existing digital interfaces (e.g., an HCI-informed resume building tool).

Experimental research designs could evaluate the effect of HCI-informed tools to measure whether they result in improved employment outcomes for low-income jobseekers.

Examples of potential HCI-informed enhancements to existing digital employment tools that could be tested include the following:

- Creating tutorials or providing additional technical assistance to build digital literacy skills for tools currently in use, like online resume builders.
- Ensuring tools can be accessed using single sign-on functionality through platforms where end users likely already have an account (e.g., Google, Facebook).

Development of new digital employment tools created with HCI design approaches that are responsive to the needs and challenges of low-income jobseekers and build on their strengths

New digital employment tools, designed using HCI principles, might represent a viable alternative to traditional E&T interventions or existing E&T tools. Designing these alternative interventions from the ground up and comparing them to existing approaches in E&T will provide insights into the relative merits of these approaches. Large-scale evaluation, including randomized controlled trials and complementary implementation and cost studies, can help build the evidence base for which digital employment tools work, why they work, and at what cost.

Examples of how new digital employment tools can be created to be responsive to low-income jobseekers include:

- Asking participants for feedback before incorporating new tools or program elements permanently to gauge whether they will meet the needs of the target population (e.g., a tool might fit the needs of refugee jobseekers but might not fit the needs of TANF clients).
- Engaging E&T populations of interest, like single mothers or individuals with prior justice system involvement, in the design process of a digital employment tool that centers the users' experiences, needs, and career goals.

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New Directions in Employment and Training Research and Evaluation: Digital Employment Tools Created with Approaches from Human-Computer Interaction

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Authors: Marisa Putnam (MEF Associates), Tawanna Dillahunt (University of Michigan), and Asaph Glosser (MEF Associates)

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Submitted to:

Hilary Bruck, Director, Division of Economic Independence

Lauren Deutsch Stanton, Social Science Research Analyst

Office of Planning, Research, and Evaluation

Administration for Children and Families

U.S. Department of Health and Human Services

Project Director: Mike Fishman

MEF Associates

1330 Braddock Place, Suite 220

Contract Number: HHSP2332015000771

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