

The Future of Work: An Overview of Knowledge, Skill, Ability, and Other Characteristic
Demands and Workplace Profiles in the Current and Future Workforce

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Abstract

The occupational demands of the workforce are seldom static over time. As technology, culture, and the economy evolve, the areas of competence expected from the typical worker can be expected to evolve as well. However, few studies have attempted to ensure the public has an up-to-date understanding of these demands. This study addresses this concern by consolidating the available occupation and employment data to determine the most in-demand categories of knowledge, skills, abilities, and other person characteristics (KSAOs). Further, the present study has identified several workplace profiles based on how attributes cluster together. Key findings of the present study suggest that the competencies relating to communication and customer and personal service, as well as science, technology, engineering, and mathematics are among the highest demanded KSAOs in the current and future workforce. In sum, the findings of this study provide vital career guidance information which could benefit individuals, career counselors, policy makers, and institutions alike.

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The Future of Work: An Overview of Knowledge, Skill, Ability, and Other Characteristic Demands and Workplace Profiles in the Current and Future Workforce

The labor force is constantly evolving due to changes brought about by the occupational demands of the socioeconomic environment. Due to this dynamic nature, changes in what constitutes essential knowledge, skills, abilities, and other characteristics (KSAOs) can be expected. These changes demand that individuals, and society at large, be proactive in their assessment of what employers require from prospective employees. Yet, despite the importance of this proactivity, very few studies have examined the available occupation data to determine the most in-demand KSAOs (Burrus et al., 2013), and fewer yet have used the available employment numbers to assess their relative importance for worker success.

Labor market information and intelligence seeks to provide individuals with the information necessary to navigate the ever-changing workforce (Wilson, 2013). Such information could be vital to individuals seeking career guidance and attempting to find their place within the world of work. However, some of the most widespread forms of labor market information, such as the type of information provided in the Bureau of Labor Statistics (BLS), tend to only inform individuals of which specific *jobs* or *job sectors* are in-demand. While helpful, such information typically lacks an account of the underlying competencies that many of the most in-demand jobs may have in common. As such, typical forms of labor market information and intelligence offer little value to the typical worker, who may not feel drawn toward a specific occupation at the outset. Rather, work-relevant information should aim to summarize broader workforce trends such as the kinds of KSAOs that are most highly demanded by the current and future workforce. Such information would greatly supplement the existing labor market information by allowing individuals to approach career readiness from a holistic

perspective, taking into account not only their individual interests, strengths, and weaknesses but also job- and sector-specific trends (e.g., job availability; sector growth). Further, this kind of broad summary of the workforce will identify major competency demands that may be required across a broad range of occupations. Thus, approaching career readiness from the perspective of competency demands rather than job availability allows individuals to identify and develop the set of KSAOs that they are both drawn to and will enable them to find work in a broad range of occupations and occupation sectors. In sum, the competency demands of the workforce are more foundational than employment demands in that they often represent the true underlying needs of the workforce as a whole.

An additional concern with commonly available work-relevant information is its use of broad descriptors. For example, an individual may hear that ‘business’ is a growing field in the labor market. However, ‘business’ can entail a wide range of domains, not limited to accounting, management, finance, and marketing; all of which are likely to have their own unique KSAO requirements. Thus, identifying growing job sectors is also problematic in that it fails to identify a clear path forward for individuals seeking to enter the field. This further exemplifies the fact that occupational demands are not easily deduced from commonly available work-relevant information. Therefore, although commonly available work-relevant information informs individuals of which sectors may yield high job availability (e.g., BLS employment projections), it generally falls short of providing information on many key elements of the labor market that are fundamental to the career guidance process. To provide a comprehensive overview of the labor market, work-relevant information must account not only for job- and sector-specific demands but also the broader competency demands of the workforce. Hence, the current lack of

such research and available information on this topic greatly warrants the need for consolidation of occupational data relating to the KSAO demands of the workforce as a whole.

To address this concern, the current study aims to provide a comprehensive portrayal of how various KSAOs are weighted by degrees of importance in connection with the current and future labor market. In doing so, the present study aims to identify which KSAO attributes are most highly demanded, and thus, provide individuals with the information necessary to make themselves employable across a broad range of occupations. Additionally, the present study identifies a handful of workplace profiles based on how KSAOs tend to cluster together across occupations. Thus, the study aims to identify broad trends in the current and future workforce that will help inform individuals, career counselors, policy makers, and institutions of the general competency demands of the workforce as a whole.

Theories on Fit

Early theorizing on the interaction between people and their work environment led to the formation of the person-environment fit (P-E fit) subdiscipline (e.g., Lewin, 1935). In the decades following, the P-E fit literature space has become a prominent area of focus for organizational researchers and now houses a plethora of related sub theories. Broadly, P-E fit is conceptualized as the degree to which an individual aligns (or corresponds) with their respective workplace environment (Edwards & Shipp, 2007). That is to say, the more an individual has ‘in common’ with various aspects of their work environment, the more the individual and the environment experience positive congruence (i.e., fit). This correspondence can occur across several person-related characteristics, such as vocational interests, as well as occupational characteristics (Holland, 1997; Kristof-Brown et al., 2005). Person-job (P-J) fit, for example, assesses occupational fit based on compatibility between persons and specific job-related

characteristics such as an individual's KSAOs and needs, and the job's tasks and rewards, respectively (Kristof-Brown et al., 2005). Alternatively, person-vocation fit studies fit between individuals and the characteristics of their vocation (Kristof-Brown et al., 2005).

In several recent meta-analyses, person-environment fit was found to be positively associated with various workplace outcomes such as performance and satisfaction, while negatively associated with other work-relevant factors such as turnover intention (Hoff et al., 2020; Nye et al., 2017; Kristof-Brown et al., 2005). For example, Neumann et al., (2020) found that person-environment fit had a similar strength in predicting variance of wages as does additional years of schooling. Generally, there appears to be substantial support for the notion that person-environment fit (i.e., correspondence or similarity) leads to more positive work-relevant outcomes and, even, life outcomes such as life satisfaction (e.g., Gander et al., 2020). Broadly, these findings suggest that fit between persons and the various aspects of their specific work environment play an important role in influencing workplace outcomes. However, I extrapolate these findings to make the assumption that fit is important not only in the relationship of a specific individual and their work environment but also for the workforce as a whole. That is to say that, from a broader, societal level, workers in the workforce should strive to fit the general occupational demands of the labor market. As such, the following paragraphs serve to further explore the factors which contribute to ideal fit.

A great deal of the current and past person-environment fit literature has been dedicated to studying vocational interest fit (e.g., Holland, 1997; Spokane, 1985; Assouline & Meir 1987; Hoff et al., 2020). The dominant theory in the domain, Holland's (1997) RIASEC model, has been widely adopted and validated in the literature (Spokane, 1985; Assouline & Meir 1987). The RIASEC model stipulates that peoples' and occupations' vocational interests can be

categorized across six broad domains: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C; Holland, 1997). Realistic vocational interest types tend to correspond with hands-on, physically intensive, and outdoor occupations such as mechanic and farmer (Holland, 1997; McClain & Reardon, 2015). Investigative types tend to be drawn toward STEM related occupations and may have strong analytical and problem-solving skills. Artistic types tend to prefer occupations that allow them to express their creativity and artistic prowess. Individuals with social vocational interests tend to enjoy working with and helping people, and thus, may work in roles such as teacher or counselor. The enterprising vocational interest type refers to individuals that tend to be charismatic and can lead or influence a group of people toward a common goal. Lastly, the conventional vocational interest type refers to occupations that require fine attention to detail and the ability to effectively organize things (Holland, 1997; McClain & Reardon, 2015).

Holland asserted that a match between an individual's primary vocational interest-type and the primary vocational interest-type supplied by the work environment can influence individual job satisfaction and job performance (1997). Indeed, recent meta-analyses have found support for Holland's (1997) initial propositions, revealing the importance of matching individuals to occupations that interest them (e.g., job satisfaction, Hoff et al., 2020; job performance, Nye et al., 2017, Van Iddekinge et al., 2011). For these reasons, the present study seeks to determine the degree to which each of the six RIASEC vocational interest categories are necessitated in the workforce. Such findings would elucidate the vocational interest demands of the workforce and inform individuals of the likelihood or ease in which one may be able to find work in a given vocational interest domain. Thus, the first research question of the present study is as follows.

Research Question 1: What are the most in-demand vocational interest types and work styles in the current and future workforce?

However, it is important to note that vocational interest congruence only represents a fraction of the broader P-E fit relationship, and thus, has important limitations. For example, Holland's (1997) RIASEC model, conceptualizes fit as pertaining to a single aspect of the person-environment relationship (i.e., vocational interests). Such conceptualizations lack the acknowledgment that it is often the aggregate experience that one has with their environment that constitutes fit (Jansen & Kristof-Brown, 2006). Accordingly, adequate fit in one dimension alone cannot be generalized to suffice the broader person-environment fit relationship (Jansen & Kristof-Brown, 2006). Additionally, Holland's (1997) model of P-E fit, like other single-dimension models, conceptualizes P-E fit to be stable, and thus, does not account for changes in individual or organizational factors over time (Sekiguchi, 2004). Recent research, however, suggests that this assumption is flawed; personal interests do in fact fluctuate over one's lifetime (Hoff et al., 2018). These findings echo the notion set forth in the theory of work adjustment stating that fit is liable to deteriorate over time given that personal attributes and organizational factors are seldom static (Dawis & Lofquist, 1984). As such, it is argued that P-E fit should be constituted on a multidimensional model of fit, in which multiple criteria and characteristics are assessed for person-environment congruence (Jansen & Kristof-Brown, 2006; Sekiguchi, 2004). These arguments highlight the need to assess other domains of fit in the present study, such as KSAO congruence, in addition to that of vocational interests.

For example, the theory of work adjustment sets forth a more comprehensive, dynamic framework on the topic (Dawis & Lofquist, 1984). The theory of work adjustment conceptualizes person-vocation fit on the following two dimensions: satisfactoriness and

satisfaction. According to this theory, if the occupation meets the needs of the individual, the individual experiences satisfaction; if the individual meets the needs of the occupation, then the individual is said to be satisfactory (to the occupation; Dawis & Lofquist, 1984). This notion corresponds closely to demands-abilities fit (i.e., fit between the individual's *knowledge, skills, and abilities* and job-task demands; Edwards, 1991) and needs-supplies fit (i.e., individuals' needs and *interests* met by work environment; Edwards, 1991). In one study, demands-abilities fit and needs-supplies fit, when aggregated, were found to be moderately to strongly correlated with job satisfaction ($r = 0.56$), organizational commitment ($r = 0.47$), and intent to quit ($r = -0.46$; Kristof-Brown et al., 2005). Further, demands-abilities fit, has been moderately supported in the literature as a sole predictor of workplace outcomes. For example, Greguras et al. (2009) found that demands-abilities fit was a significant predictor of organizational commitment as well as a distal predictor of job performance. Hence, those wishing to maximize fit between themselves and their environment should consider not only personal factors, like their specific vocational interests and work-related needs, but also occupational factors like the job's competency requirements. Demands-abilities fit, thus, seems to comprise an important portion of the broader P-E fit relationship and warrants the present study to also assess the specific KSAs required by the workforce in addition to vocational interest demands.

Altogether, the P-E fit and the theory of work adjustment frameworks suggest that person-environment correspondence should be considered across a comprehensive set of dimensions to ensure adequate fit. Thus, identifying the major occupational demands (e.g., KSAOs) of the workforce would allow individuals to develop the competencies necessary to fit the *typical* occupation within the labor market. For example, individuals could seek out training and educational opportunities that most closely reflect the highest-demanded KSAOs of the

workforce, and thus ensure that they will provide value in many of the most prevalent occupations. Alternatively, early childhood interventions and adolescent career programs can be used to increase the most relevant and important KSAOs within the labor market. For these reasons, an understanding of the most in-demand KSAOs would be helpful to individuals and larger initiatives in making informed decisions on the characteristics and attributes that should be targeted for developmental purposes. This study aims to provide this necessary information by examining the highest necessitated KSAO attributes within the current and future labor market. As such, the second research question of the current study is as follows.

Research Question 2: What are the most in-demand knowledge, skill, and ability attributes in the current and future workforce?

Finally, the P-E fit and related literature space suggests that *individuals* should be proactive in their assessment of job relevant KSAOs in order to increase fit between themselves and their vocation, and thus increase the likelihood of experiencing positive workplace outcomes. However, I assume the benefits of fit hold true on an aggregate level as well, across *all* workers in the workforce. Under this assumption, workers who experience perfect fit with their occupations should all exhibit identical KSAO competencies. That is to say that ideal fit between workers and organizations on an aggregate level would require that each individual in a given occupation possess the unique set of competencies that the occupation requires to the exact degree at which they are required. This would indicate that unique workplace profiles exist, in which workers of a specific KSAO profile type are most aptly suited toward the KSAO demands of specific occupation or style of occupations. Identifying such workplace profiles could further supplement the available work-relevant information by providing individuals an additional

resource to draw from when making career related decisions. Hence, the final research question of the present study is as follows.

Research Question 3: How do the various KSAO attributes tend to cluster together in the workforce and what kind of workplace profiles can be inferred from this information?

Early Experiences & Career Readiness

Several theories posit that career development begins in early life (i.e., Super et al., 1973; Lent & Brown, 2002). Super et al. (1973) suggested that early experiences in life, such as the kinds of work-relevant information a child is exposed to from their friends, family, and social settings often begin to influence the child's personal interests. These interests, Super suggests, begin to guide the choices an individual makes such as the types of activities one is drawn towards (1973). Over time these choices begin to develop one's vocational self-concept; individuals begin to solidify their views of the various career options presented to them and determine their ideal career path (Super et al., 1973).

Social cognitive career theory takes this notion one step further. Career development, according to the social cognitive career theory, is the product of not only one's personal factors and attributes as described by Super (1973), but also circumstantial factors such as socioeconomic constraints and environmental stimuli (Lent & Brown, 2002). In essence, it is the interaction between environmental factors and one's internal thoughts, beliefs, and perceptions about the workplace and their ideal role in it that constitute what an individual may perceive as a viable and desirable career path (Lent & Brown, 2002). These suggestions serve not only to echo voices in the P-E fit literature that argue for the importance of person-environment interaction but also to extend its importance into childhood.

Given the early onset in which individuals begin to contemplate their vocational interests and determine whether their KSAOs can accommodate such interests, it is warranted to provide career development interventions and opportunities for individuals early in life. Such opportunities could aid individuals in developing the KSAOs necessary to maximize potential fit in a certain occupation or could help an individual understand which set of KSAOs are worth developing in an effort to maximize broad employability.

Introducing grade school students to vocational KSAOs (e.g., the introduction of computer proficiency skills such as typing) has been a focus of the U.S. government for decades (Bishop & Mane, 2004; National Center for Education Statistics, 2020a). However, participation in career technical education has declined since 1992 resulting in an average of only 2.6 Career technical education credits completed by high school graduates in recent years (National Center for Education Statistics, 2020a). Further, while 88% of high school graduates report having completed career technical education credits of some kind, only 38% completed 2 or more credits within a specific concentration; indicating that the current structure of career technical education offerings could represent a haphazard approach to career readiness (National Center for Education Statistics, 2020a).

Despite these concerns, career technical education has been shown to have benefits at the individual level. Individuals that learned vocation-specific knowledge, skills, and abilities in high school earned 12% higher wages the first year after high school and 8% higher wages seven years after high school than those who did not take similar coursework. Furthermore, these outcomes were consistent regardless of whether the students went on to obtain university degrees (Bishop & Mane, 2004). Moreover, participation in courses that directly develop the KSAOs required by an individual's desired career has been shown to increase high school attendance

rates and even lead to lower unemployment levels when at least 3 career technical education credits were completed (Bishop & Mane, 2004; National Center for Education Statistics, 2020b).

Taken together, career technical education provides a remarkable opportunity to aid youth in career exploration and foster the development of KSAOs that not only meet an individual's unique personal interests but also serve to establish a strong basis of employability and preparation for their entrance to the workforce. Hence, to continue adapting career technical education offerings to the ever-changing workforce, policy makers and educational institutions should stay up to date regarding the most pressing and prevalent competency demands. Such information could serve to inform the decision-making process regarding which career technical education offerings are created or renewed and could guide the development of early childhood career development interventions.

Present Study

The aforementioned theories in the person-environment fit and related literature space suggest that the ideal worker should have a positive correspondence with their work environment in order to maximize the likelihood of beneficial workplace outcomes. Namely, previous research has identified knowledge, skills, and abilities (e.g., KSAs) and vocational interests (e.g., other characteristics) as important factors in the P-E- fit relationship. As such, the present study uses current occupational and employment data to develop a summary of the most important and in-demand vocational interest categories and work styles (research question 1) and knowledge, skill, and ability attributes (research question 2) in the workforce. By identifying the highest-necessitated attributes across all occupations in the workforce, the present study will provide a broad account of the competencies and characteristics required by the typical worker in the labor market. Additionally, the present study examines the profile clusters that form within the labor

market to determine the kinds of workers that would need to exist to have a perfect match between the supply of workers and the demands of jobs (research question 3). Such information could inform individuals, policymakers, and other leaders of the most critical sets of KSAOs which can be used to guide individual decision-making, education curricula, and extra-curricular, workforce readiness programs.

Method

Employment Projections

I used the Bureau of Labor's Statistics' Employment Projections (BLS-EP) database to obtain the workforce employment numbers (U.S. Bureau of Labor Statistics, 2021). The BLS-EP database reports information on the current and projected employment numbers (i.e., 2020, 2030), median annual wages, entry-level education requirements, job-relevant experience requirements, and typical job-training across specific occupations. There were 153.5 million employees in 2020 and 165.4 million projected employees in 2030: indicating an estimated growth of 11.9 million jobs in the labor market by 2030 (U.S. Bureau of Labor Statistics, 2021).

Occupational Characteristics

The Occupational Information Network (O*NET) provides detailed information on occupational characteristics and attributes (National Center for O*NET Development, 2022). For this study, I used the O*NET 27.0 dataset which included 33 knowledge attributes, 35 skill attributes, 52 ability attributes, and 6 vocational interest attributes. Each attribute is scored on the basis of its importance (i.e., the degree to which respondents feel a given attribute is relevant to the occupation; scored on a 5-point Likert scale where 1 = Not Important and 5 = Very Important) and its level (i.e., the degree to which respondents feel a given attribute is present

within or required by the occupation; scored on an 8-point Likert scale ranging from 0 - 7, anchored differently across attributes).

Procedure

All analyses were conducted using R. First, the two datasets (O*NET 27.0 and BLS-EP) were cross walked using the SOC coding system shared between the two datasets. Next, weighted means were calculated by averaging the level and importance reported for each attribute of knowledge, skills, abilities, work styles, and vocational interests with the BLS occupation data. Weighted means were calculated for the current employment numbers (2020), cumulative projected employment numbers (2030), and the change between the two (only jobs projected to open between 2020 and 2030).

Lastly, a Latent Profile Analysis was conducted to identify workplace profiles based on attribute groupings. Latent Profile Analysis (LPA) uses a latent variable model procedure to identify clusters or groups of data within a set of continuous variables, and thus provides insight into what unique profiles may exist in the dataset. To conduct this analysis, I used the *tidyLPA* package (e.g., Rosenberg, 2021) in R and followed the guidelines set forth by Ram and Grimm (2009) and Spurk et al. (2020). The procedure was as follows: I first used the Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) to determine a rough estimate for the optimal number of profiles in each domain of profile clusters (i.e., knowledge, skills, abilities, and vocational interests). Next, I used the entropy value to identify the models with distinct groupings and minimal overlap. Lastly, I used the Bootstrapped Likelihood Ratio Test p-value (BLRT p) to determine if latent profile models with one fewer or one more profile ($k-1$; $k+1$) were significantly different from the estimated number of profiles determined from the BIC and AIC (k). As a general rule, when the BLRT p value given for adding an additional

profile was no longer significant, and thus no longer indicated a significant change had been made to the model, I selected the model with the lowest number of profiles (i.e., the most parsimonious model).

Results

Descriptive Analyses

On average, there were only minor differences in the relative importance of each of the top KSAOs assessed between the years 2020 and 2030. As such, it can be inferred that the KSAOs most strongly necessitated by the current labor market will also be strongly necessitated in 2030, with only minor fluctuations in the average values and order of relevance. Table 1 reports the weighted means for the top five demanded attributes for the knowledge, skills, abilities and work styles categories as well as all six of the vocational interest types. The weighted means in this table have been calculated using (1) the employment counts for 2020, (2) the total projected employment counts for 2030 (i.e., 2020 employment counts plus projected openings by 2030), and (3) only the new jobs projected to open in the workforce between 2020 and 2030 (i.e., the difference between employment counts in 1 and 2). The following sections reference the weighted means identified in Table 1 to indicate which attributes of each occupational characteristic domain were determined to be required at the highest level across all occupations in the current and future workforce. Relative importance simply refers to the order by which a given attribute is demanded by the workforce relative to other attributes. Similarly, necessity refers to the weighted mean values, with higher values indicating that the workforce demands the given attribute to a greater degree.

Research Question 1: What are the most in-demand vocational interest types and work styles in the current and future workforce?

The first research question of the present study sought to determine which other person characteristics, such as vocational interest types and work styles, were most highly necessitated in the current and future labor market. The results that follow display the means calculated for the highest scoring attributes within each category weighted by occupational counts.

Among the six total vocational interest types, the current workforce highly necessitates workers who classify as conventional ($M = 4.63$), realistic ($M = 4.25$), and enterprising ($M = 4.04$). When assessed only by projected occupation openings, these interest types are expected to see substantial changes (e.g., realistic, $M = 4.47$; conventional, $M = 4.19$; enterprising, $M = 3.82$). From this view I expect the realistic interest type to displace the conventional interest type in workforce necessity and relative importance.

The five highest demanded work styles in the current workforce are dependability ($M = 6.13$), attention to detail ($M = 6.07$), integrity ($M = 6.02$), cooperation ($M = 5.82$), and self-control ($M = 5.72$). Among projected job openings, these work styles are expected to have minor fluctuations in necessity but not relative importance (e.g., dependability, $M = 6.17$; attention to detail, $M = 6.04$; integrity, $M = 6.03$; cooperation, $M = 5.89$; and self-control, $M = 5.81$).

Research Question 2: What are the most in-demand knowledge, skill, and ability attributes in the current and future workforce?

This research question sought to determine the areas of knowledge, skills, and abilities that are most important and in-demand in the current and future labor market. The results that follow display the means calculated for the highest scoring attributes within each category weighted by occupational counts.

The analysis determined that the five highest demanded areas of knowledge in the current workforce are customer and personal service ($M = 4.14$), English language ($M = 3.54$), education

and training ($M = 3.18$), computers and electronics ($M = 3.14$), and mathematics ($M = 3.1$). Further, when weighted only on projected job openings in the labor market between 2020 and 2030, most of these areas of knowledge maintain their relative importance and are expected to increase in necessity (e.g., customer and personal service, $M = 4.21$; English language $M = 3.56$; education and training $M = 3.34$), apart from computers and electronics ($M = 3.00$) and mathematics ($M = 2.90$). Moreover, the relative importance for mathematics knowledge ($M = 2.90$) is expected to be displaced by that of administration and management ($M = 2.94$) among projected job openings.

The five highest demanded skills in the current workforce are active listening ($M = 3.44$), reading comprehension ($M = 3.40$), critical thinking ($M = 3.37$), speaking ($M = 3.31$), and monitoring ($M = 3.21$). Among projected job openings between 2020 and 2030, these skills are expected to have subtle fluctuations in relative importance as well as average necessity in the workforce (e.g., active listening, $M = 3.40$; critical thinking, $M = 3.38$; reading comprehension, $M = 3.35$; speaking, $M = 3.29$; monitoring, $M = 3.25$).

The current workforce highly necessitates the following five abilities: oral comprehension ($M = 3.80$), oral expression ($M = 3.76$), near vision ($M = 3.48$), written comprehension ($M = 3.45$), and problem sensitivity ($M = 3.39$). When weighted only on projected job openings, each mentioned ability is expected to see a minor decrease in necessity while maintaining relative importance to one another (e.g., oral comprehension, $M = 3.79$; oral expression, $M = 3.75$; near vision, $M = 3.45$; written comprehension, $M = 3.43$), apart from problem sensitivity which is expected to see a minor increase in average necessity ($M = 3.43$).

Latent Profile Analyses

Research Question 3: How do the various KSAO attributes tend to cluster together in the workforce and what kind of workplace profiles can be inferred from this information?

The final research question of the present study sought to uncover the underlying profiles that categorize the world of work. Profiles have been separated by each of the KSAO categories (i.e., knowledge, skills, abilities, other characteristics). Profile scores for each attribute within a category have been standardized based on the attributes grand mean and standard deviation. That is to say that an average and standard deviation were computed for each attribute across all occupations; Profile scores were then standardized against these statistics to determine how each profile scored on an attribute in relation to the total average.

Vocational Interest Profiles

The vocational interest LPA used the six interest categories in Holland's (1997) RIASEC model to produce eight significantly unique profiles. Figure 1 displays each profiles' z-scores for each of the six vocational interest categories.

Business Administrators & Maintainers. Compared to the average interest level, this profile scored moderately high in both the Enterprising ($z = 1.39$) and Conventional ($z = 0.95$) interest categories and moderately low in the Investigative ($z = -0.64$) and Realistic ($z = -0.89$) interest categories. Individuals in this class are likely to put their capacity to organize things, people, and data to use in a business setting. Some of the occupations in this profile were office clerks, accountants and auditors, retail salespersons, human resource specialists, and cashiers.

Business Creatives. Business creatives scored highly above the mean in the Artistic interest category ($z = 2.81$), moderately above in Enterprising ($z = 0.75$), and below the mean in Conventional ($z = -1.18$), Realistic ($z = -0.66$), and Investigative ($z = -0.51$). Individuals in this class tend to use their creative faculties to sell products, improve businesses, and innovate in

workplace settings. Some examples of Business Creative careers are hairstylists and cosmetologists, producers and directors, graphic designers, and writers and authors.

Analysts & Researchers. Analysts and researchers scored highly above the mean in Investigative ($z = 1.77$), below the mean in Social ($z = -0.54$), and relatively undifferentiated in all other interest types ($z = -0.37$ to 0.34). Individuals in this profile are likely to prefer individual work and tend to have an interest in knowledge and empirical observation. Examples of typical occupations for this profile are research analysts, engineers (e.g., civil, electrical, mechanical), statisticians, and scientists (e.g., chemists, biologists, medical).

Realistic Organizers. The realistic organizers scored moderately above the mean in Realistic ($z = 0.83$) and moderately below the mean in Social ($z = -0.62$), with only slight deviations from the mean in all other interest types ($z = -0.52$ to 0.48). Individuals in this class are likely to enjoy working with things and could also find themselves working in jobs that focus on improving organization and maintenance. These individuals tend to pursue occupations with a hands-on style of work and may find themselves working as product stockers, truck and tractor operators, maintenance and repair workers, plumbers, and landscapers/groundskeepers.

Service Focused Group. The service focused group scored above the mean on the Social ($z = 1.82$), Artistic ($z = 1.32$), and Investigative ($z = 0.55$) interest categories, while scoring below the mean on Realistic ($z = -1.40$) and Conventional ($z = -0.82$). Individuals in this class are likely to have a strong desire to help, communicate, and guide people. These interests tend to lead individuals in this profile to education-related careers (teachers, teachers' assistants, professors, tutors), and healthcare-related careers (nurses, social workers, therapists).

Labor Creatives. The labor creatives scored above the mean on the Artistic ($z = 1.34$) and Realistic ($z = 0.76$) interest categories and below the mean on Social ($z = -0.73$) and

Enterprising ($z = -0.73$). Individuals in this class are likely to express their creativity with material things, often in a hands-on manner. Common occupations in this class pertained to architecture, masonry, and culinary endeavors.

Material Focused Group. The material focused group scored above the mean on Realistic ($z = 1.00$) while scoring moderately below the mean ($z = -0.84$ to -0.66) on all other interest types. Individuals in this class are likely to be drawn towards working with things in a hands-on manner and may require a high degree of physicality to do so. Some examples of occupations for this profile are freight, stock, and material movers, construction laborers, agricultural equipment operators, packers and packagers, and chemical equipment operators.

Social-Investigative Group. This profile scored above the mean on both the Social ($z = 1.44$) and Investigative ($z = 0.70$) interest categories, while scoring lower than the mean on Conventional ($z = -0.75$). This combination of interests is likely to draw individuals in this profile towards occupations that allow them to solve problems for others. Some examples of occupations for this profile are physicians, medical assistants, athletic trainers, and dietitians/nutritionists.

Knowledge Profiles

A latent profile analysis was run to assess which of the 33 areas of knowledge identified by O*NET tended to cluster together in various occupations. The knowledge LPA produced 6 unique profiles. Figure 2 displays each profiles' z-scores for each of the 33 knowledge attributes.

Business Administrators. Characterized by a high focus on business-related knowledge, the business administrators group scored highly above the mean in economics and accounting ($z = 1.11$), and moderately above the mean ($z = 0.50$ to 1.00) in areas of knowledge relating to

business administration (e.g., administration and management, administrative) and communications and personnel management (e.g., communications and media, sales and marketing, customer and personal service, personnel and human resources). Conversely, this profile scored below the mean on areas of knowledge relating to science (e.g., biology, chemistry, physics) and mechanics. Individuals in this profile are likely to know how to manage people and resources, organize business affairs, and communicate effectively both in and out of the workplace. Common occupations for this profile were managerial and secretarial roles, first-line supervisors, systems managers, and sales representatives.

Anthropologists. The anthropologists profile scored above the mean ($z = 0.91$ to 2.28) in a broad range of human-related knowledge domains such as history and archeology, philosophy and theology, sociology, education and training, English language, geography, psychology, and foreign language. This profile also scored moderately above the mean ($z = 0.75$ to 1.45) on areas of knowledge pertaining to helping and communicating with others (e.g., communications and media, personnel and human resources, and therapy and counseling). Not surprisingly, this profile lacks a necessity for knowledge relating to the operation of things (e.g., mechanical, manufacturing, engineering). Individuals in this profile are likely to have a strong understanding of people and their individual differences and be effective communicators. As such, individuals in this profile tend to be drawn toward careers as educators (kindergarten through post-secondary), clergy and religious workers, human resources managers, and psychologists.

People-Oriented Servicers. The people-oriented servicers group scored highly above the mean ($z = 1.77$ to 1.88) in healthcare-related areas of knowledge such as medicine and dentistry, psychology, and therapy and counseling. Additionally, this profile scored moderately above the mean ($z = 0.58$ to 1.13) in human and communicative areas of knowledge (e.g., customer and

personal service, English language, foreign language, sociology, and education and training), and ethical areas of knowledge (e.g., philosophy and theology, and law and government). Individuals in this profile are likely to value helping, working with, and solving problems for others. Some of the highest employing occupations in this profile were registered nurses, counseling professionals, police and patrol officers, and social workers.

Beginner-Level Knowledge Workers. This profile scored below the mean ($z = -0.99$ to -0.04) in all areas of knowledge, except food production ($z = 0.23$). As such, these individuals are more likely to work in environments with minimal knowledge demands. Further, individuals with this knowledge profile make up a large part of the labor force associated with food service. Occupations that meet these criteria could be restaurant waiters, cashiers, and line cooks.

Unspecialized High-Knowledge Workers. This profile scored above the mean on almost all areas of knowledge, with high scores in STEM-related categories (e.g., engineering, $z = 1.41$; physics, $z = 1.37$; mathematics, $z = 1$; chemistry, $z = 1$; computers and electronics, $z = 0.8$; telecommunications, $z = 0.77$). In addition to its focus on STEM fields, this profile also scored moderately high on construction-related categories (e.g., building and construction, public safety and security, geography), manufacturing-related categories (e.g., mechanical, production and processing), and administration and management. Individuals in this profile are likely to have a broad range of knowledge that prepares them for leadership positions in a host of occupations pertaining to business, STEM, and industrial fields. Common occupations for this profile are agricultural managers, computer network architects, electrical engineers, construction managers, and first-line supervisors of production and operating workers.

Trade Workers. The trade workers group scored below the mean on almost all categories of knowledge, except those pertaining to labor-intensive trade-work (e.g., mechanical,

$z = 0.96$; building and construction, $z = 0.64$; production and processing, $z = 0.61$). Individuals in this profile are likely to work with their hands on materials and machines, often in physically demanding positions or environments. Examples of common occupations for this profile are automotive service technicians and mechanics, industrial truck and tractor operators, construction laborers, and highway maintenance workers.

Skill Profiles

The skills LPA produced 5 unique profiles illuminating which of the 35 examined skills tend to cluster together in persons and occupations. Figure 3 displays each profiles' z-scores for each of the 35 skill attributes.

Leaders. Leaders scored above the mean ($z = 0.67$ to 1.21) in 27 of the 35 examined skills. Some of the highest scoring categories in this profiles skill set pertain to communication and social skills (e.g., active listening, speaking, reading comprehension, writing, social perceptiveness), personnel leadership (e.g., persuasion, monitoring, instructing, time management, negotiation, learning strategies), management (e.g., management of financial, material, and personnel resources, systems analysis, systems evaluation), and critical thinking (e.g., critical thinking, complex problem solving, judgment and decision making, active learning). However, this profile lacks proficiency in several technical areas relating to equipment maintenance and operation (e.g., equipment maintenance, equipment selection, operation and control, operations monitoring, repairing, troubleshooting). Individuals with this skill set are likely to perform well in leadership roles where they can optimize company performance by solving complex problems and managing team members and resources effectively. Examples of common occupations for this profile are chief executives, general and operations managers, lawyers, financial managers and personal financial advisors, and physicians.

Assistants. Assistants scored within 0.5 standard deviations from the mean for a majority of the examined skills, with no visible strengths. Perhaps the most notable characteristic of this profile is that, while nearly all its scores are below average, its highest deficiencies coincide with the highest deficiencies of the Leaders profile (e.g., equipment maintenance, equipment selection, operation and control, operations monitoring, repairing, and troubleshooting). From this, I posit that individuals in this profile are likely to work in similar roles and environments as the Leaders, however, likely at a lower degree of skill or level within a company. Common occupations for this profile include secretaries and administrative assistants, receptionists and information clerks, paralegals and legal assistants, customer service representatives, and first-line supervisors of food preparation and serving workers.

Operation Technicians. Operation technicians scored above the mean ($z = 0.9$ to 1.34) in many technical skills (e.g., equipment maintenance, equipment selection, operation and control, installation, operations monitoring, repairing, troubleshooting, and quality control) and below the mean in areas relating to communication and social skills (e.g., active listening, speaking) and critical thinking (e.g., complex problem solving, judgment and decision making). As such, individuals in this profile are likely to excel in the management, operation, and maintenance of mechanical equipment. Common occupations for Operations Technicians are general maintenance and repair workers, industrial machinery mechanics, carpenters, production workers, and electrical power-line installers.

Technology-Orientated Technicians. Technology-oriented technicians scored moderately above the mean ($z = 0.51$ to 1.2) in areas relating to technical skills (e.g., equipment maintenance, equipment selection, operation and control, operations analysis, operations monitoring, repairing, troubleshooting, quality control, systems analysis, systems evaluation),

managerial skills (e.g., management of material and personnel resources), and STEM skills (e.g., science, mathematics, programming). Further, this profile did not score below the mean on any of the examined skill categories, indicating proficiency in a broad range of skills. I found that technology-oriented technicians tend to work as software developers and software quality assurance analysts and testers, first-line supervisors of mechanics, installers, and repairers, and surgical technologists.

Novice-Skill Laborers. The novice-skill laborers group scored far below the mean ($z = -1.38$ to -0.16) on all skills except for operation and control ($z = 0.05$). Given the lack of skill proficiency in all areas, I posit that individuals in this profile are likely to perform best in beginner-level environments with minimal requirements in areas of technical, cognitive, managerial, and communicative skills. Novice-skill laborers tend to work as cashiers, fast food and counter workers, passenger vehicle drivers, and postal service mail carriers.

Ability Profiles

The abilities LPA produced 5 unique profiles based on the 20 abilities examined by O*NET. Figure 4 reports each profiles' z-scores for each of the 20 ability attributes.

Thinkers. Thinkers scored above the mean ($z = 0.57$ to 1.22) on abilities associated with cognitive functioning (e.g., cognitive processing, creativity, mathematical skill, memorization, problem sensitivity, reasoning/logic) and communication (e.g., language comprehension, language expression, speech clarity), while scoring below the mean ($z = -1.16$ to -0.44) on *all* abilities pertaining to physicality (e.g., corporeal control, dexterity, flexibility, gross body control, stamina, strength, visual acuity, visual processing). As such, thinkers are likely to excel in occupations that require high levels of critical thinking, problem-solving, reasoning, and comprehension. Examples of common occupations for thinkers include project management and

business operations specialists, market research analysts and marketing specialists, financial and investment analysts, and data scientists.

Wide-Ability Workers. This profile scored marginally above the mean ($z = 0$ to 0.48) on *all* categories of abilities, with moderate distinction in areas relating to concentration and cognition (e.g., attentional control, $z = 0.73$; problem sensitivity, $z = 0.71$; cognitive processing, $z = 0.68$; memorization, $z = 0.56$). While other profiles tended to show strong distinctions in either physical or cognitive-based abilities, often at the detriment of the other skill categories, wide-ability workers scored at or above the mean across both domains. As such, wide-ability workers are likely to have a robust range of moderate-level abilities that would enable them to perform well in a variety of settings and roles. However, these roles will likely require individuals that can combine their cognitive and physical proficiencies to solve problems on the go. Additionally, the distinction in abilities relating to concentration and problem-solving (e.g., attentional control, problem sensitivity) implies that these individuals may work in relatively high-stakes settings, which require a greater deal of in-the-moment focus and cognitive acuity. Common occupations for wide-ability workers include registered nurses, dental hygienists, emergency medical technicians and paramedics, food service managers, and bartenders.

High-Risk Movers. High-risk movers scored above the mean on areas relating to physical ability (e.g., corporeal control, $z = 1.14$; gross body control, $z = 1.1$; strength, $z = 1.1$; stamina, $z = 1.02$; dexterity, $z = 0.82$; flexibility, $z = 1.11$), and sensory acuity (e.g., visual acuity, $z = 1.14$; visual processing, $z = 1.05$; auditory acuity, $z = 1.03$; response speed, $z = 1.22$), while scoring below the mean on areas relating to communication (e.g., speech clarity, $z = -0.72$; language comprehension, $z = -0.81$). Thus, high-risk movers are predominantly characterized by their strong physical capabilities. Additionally, these individuals are likely to use their faculties

of sensory acuity, corporeal control, and response speed to effectively perform high-risk tasks. As suggested by the profiles' predominance in physical attributes, these tasks are likely to involve working with things such as machinery and materials. High-risk movers tend to find work as freight, stock, & material movers, construction laborers, carpenters, production workers, and industrial truck and tractor operators.

Novice-Ability Workers. The novice-ability workers group scored below the mean on all the examined abilities except those relating to communication (e.g., speech clarity, $z = 0.06$; language comprehension, $z = 0.06$; language expression, $z = 0.12$). This profile's greatest deficiencies seem to be in areas relating to physical competency (e.g., gross body control, $z = -1.01$; strength, $z = -0.99$; stamina, $z = -1.03$), whereas its deficiencies in cognitive-based abilities were less severe (e.g., cognitive processing, $z = -0.47$; mathematics, $z = -0.07$; memorization, $z = -0.21$). I posit that individuals in this profile are likely to perform well in occupations that are people-focused with low to average levels of cognitive challenge and minimal dependence on physicality. Common occupations for the novice-ability workers profile include retail salespersons, office clerks, customer service representatives, real estate sales agents, and data entry keyers.

Low-Risk Movers. Low-risk movers scored moderately above the mean on some areas relating to physical capability (e.g., dexterity, $z = 0.51$; flexibility, $z = 0.58$; stamina, $z = 0.61$; strength, $z = 0.56$), while scoring far below the mean on areas relating to cognitive functioning (e.g., cognitive processing, $z = -1.22$; problem sensitivity, $z = -1.03$; reasoning, $z = -1.11$), communication (e.g., language comprehension, $z = -1.07$; speech clarity, $z = -0.89$), and focus (e.g., attentional control, $z = -0.95$). As such, I posit that Low-Risk Movers are likely to thrive in occupational settings that require moderate physicality and low cognitive and communicative

ability. Common occupations for low-risk movers include cashiers, fast food and counter workers, home health and personal care aides, janitors and cleaners, and nursing assistants.

Discussion

Person-environment fit (P-E fit) literature suggests that individuals who correspond or 'fit' with their occupation on one or more domains are more likely to experience positive workplace outcomes (Hoff et al., 2020; Nye et al., 2017; Kristof-Brown et al., 2005). A subset of the P-E fit literature, person-vocation fit, posits that the degree to which an individual can perform the tasks demanded by their occupation represents an important portion of the broader P-E fit relationship (i.e., satisfactoriness; Dawis & Lofquist, 1984). Hence, the present study supplements the P-E fit literature by providing a comprehensive account of the KSAOs demanded by the current and future workforce and organizes these KSAOs according to their unique profile groupings. Such information provides guidance for individuals and career counselors seeking to take advantage of the existing P-E fit literature and serves to inform policy makers and institutions in their decision-making process regarding educational curricula and workforce initiatives and interventions.

Research Questions 1 & 2: What are the most in-demand vocational interest types, work styles, and knowledge, skill, and ability attributes in the current and future workforce?

Given the importance of demands-abilities congruence in the person-vocation relationship, it is important that individuals understand the kinds of KSAOs they will be expected to possess when entering the workforce. As such, the current study calculated weighted means to assess which KSAOs were most highly necessitated. Notably, the present study has extended the scope and strength of several findings presented in a 2013 report which espoused similar goals (Burrus et al.). The present study built upon the approach set forth by Burrus et al.

(2013) by using employment projection data in addition to occupational characteristic data. In doing so, my findings account for the total number of occupation positions that demand a given KSAO attribute, and thus, offer a more representative overview of the KSAOs demanded by the current and future workforce.

Key findings of the present study indicate that not all KSAOs are necessitated equally in the workplace. Rather, the workforce places its' highest demand on KSAOs relating to science, technology, engineering, and mathematics (STEM) and communication and service. More specifically, my findings suggest that worker success in STEM related occupations is influenced by an employee's *knowledge* of computers and electronics and mathematics, *proficiency* (i.e., skill) in critical thinking, and *ability* to recognize problems (i.e., problem sensitivity). Further, weighted means for communication and service-related attributes suggest high demand for employees with *knowledge* of customer and personal service and the English language, *proficiency* in active listening, reading comprehension, and speaking, and the *ability* to express themselves orally and comprehend written and spoken word (i.e., oral expression, oral and written comprehension).

Additionally, weighted mean analyses of the current study suggest that conventional and realistic vocational interest types are necessitated by the current workforce to a greater degree than other interest types. This indicates that the workforce places greater demand for workers with vocational interests relating to organization of things, data, and systems as well as interests relating to physically intensive or material-focused occupations, respectively. Finally, the workforce seems to place high emphasis on work styles relating to an individual's values. Indeed, several of the highest necessitated work styles are, colloquially, not thought of as being related to work but rather as the foundation of one's character. Take, for example, the values of

honesty and ethicality, responsibility and reliability, and emotional composure (i.e., the work styles integrity, dependability, and self-control, respectively). Each of these mentioned work styles scored highly in the present study's analyses and, interestingly, they seem to say more about the type of *person* that the workforce demands rather than the type of *worker*.

Broadly, these findings echo those found in the Burrus et al. (2013) report. The top five attributes across all studied domains were found to be largely unchanged between the two studies, with only minor fluctuations in relative order and a few notable substitutions (Burrus et al., 2013). Namely, Burrus et al., (2013) reported that judgement & decision making was the fifth highest necessitated skill attribute. The present study, however, found monitoring to take to fifth position in average demand for the skill dimension. Additionally, Burrus et al., (2013) found deductive reasoning to be the fifth highest demanded attribute in the abilities dimension, whereas the findings of the present study indicate that deductive reasoning has been outplaced by the demand for near vision. In sum, the present study adds analytic strength to the findings of Burrus et al., (2013) by finding similar results with a more robust methodology. Together, the two studies suggest that the workforce highly demands KSAOs relating to communication and customer and personal service as well as science, technology, engineering, and mathematics (STEM). As such, individuals seeking to experience positive fit with the workforce as a whole should develop related KSAOs, thus maximizing opportunity for employability across a broad range of occupations.

Research Question 3: How do the various KSAO attributes tend to cluster together in the workforce and what kind of workplace profiles can be inferred from this information?

The present study has organized workplace competencies by identifying unique profiles for each of the major KSAO domains. Most notably, of the 24 identified workplace profiles,

several profile groupings emerged based on commonalities between profiles' competency arrangements, perceived occupational sectors, and reported occupations. For example, many of the workplace profiles tended to have KSAO proficiencies that were concentrated in one of four occupational categories. Moreover, profiles that shared distinct KSAO proficiencies tended to also share common deficiencies, indicating a similar array of strengths and weaknesses across these profiles; thus, providing further validity to the notion that these profiles may comprise a distinct profile subgroup. Additional criteria used to explore possible profile subgroupings was commonalities between the types of jobs and job sectors each profile was reported to be associated with. From this information, I have inferred that a majority of the original 24 workplace profiles can be classified within one of the following four workplace profile subgroups: service (characterized by a focus on competencies relating to communication or people-oriented knowledge); manual labor (represented by a focus in corporeal, visual, and auditory capability or an orientation toward manual labor); business (characterized by a focus in managerial, administrative, communicative, and cognitive KSAOs); and STEM (characterized by a concentration of KSAOs in science, technology, engineering, or mathematics). Table 2 displays the four profile subgroups along with the definitions, included profiles, typical KSAOs, and common occupations for each.

The first subgroup of profiles tended to match one of two descriptions. I have opted to name this category of profiles under the term 'communication & service,' given that several of the included profiles, as well as many of the occupations associated with this category, are related to service and people-oriented positions. The first set of profiles in this subgroup tended to have an undifferentiated focus of KSAO competencies and, often, a general lack of distinctive proficiency altogether. It seems to be the case that many workers with below-average

competencies find themselves working in service-related occupations. This distinction is important, as it does not seem to be the case that profiles with this description exhibit a specialization toward service, as the second set of profiles in this subgroup does. Rather, profiles in this category tend to exhibit no distinct specialties and instead *find* themselves working in service-related occupations. It may be the case that the workforce is simply saturated with these low-barrier-to-entry service-related jobs, and as such, represent an easy opportunity for individuals to gain work experience regardless of their skillset. Examples of such profiles include the following: beginner-level knowledge workers, novice-skill laborers, novice-ability workers. The second group of service profiles, however, *did* tend to have a distinct specialization toward either communication, service, or people oriented KSAOs. It was not uncommon for profiles that match this description to have an additional area of competency, indicating that these profiles are likely to work with people toward a specific goal. An example could be the social-investigative group, who display a unique interest in both people and problem solving. Other profiles that may match this description include the service-focused group, people-oriented knowledge group, and anthropologists. In sum, profiles that match the latter description are likely to excel in helping others by providing support, service, and guidance, or by offering aid in solving a sensitive problem.

The second subset of worker profiles, titled ‘manual labor’ emerged within the occupational sectors of vocational work and trades work. Profiles within this subset tended to exhibit a strong concentration of KSAO competencies relating to physicality (e.g., corporeal, visual, and auditory capability) and material/mechanical proficiency. Further, nearly all of the jobs associated with these profiles fall within the vocational or manual labor occupation sectors. The profiles included in this subset are labor creatives, material-focused group, trade-workers,

operation technicians, high-risk movers, and low-risk movers. These findings highlight the value that the workforce places on vocational or trades work. For example, this profile subgroup contains 6 out of the total 24 workplace profiles (25%), indicating that manual laborers comprise an important portion of the workforce.

A third subgroup of worker profiles, the ‘business’ group, tended to exhibit strong managerial, administrative, cognitive, and communicative KSAOs. It is worth noting, however, that the communication competencies that this group tended to possess were more aligned with business topics (e.g., the *skills* of negotiation and persuasion; *knowledge* of communications and media and sales and marketing), unlike the people-oriented communication competencies that the service group was more likely to possess (e.g., psychology; therapy & counseling). An additional commonality between profiles in the business subgroup is the general deficiency in KSAOs relating to science, physicality, and mechanical/equipment operations. This group is further identified by its association with corporate related occupations. Many of the reported jobs for profiles within this group shared similar titles such as systems manager, first-line supervisor, sales representative, and office clerk. Profiles conceptualized as belonging to the business group included business administrators, business administrators & maintainers, leaders, thinkers, assistants, and business creatives.

The final subgroup of workplace profiles, the STEM group, tended to exhibit a concentration of KSAOs in one of the four STEM domains (science, technology, engineering, and mathematics) or a related field. Profiles that comprise the STEM subgroup include the analysts & researchers, unspecialized high-knowledge workers, and technology-oriented technicians. Notably, only three of the 24 workplace profiles meet the description of the STEM subgroup, indicating that these kinds of workers could be underrepresented in the workforce.

One interpretation of this general lack of STEM profile types could be that some STEM fields in the workforce, such as technology, computers, and electronics, are still in their infancy relative to other occupational sectors. Thus, STEM profiles may still be in the process of emerging within the occupational space and, given the rate of technological advancements over previous decades, could still yet find their role as a dominant profile group.

An additional trend related to the 24 workplace profiles identified in the current study is the distinction between profiles whose KSAOs are specialized and profiles whose KSAOs are general. For instance, many of the identified profiles exhibited above average KSAOs in one domain or category, often to the detriment of most others. Examples of such profiles include analysts & researchers, business administrators, people-oriented service, thinkers, and business creatives. Conversely, other profiles tended to either exhibit a medium- to high-degree of proficiency in a broad range of KSAOs. Examples of profiles within this subset include unspecialized high-knowledge workers, anthropological knowledge, leaders, and wide-ability workers. These two profile subsets, which I have opted to label as specialists and generalists, respectively, suggest that there are two general approaches an individual can take when preparing to enter the workforce: individuals can either study a broad set of KSAOs that will increase employability across a wide range of occupations or individuals can opt to pursue a highly specialized KSAO focus; each of which is likely to be accompanied with its own unique advantages and disadvantages. In either event, policy makers and educational institutions should acknowledge these two general approaches, inform students about the respective strengths and weaknesses of each, and encourage students to tailor their educational coursework toward their chosen approach.

Taken together, the findings of this study provide individuals with a realistic understanding of the KSAO demands of the workforce they are soon to enter and the information necessary to make themselves highly employable. Individuals seeking to take advantage of the information presented here should determine the KSAOs they currently possess and which workplace profile they intuit themselves to be. Such judgments will help individuals determine the occupational fields that best match their workplace profile type as well as discern which of the major KSAOs they will need to develop in order to maximize employability. This process will guide individuals as they navigate the vast workforce and determine their ideal role within it. By the same token, the present study could bring immense value to career counseling professionals by providing them with the resources necessary to inform individuals of the workforces' highest demanded KSAOs, and thus, a roadmap to ensure one has the highest chance of employability. Finally, policy makers and institutions should account for the information provided here when making decisions on educational curricula.

Strengths, Limitations, and Future Directions

The present study has extended the scope and validity of previous research (i.e., Burrus et al., 2013) as well as provided an update to the occupational demands of the current and future workforce. Further, the present study has made a novel contribution to the field by identifying 24 workplace profiles that could serve to be the foundation of future research and interventions. For example, Holland (1997)'s RIASEC model inspired the conception of the Occupational Information Network's interest profiler tool, which helps millions of Americans every month by suggesting occupations in which they are likely to experience high interest congruence (Hoff et al., 2020, U.S. Department of Labor, 2018). Similarly, the workplace profiles identified in this

study could form the basis for a similar tool; thus, providing important career guidance information for individuals seeking to navigate the world of work in coming years.

However, the present study is not without limitations. Those planning to apply the findings set forth in this article should consider the following concerns. Firstly, the present study lacks real-person data. While the use of archival data has enabled me to cast a broad net and make widespread observations and inferences into trends in the national workforce, the findings set forth in this study lack the validity that would have accompanied a workforce census design. Archival data, specifically those which are derived from self-report survey methods as in the current study, are prone to error and bias from subjects, and prone to error yet again in the hands of the original data collectors. In order to substantiate the findings of this study further, future researchers should survey employees across a host of occupation sectors regarding the KSAOs they deem vital to their specific job tasks. Additionally, future researchers should aim to identify relationships between employee KSAO characteristics, such as area of competency, and occupational outcomes such as average salary. Moreover, future researchers should aim to determine if specific KSAO characteristics (e.g., broad range of competencies with modest proficiency in all vs. narrow range of competency with specialized, heightened proficiency) play a significant role in the person-environment fit relationship and broader workplace outcomes.

Profiles produced in the present study describe what clusters of KSAOs exist within the examined *occupational* data, not data from real-world employees. I then extrapolate from these findings to hypothesize that, to produce a perfect fit between an individual and their respective occupation, individuals must also exist with the unique combinations of traits found within each profile. Again, however, these profiles are more technically understood to be clusters of KSAO

demands that exist within occupations, not employees. Thus, the profiles describing various employee types and their unique traits set forth in the present study are theoretical in nature.

Previous research has sought to organize the workforce by identifying what kind of *jobs* exist (e.g., job types; Karasek & Theorell, 1990; Holman, 2013). Alternatively, the present study has utilized occupational characteristic data to theorize about what kind of *employees* exist, given the occupational demands of the workforce. Nevertheless, mapping the employee profile types identified in the present study onto the job profile types theorized in previous work (e.g., Holman, 2013) may provide value to both models and elucidate the current findings. Future research should determine if alignment exists between the six job types conceptualized by Holman (2013) and the 24 workplace profiles conceptualized in the current study.

Conclusion

The present study has summarized available occupational characteristics and employment data to determine the highest necessitated areas of knowledge, skills, abilities, and other person characteristics in the current and future work force. Further, my analyses have identified 24 novel workplace profiles based on how KSAOs tend to group together in labor market. In sum, this study is a comprehensive overview of the workforces' occupational demands and provides individuals, career counselors, and policymakers with meaningful and actionable career guidance information.

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Table 1

Most In-Demand Knowledge, Skills, Abilities, and Other Person Characteristics Based on the Overall Weighted Averages

Characteristic	Weighted Average		Projected Openings
	2020	2030	
Knowledge			
Customer & Personal Service	4.14	4.14	4.21
English Language	3.54	3.54	3.56
Education & Training	3.18	3.20	3.34
Computers & Electronics	3.14	3.13	3.00
Mathematics	3.10	3.08	2.90
Skills			
Active Listening	3.44	3.44	3.40
Reading Comprehension	3.40	3.39	3.35
Critical Thinking	3.37	3.37	3.38
Speaking	3.31	3.31	3.29
Monitoring	3.21	3.22	3.25
Abilities			
Oral Comprehension	3.80	3.80	3.79
Oral Expression	3.76	3.76	3.75
Near Vision	3.48	3.48	3.45
Written Comprehension	3.45	3.45	3.43
Problem Sensitivity	3.39	3.39	3.43
Work Styles			
Dependability	5.99	5.99	6.03
Attention to Detail	5.91	5.91	5.87
Integrity	5.85	5.85	5.86
Cooperation	5.62	5.63	5.70
Self-Control	5.51	5.52	5.62
Vocational Interests			
Realistic	4.25	4.27	4.47
Investigative	2.54	2.56	2.69
Artistic	1.86	1.89	2.14
Social	3.34	3.40	3.97
Enterprising	4.04	4.02	3.82
Conventional	4.63	4.57	4.19

Note. Weighted averages were determined by the level-rating of the KSAO category (on an 8-point Likert scale; minimum score = 0, maximum score = 7) and the 2020 and 2030 employment numbers reported in the BLS-EP dataset. Work Styles were rated on importance using a 5-point Likert scale; the values were min-max transformed, creating a scale with a minimum of 0 and a maximum of 7. The Projected Openings column reports the weighted averages based on the projected increase of 11.9 million jobs in the employment numbers between 2020 to 2030 report in the BLS-EP.

Table 2
Workplace Profile Subgroups Based on Profile Commonalities

Class	Definition	Included Profiles	Typical KSAOs	Example Occupations
<i>Communication & Service</i>	Workplace profiles in this classification tended to either have strong competencies relating to communication, service, or people-oriented knowledge or have undifferentiated KSAOs. These individuals are likely to work in roles that allow them help others or provide service, support, and guidance.	- Service-Focused Group - People-Oriented Servicers - Social-Investigative Group - Anthropologists - Beginner-Level Knowledge Workers - Novice-Skill Laborers - Novice-Ability Workers	<u>Knowledge</u> Customer & personal service English language <u>Skills</u> Active listening Service orientation Social perceptiveness <u>Abilities</u> Oral/written expression Oral/written comprehension <u>Vocational Interests</u> Social	- Counseling professionals & social workers - Registered nurses - Teachers - Retail salespersons - Fast food and counter workers - Cashiers
<i>Manual Labor</i>	Workplace profiles in this classification tended to have KSAOs concentrated in corporeal, visual, and/or auditory capability. As such, these individuals are likely to excel in physically intensive roles and may have an orientation toward manual labor, outdoors work, and/or mechanical roles.	- Trade Workers - High-Risk Movers - Low-Risk Movers - Material Focus Group - Labor Creatives - Realistic Organizers - Operation Technicians	<u>Knowledge</u> Building & construction Mechanical <u>Skills</u> Equipment maintenance Operations monitoring <u>Abilities</u> Corporeal control Strength Stamina Visual/auditory acuity Response speed <u>Vocational Interests</u> Realistic	- Freight, stock, and material movers - Heavy and tractor-trailer truck drivers - Maintenance and repair workers - Stockers and order fillers - Landscaping & groundskeeping workers

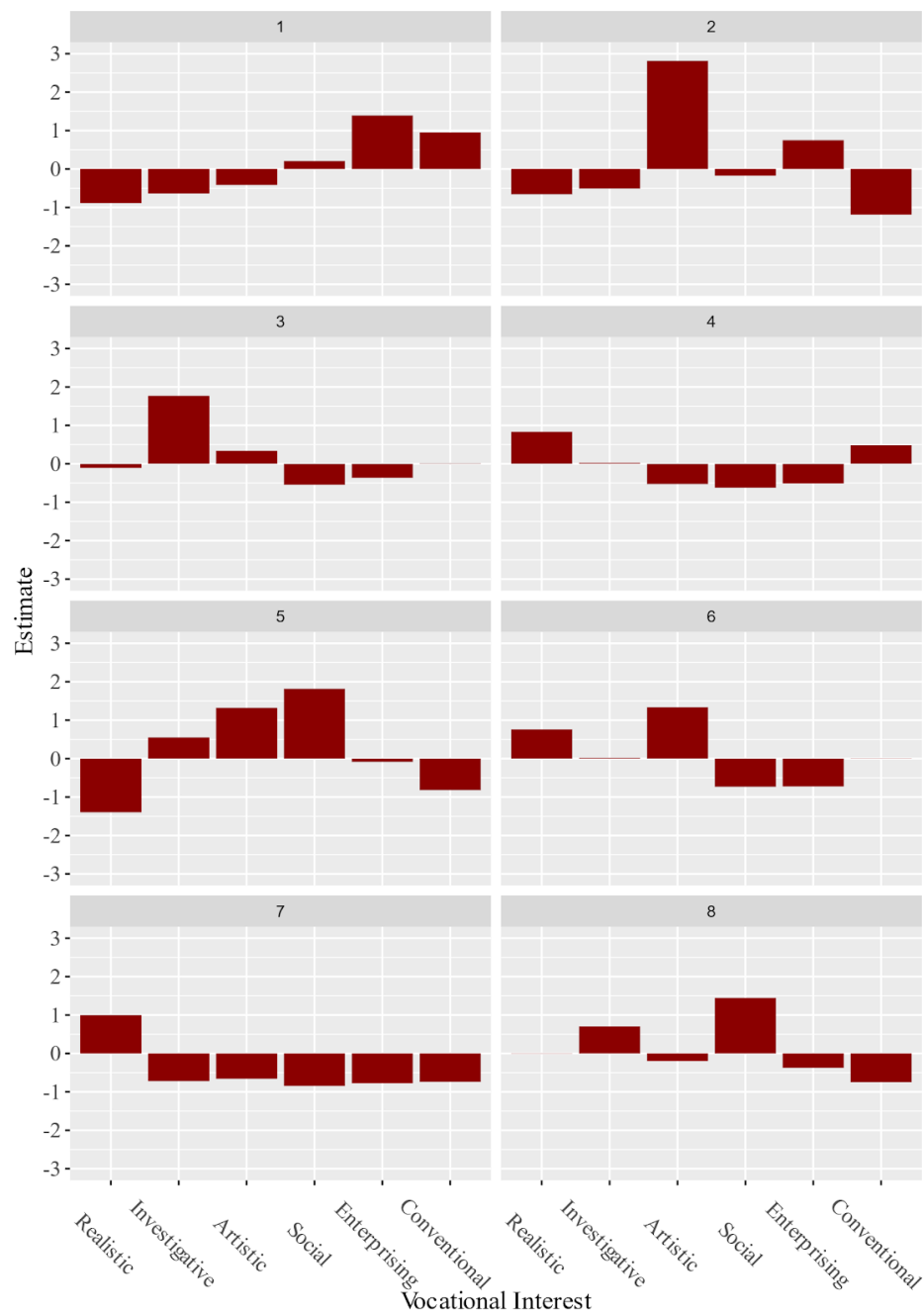
Note. This table displays the four workplace profile subgroups which have been inferred based on commonalities between the original profiles identified by the Latent Profile Analyses. The commonalities used to derive these subgroups included shared KSAO proficiencies and deficiencies, and shared occupation sectors. The Typical KSAOs and Example Occupations columns serve only to provide common examples for KSAOs and occupations that are associated with profiles included in each group. These columns do not necessarily reflect the highest demanded KSAOs or highest employing occupations for a given subgroup.

Table 2 Continued*Workplace Profile Subgroups Based on Profile Commonalities*

Class	Definition	Included Profiles	Typical KSAOs	Example Occupations
<i>Business</i>	Workplace profiles in this classification tended to have strong managerial, administrative, communicative, and cognitive KSAOs. As such, these individuals are likely to excel in corporate roles where they can exercise their capacity to organize things, people, and systems, think through complex problems, and manage a team.	• Business Administrators • Business Admin. & Maintainers • Leaders • Thinkers • Assistants • Business Creatives	<u>Knowledge</u> Sales and marketing Personnel & human resources Economics & accounting <u>Skills</u> Monitoring Management of - material resources - financial resources - personnel resources <u>Abilities</u> Critical thinking Problem sensitivity Mathematical skill <u>Vocational Interests</u> Enterprising	• General & operations managers • Sales representatives • First-line supervisors • Secretaries & administrative assistants
<i>STEM</i>	Workplace profiles in this classification tended to have KSAOs concentrated in science, technology, engineering, and mathematics, or a related field. These individuals are likely to work in a role that requires a high degree of cognitive capacity and a knack for critical thinking.	• Unspecialized High-Knowledge Workers • Analysts & Researchers • Technology-oriented technicians	<u>Knowledge</u> Computers & electronics Engineering & technology Biology/Chemistry/Physics <u>Skills</u> Science Mathematics Programming <u>Abilities</u> Critical thinking Problem sensitivity Deductive reasoning <u>Vocational Interests</u> Investigative/Conventional	• Software developers • Market research analysts • Engineers (all denominations) • Computer support specialists • Electricians

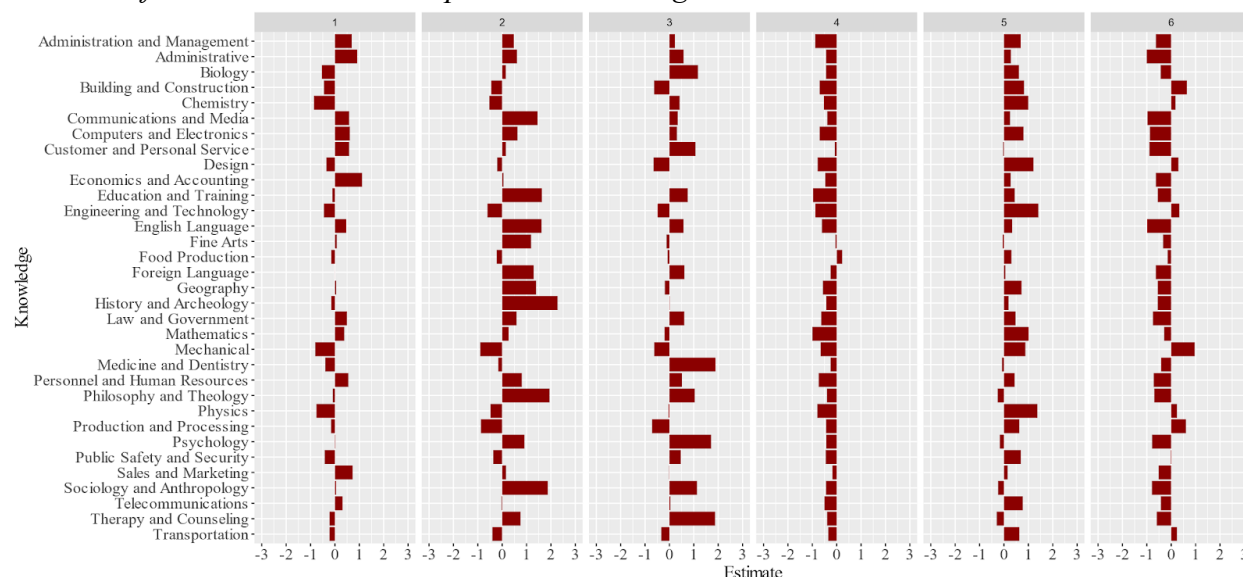
Note. This table displays the four workplace profile subgroups which have been inferred based on commonalities between the original profiles identified by the Latent Profile Analyses. The commonalities used to derive these subgroups included shared KSAO proficiencies and deficiencies, and shared occupation sectors. The Typical KSAOs and Example Occupations columns serve only to provide common examples for KSAOs and occupations that are associated with profiles included in each group. These columns do not necessarily reflect the highest demanded KSAOs or highest employing occupations for a given subgroup.

Figure 1
Latent Profiles Based on the Occupations' Vocational Interest Scores



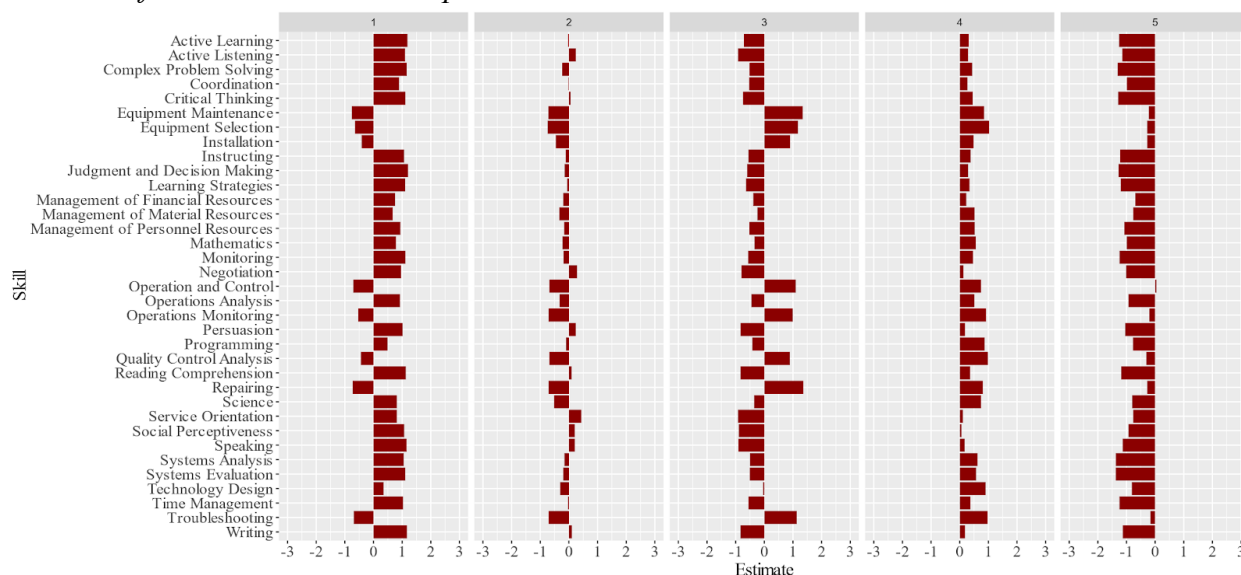
Note. Profiles are as follows: 1 = Business Administrators & Maintainers; 2 = Business Creatives; 3 = Analysts & Researchers; 4 = Realistic Organizers; 5 = Service Focused Group; 6 = Labor Creatives; 7 = Material Focused Group; 8 = Social-Investigative Group. Each estimate was standardized using the grand mean score and standard deviation of each respective interest category. For example, I calculated the mean and standard deviation of the realistic scores across all occupations; I then used these statistics to standardize the reported mean estimates.

Figure 2
Latent Profiles Based on the Occupations' Knowledge Scores



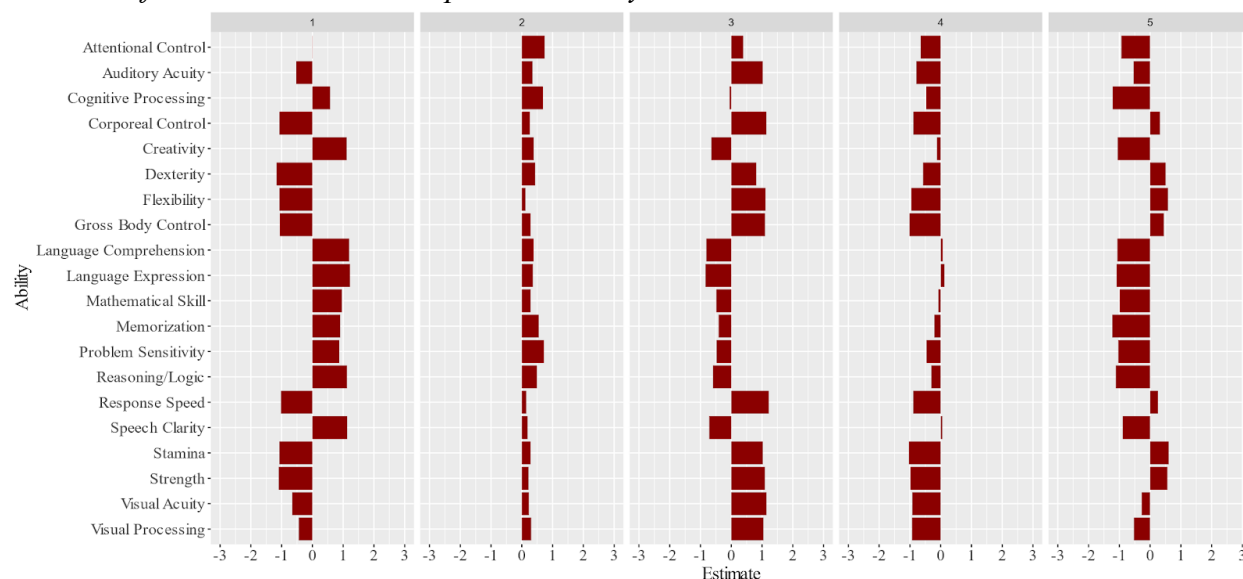
Note. Profiles are as follows: 1 = Business Administrators; 2 = Anthropologists; 3 = People-Oriented Servicers; 4 = Beginner-Level Knowledge Workers; 5 = Unspecialized High-Knowledge Workers; 6 = Trade Workers. Each estimate was standardized using the grand mean score and standard deviation of each respective knowledge category. For example, I calculated the mean and standard deviation of the administration and management scores across all occupations; I then used these statistics to standardize the reported mean estimates.

Figure 3
Latent Profiles Based on the Occupations' Skill Scores



Note. Profiles are as follows: 1 = Leaders; 2 = Assistants; 3 = Operation Technicians; 4 = Technology-Orientated Technicians; 5 = Novice-Skill Laborers. Each estimate was standardized using the grand mean score and standard deviation of each respective skill category. For example, I calculated the mean and standard deviation of the active learning scores across all occupations; I then used these statistics to standardize the reported mean estimates.

Figure 4
Latent Profiles Based on the Occupations' Ability Scores



Note. Profiles are as follows: 1 = Thinkers; 2 = Wide-Ability Workers; 3 = High-Risk Movers; 4 = Novice-Ability Workers; 5 = Low-Risk Movers. Each estimate was standardized using the grand mean score and standard deviation of each respective ability category. For example, I calculated the mean and standard deviation of the attentional control scores across all occupations; I then used these statistics to standardize the reported mean estimates. Due to computational limitations, I average the scores across congruent ability categories. For example, the hearing sensitivity, auditory attention, sound localization, and speech recognition categories were averaged together to create the auditory acuity category.