



## **Research Memorandum**

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# **Building a Case to Develop Noncognitive Assessment Products and Services Targeting Workforce Readiness at ETS**

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# ETS Research Memorandum Series

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ETS, Princeton, New Jersey

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As part of its nonprofit mission, ETS conducts and disseminates the results of research to advance quality and equity in education and assessment for the benefit of ETS's constituents and the field.

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## **Abstract**

The goal of this paper is to establish the case for conducting research on the readiness of individuals for the workforce as part of the Workforce Readiness Initiative at ETS, with specific emphasis, at least initially, on noncognitive indicators of readiness. We begin by defining a conceptual framework that encompasses noncognitive constructs and measures, followed by a brief review of the literature highlighting the importance of noncognitive predictors in education and the workforce. Next, we examine the importance of research on workforce readiness and consider how ETS can conduct workforce readiness research. Finally, we give an overview of work accomplished in this area at ETS, include an action plan of workforce research in progress, and summarize future planned directions.

Key words: workforce readiness, noncognitive, noncognitive assessment, personality

The goal of this paper is to establish the case for conducting research on the readiness of individuals for the workforce as part of the Workforce Readiness Initiative at ETS, with specific emphasis, at least initially, on noncognitive indicators of readiness. We begin by defining a conceptual framework that encompasses noncognitive constructs and measures, followed by a brief review of the literature highlighting the importance of noncognitive predictors in education and the workforce. Next, we provide our thoughts on two important questions, “Why is research on workforce readiness important?” and “How can ETS conduct workforce readiness research?” Finally, we overview the existing work that has been accomplished in this area at ETS, include an action plan of how workforce research is currently proceeding, and summarize future planned directions.

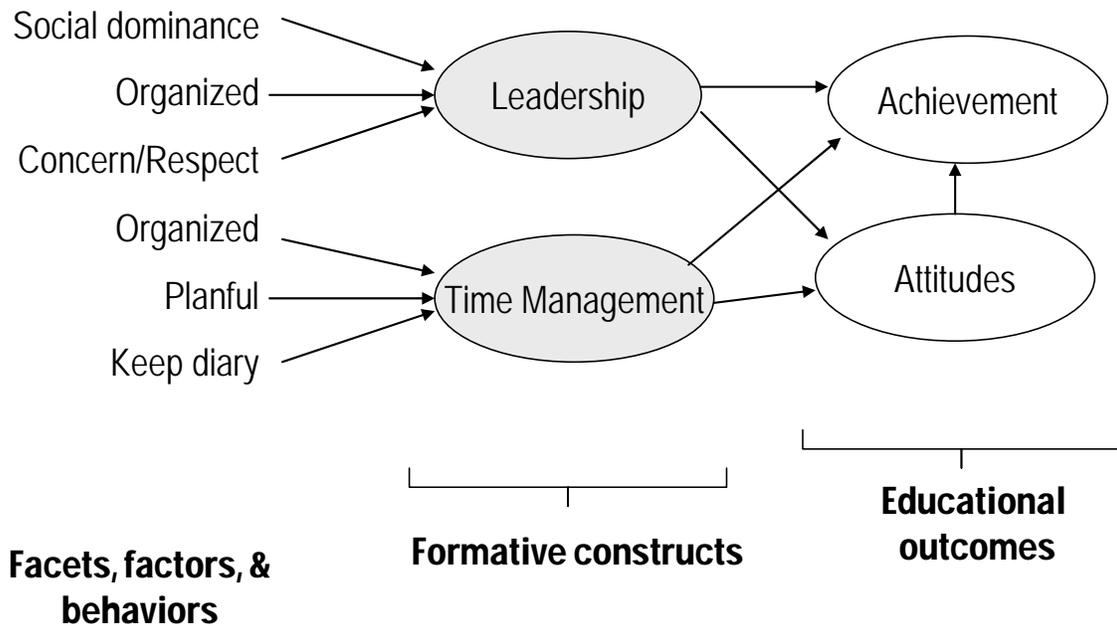
### **What Are Noncognitive Variables?**

#### **Explanation of Five-Factor Model (FFM) Conceptual Framework**

Much of the research on personality attributes has coalesced on the notion that personality can be distilled into five broad dimensions, in what is known as the *five-factor model (FFM)*. The FFM, also known as the Big Five, or OCEAN model, provides a conceptual framework for personality research that comprises five broad traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. Researchers have demonstrated that this framework generalizes across differing cultures and rating sources (Hogan & Ones, 1997; Saucier & Goldberg, 1998). An influential meta-analysis by Barrick and Mount (1991) highlighted the validity of the FFM approach in predicting workforce outcomes, leading many applied psychologists to accept this framework as a taxonomic structure for personality (Hough & Oswald, 2008; Matthews, Zeidner, & Roberts, 2006).

Although the FFM approach is widely accepted, additional noncognitive variables (e.g., engagement, honesty, leadership) have also been shown to provide both scientific and practical value (Kyllonen, Lipnevich, Burrus, & Roberts, 2009). The idea of formative constructs, which are derived from personality facets, factors, and behaviors, has taken hold as a complementary approach of linking noncognitive variables with academic outcomes. Formative constructs here are simply defined as composites or a basic sum of a set of components, in contrast to reflective constructs, which are defined as latent psychological traits such as intelligence or personality (see Edwards & Bagozzi, 2000). Figure 1 demonstrates how facet-level variables (such as being organized or planful) can lead to formative constructs like time management, which in turn may

be related to educational and workforce outcomes. In this way, both the FFM and formative construct approaches can serve as a conceptual framework to identify key noncognitive variables and their relations to important outcomes.



**Figure 1. Formative constructs: examples.**

In terms of existing research, several meta-analyses have demonstrated the predictive validity of noncognitive variables on educational outcomes (e.g., Crede & Kuncel, 2008; Lafontaine & Monseur, 2007; Nofle & Robins, 2007). For workplace outcomes, noncognitive variables have been shown to not only predict overall job performance and objective performance measures (Barrick, Mount, & Judge, 2001; Dudley, Orvis, Lebiecki, & Cortina, 2006; Hogan & Holland, 2003), but also contextual performance, such as dedication to the job, interpersonal interactions, and organizational citizenship (Borman, Penner, Allen, & Motowidlo, 2001; Dudley et al., 2006; Hertz & Donovan, 2000; LePine, Erez, & Johnson, 2002; Organ & Ryan, 1995). Noncognitive variables also predict learning and skill acquisition (Barrick & Mount, 1991; Barrick et al., 2001; Colquitt, LePine, & Noe, 2000; Kyllonen, Roberts, & Stankov, 2007), as well as creativity and innovation (Feist, 1998; Hough, 1992).

Of the five main personality factors, conscientiousness has been shown to be the most consistent, significant predictor of workplace performance (Barrick & Mount, 1991; Behling,

1998; Dudley et al., 2006; Hogan & Holland, 2003; Hurtz & Donovan, 2000). For example, meta-analyses on the prediction of job performance from personality dimensions have demonstrated that broad measures of conscientiousness predict overall job performance at  $\rho = .22$  (Barrick & Mount, 1991; Hurtz & Donovan, 2000), even controlling for cognitive ability (Hough & Oswald, 2008; Schmidt & Hunter, 1998). In addition to overall job performance, broad measures of conscientiousness have been shown to predict a number of other valued workplace outcomes, such as organizational citizenship behaviors (Borman et al., 2001; Sackett et al., 2006) and leadership behaviors (Judge, Bono, Ilies, & Gerhardt, 2002) as well as undesirable behaviors such as procrastination (Judge & Ilies, 2002), to name a few.

In addition, it appears that noncognitive variables can help reduce disparate impact (Hough, Oswald, & Ployhart, 2001; Sackett & Ellingson, 1997; Sackett, Schmitt, Ellingson, & Kabin, 2001; Schmitt, Rogers, Chan, Sheppard, & Jennings, 1997). Although effect sizes relating broad measures of personality to performance are often small, Hough and Oswald (2008) noted that “even modest amounts of validity can translate into significant amounts of utility to the organization when aggregated across individuals and over time (conversely, not administering a personality measure means losing this utility)” (p. 268).

Given the large body of evidence supporting the importance of noncognitive variables in education and in the workforce, there are a number of ways in which researching noncognitive predictors of workforce skills serves ETS as an organization. This paper highlights arguments from a policy perspective, as well as arguments based on scientific merit and business practices.

### **Importance of Workforce Readiness Research**

ETS has emerged as a leader in alerting the American public on the need for a better prepared workforce. The ETS Policy Information Report, *America's Perfect Storm* (Kirsch, Braun, Yamamoto, & Sum, 2007) reported that almost half of the job market growth over the next 25 years will be in occupations associated with high skill levels and a required college education (Kirsch et al., 2007). The report called attention to factors and trends indicating that the current student population would not be prepared for work, highlighting the importance of a broadly educated and skilled workforce in achieving continuous economic growth and reducing widening gaps in performance and achievement. Specifically, the authors described three converging forces that put the nation's economy at risk. These are: (a) the lack of literacy and numeracy skills within the adult population, (b) the changes in the structure of the U.S. economy,

and (c) the change in demographic trends within the United States. Better understanding of noncognitive factors can address each of these three forces.

### **The First Force**

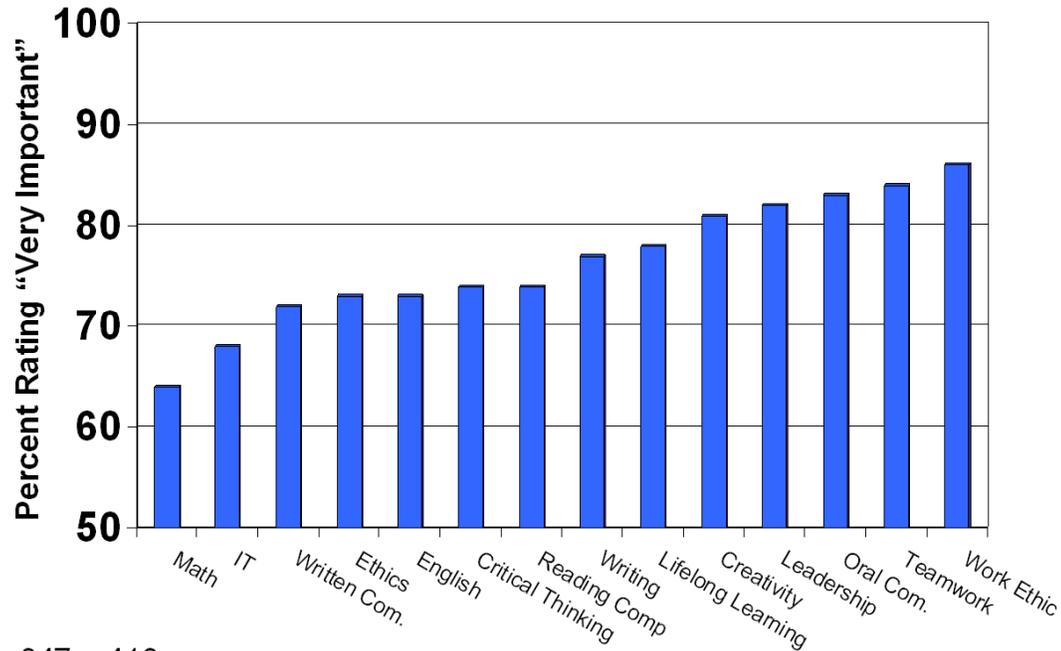
The authors of *America's Perfect Storm* (Kirsch et al., 2007) relied heavily on a book called *Teaching the New Basic Skills* (Murnane & Levy, 1996) in identifying literacy and numeracy skills as essential to the nation's job market growth. Interestingly, in addition to the cognitive skills identified by *America's Perfect Storm* (Kirsch et al., 2007), Murnane and Levy (1996) stated that it is equally important for the 21st century workforce to possess noncognitive skills (they refer to these as *soft skills*), such as teamwork and communication. Workforce research that assesses these skills and creates interventions designed to improve them can provide an essential complement to research on numeracy and literacy skills to create a better-equipped workforce.

### **The Second Force**

Research on the noncognitive predictors of workplace performance clearly addresses issues related to ongoing structural changes to the economy. Labor markets are different than in decades past, due in part to “industrial and corporate restructuring, declines in unionization, technological change, and globalization” (Kirsch et al., 2007, p. 6). These changes favor workers who possess a different set of skills than were required under the old economic structure, and several of the most important of these skills can be characterized as noncognitive. These skills were recently identified in an influential report put out by The Conference Board, Partnership for 21st Century Skills, Society for Human Resource Management, and Corporate Voices for Working Families (Casner-Lotto & Barrington, 2006) titled, *Are They Really Ready to Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century U.S. Workforce*.

Based on responses from 400+ surveys and 12 interviews with human resource professionals and executives in the business community, The Conference Board (Casner-Lotto & Barrington, 2006) identified skills that are becoming increasingly important to workplace success. Noncognitive skills such as work ethic and teamwork were listed as among the most important personal skills for success in the workplace in the 21st century (see Figure 2). Interestingly, these noncognitive skills were rated more important than skills traditionally taught

and assessed by high schools and colleges. In short, the business community is explicitly stating that classic cognitive skills are not enough for workplace success and that noncognitive skills are important as well. Addressing these business needs is a vital component of pursuing workforce research at ETS.



N = 347 ~ 413

**Figure 2. Conference Board findings: employer ratings of important work skills.**

**IT = information technology; Written Com. = written communications;**

**Reading Comp = reading comprehension; Oral Com. = oral communications.**

### **The Third Force**

The third force identified by *America's Perfect Storm* (Kirsch et al., 2007) was the change in demographic trends expected to occur within the United States over the next 30 years. Specifically, there will be a dramatic increase in racial and ethnic diversity over this time period. The changing makeup of the American populace will result in an increase in the importance of noncognitive workforce assessments. Although cognitive assessments consistently demonstrate

validity in workforce studies (and are legally defensible when shown to be directly relevant to the job), the use of traditional cognitive assessments alone can present problems in business contexts. For example, using traditional cognitive instruments as the sole predictor in selection contexts typically leads to some racial and ethnic minorities being selected at a lower rate than whites. However, as previously reviewed, noncognitive assessments typically result in less disparate impact than do traditional cognitive assessments. Thus, an increase in noncognitive workforce assessment has the potential to result in selection and training practices that result in a more diverse workplace for the 21st century workforce.

### **Developing the Case for ETS Involvement in Workforce Readiness Research**

The authors of *America's Perfect Storm* (Kirsch et al., 2007) clearly believed that workforce research should be conducted: "If we continue on our present heading and fail to take effective action, the storm will have a number of predictable and dire implications for future generations, with consequences that extend well beyond the economic realm to the ethos of our society" (Kirsch et al., 2007, p. 7). The question was whether ETS should be actively involved in this domain of research. To this end, several criteria can be addressed to inform the decision-making process. Below, we address three criteria we feel should be essential decisions made by ETS. These are mission consistency, scientific merit, and business value.

#### **Mission Consistency**

Any work conducted by ETS should be consistent with its mission and its status as a tax-exempt nonprofit organization. The first part of the ETS mission is "to advance quality and equity in education by providing fair and valid assessments, research and related services." Assessing workforce readiness addresses this goal by examining the impact of education and learning on the job. Understanding the skills and abilities that are most predictive of occupational success serves as a form of validation of learning in school contexts, by highlighting the impact of learning at work. Forming fair and valid assessments of noncognitive skills as they apply to workforce performance also strengthens ETS' commitment to lifelong learning, by showing how learning or training in noncognitive skills such as time management, teamwork, and metacognitive skills impact performance beyond the school and at the workplace. In this way, researching noncognitive variables in work contexts not only creates new knowledge and capabilities for ETS, but can also enhance existing products, much as the *ETS<sup>®</sup> Personal*

*Potential Index (ETS® PPI)* serves as an augmentation of the *GRE®* for predicting graduate school performance and success.

The second part of the ETS mission states, “Our products and services measure knowledge and skills, promote learning and educational performance, and support education and professional development for all people worldwide.” In this sense, studying professional development and life-long learning directly addresses ETS mission goals of promoting learning and the impact of knowledge and skills in the workforce.

Bennett (2008) stated that an organization’s mission should be aligned with its tax exempt purpose. The report, *What Does It Mean to Be a Nonprofit Educational Measurement Organization in the 21st Century?* (Bennett, 2008), listed several tests or requirements that must be met in order for an educational nonprofit organization to be federally tax exempt (Bennett, 2008). Research on workforce readiness appears to meet these requirements as follows:

- **The organizational test.** “An entity meets this organizational test if its articles of incorporation limit its function to one or more exempt purposes (e.g., educational) and do not expressly allow the organization to engage, other than insubstantially, in activities that are not consistent with those purposes” (Bennett, 2008, p. 1). As stated previously, assessing workforce readiness addresses this test by examining the impact of education and learning on the job. Understanding the skills and abilities that are most predictive of occupational success serves as a form of validation of learning in school contexts, by highlighting the impact of learning at work.
- **The inurement test.** “No part of the organization’s net earnings may benefit any private individual” (Bennett, 2008, p. 2). This will not change as a result of conducting workforce-readiness research.
- **The lobbying restriction.** This means that the organization cannot participate in political activities. This will not change as a result of conducting workforce-readiness research.
- **The public benefit test.** “The organization must operate for the advantage of public, rather than private, interests. Private interests can be benefited, but only incidentally. Further, the principal beneficiaries of the organization’s activities must be sufficiently numerous and well-defined so that the community is, in some way, served” (Bennett,

2008, p. 2). *America's Perfect Storm* (Kirsch et al., 2007) makes clear that research on workforce-related skills would provide an enormous service to the American public. Research conducted in individual organizations may benefit the organizations studied, but to no greater extent than current ETS endeavors confer advantage to individual universities, high schools, teachers, or students over other similar entities.

- **The public policy test.** The organization's purpose must be consistent with the public conscience. To some extent, work on noncognitive characteristics of workforce readiness meets the public policy test better than does much of the work currently conducted by ETS. For instance, people of different ethnic backgrounds tend to perform equally well on noncognitive characteristics, something that cannot be said for traditional educational assessments such as the GRE and *SAT*<sup>®</sup>. This fact weighs heavily on the public's conscience and has been a continual source of public criticism of ETS and the field of standardized testing as a whole.

Research on workforce readiness is also consistent with the history of ETS. For example, Carl Brigham, inventor of the SAT, was interested in using assessment as a guide for instruction in addition to using it for selection (Bennett, 2008). Workforce readiness work would be used precisely for this instructional guidance function. President Henry Chauncey was interested in identifying new constructs that could be measured in individuals, outlining a so-called *census of abilities* that incorporated noncognitive factors such as drive, motivation, conscientiousness, and the ability to get along with others. Furthermore, he was interested in using these constructs to benefit society as a whole (Bennett, 2008). As we have demonstrated, *America's Perfect Storm* (Kirsch et al., 2007) argued quite persuasively that this work will have great benefit to society.

Having outlined the policy and mission-related goals in conducting workforce research, how can ETS contribute to understanding workforce readiness? To address these policy goals, ETS can develop valid, reliable assessments of noncognitive skills and identify workers who have not accumulated these skills from their previous education. Next, ETS can develop interventions to improve these skills and follow up by assessing the effectiveness of these interventions. Examples of potential avenues of research from a policy perspective are underscored in the section on future directions below.

## **Scientific Merit**

From a scientific perspective, ETS can provide unique contributions to the understanding of the relation between noncognitive constructs and performance. With access to large samples of graduating students, ETS can leverage its connections by following students after graduation to monitor workforce performance. Workforce research can contribute towards a better solution for the longstanding *criterion problem*, one of the most important and difficult problems in workforce and general validation research (Guion, 1998). Specifically, assessing various performance metrics to determine valid criteria to use for both noncognitive and cognitive workforce skills represents an important avenue of ongoing research. This sort of applied research using combined student and real-world business samples can thus contribute greatly to both the organizational and educational literatures. A specific example of the kinds of scientific research questions that can be explored through workforce research appears below in the Action Plan section outlining the current Call Center Study at ETS.

In addition, ETS has several advantages over typical firms that study workforce readiness. First, ETS's status as a nonprofit organization places it in a unique position to make substantial scientific contributions. That is, because it is not accountable to shareholders, ETS is free to take risks and attempt to answer more difficult workforce research questions than can the average consulting firm more concerned with its financial bottom line. Furthermore, ETS's status as a world-class testing agency provides it with resources that would not be available to most firms. For example, ETS's psychometric capabilities are unmatched by most, if not all, for profit consulting firms.

## **Business Value**

Bennett (2008) stated that, in order to fund its mission, a nonprofit organization such as ETS must be responsive to market needs. As evidenced by Casner-Lotto and Barrington (2006), there is a strong demand in the market for assessments and measures that can aid organizations in identifying skilled versus unskilled workers. Given the importance placed on noncognitive skills, ETS has a unique opportunity to leverage its name behind products assessing noncognitive skills for the workforce.

It is an open issue whether noncognitive skill assessments at ETS ought to be designed or advertised for purposes of selection or hiring decisions. But selection is only one of many possible uses for workforce assessments. ETS can provide unique insight for assessments

designed for training and development, promotion and succession planning purposes. These kinds of noncognitive assessments can help organizations understand where employees might best be placed to improve skills or how to target interventions to promote the skills they would like to improve.

Much as the Myers Briggs Type Indicator (MBTI) is widely used to assess employee skills and fit in an organization, ETS has the capability to develop and test products that would identify skilled workers for an organization. The MBTI purports to measure 16 personality types along four dimensions (extraversion-introversion, sensing-intuition, thinking-feeling, and judgment-perception). Despite suffering from significant psychometric problems in terms of both validity and reliability (see Pittenger, 1993), according to the MBTI Foundation, millions of people take the MBTI each year, and the assessment has widespread use in the industry (Myers, 2012). The popularity of measures like the MBTI, despite known psychometric issues, provide further evidence of the high existing demand for noncognitive skill measures in organizations.

The *TOEIC*<sup>®</sup> test is an example of a successful ETS product that assesses skills and learning in a business context, as evidenced by its approximately 6.6 million annual tests administered. By measuring speaking, writing, listening, and reading proficiency in workplace English, the TOEIC not only assesses learning in a workplace context, but also meets a market need from both the business and educational communities. The *PRAXIS*<sup>™</sup> series of teacher licensure and certification assessments also represents an existing workforce assessment at ETS that focuses on the profession of teaching, identifying, and measuring general and subject-specific teaching skills. Finally, ETS has produced an *iSkills*<sup>™</sup> certification assessment that incorporates computer literacy and critical thinking skills, an assessment designed to hone the proficiencies of college students as they prepare for the workforce. Just as each of these products was developed at ETS to assess workforce needs, creating products that assess important noncognitive skills can contribute to market needs for noncognitive measures that may lead to improved workforce readiness and success. ETS should thus seek to develop valid and reliable assessments of constructs such as teamwork and work ethic (conscientiousness) that have been previously rated as very important to workforce success (Casner-Lotto & Barrington, 2006).

### **Summary of Perspectives**

In the end, the goal of workforce research in an educational testing organization is simple: How can we determine if the educational system—K-12 and higher education—is

adequately preparing students for their jobs if we are not assessing job performance? ETS does not necessarily need to compete directly with businesses and consulting firms to provide selection measures, but developing assessments to predict how noncognitive skills in education transfer to the job is an important goal that serves as a direct extension of the ETS mission to research learning. And this approach leverages the ETS name to provide unique capabilities for workplaces and organizations. We already know from Casner-Lotto and Barrington (2006) that businesses place great value on noncognitive skills, and by developing assessments of noncognitive skill that predict work performance, ETS not only addresses the external needs and demands of businesses, but furthers underlying research and mission goals. In this way, pursuing product development in the area of assessing noncognitive skills synthesizes marketing, scientific, and mission-related goals.

There are a number of concrete steps ETS can take in pursuit of these goals. ETS and the Center for Academic and Workforce Readiness and Success (CAWRS) can develop new assessments of personality, teamwork, and leadership and then pilot and test these assessments in workplace contexts to assess workplace skills and learning. In the process of validating these assessments, ETS can also identify the important facets of workforce performance for a given job. Future directions for workforce research at ETS, along with a specific example of how workforce research is currently being instantiated at ETS, are provided below.

### **Action Plan: An Example of Workforce Research Currently Proceeding at ETS**

The Call Center Study is a project at CAWRS with the main goal of assessing the extent to which employee noncognitive skills (and related competencies) predict performance for samples of customer service representatives (CSRs). To this end, 330 CSRs from the ETS Ewing Call Center and 91 CSRs from Prometric's Baltimore Call Center completed an online survey containing self-report personality items that had been matched to a competency model derived by the Strategic Workforce Solutions division (largely from various job analyses and company mission statements). Personality and performance were each measured at multiple facet levels, and understanding the differential prediction of personality facets and performance ratings should not only contribute to the scientific literature, but also provide applied insight for the ETS Test Taker Services (TTS) group, which is an organization seeking to identify predictors of workforce performance.

Studying both personality and performance at the facet level leads to numerous intriguing research questions. How do objective measures (such as average call handle time and email rate per hour) relate to more subjective evaluations like supervisor ratings or even the overall ETS organizational metric of yearly cluster ratings? Are specific facet-level personality measures more useful at predicting certain kinds of performance or identifying skilled/prepared workers than larger broad FFM traits? The answers to these kinds of research questions have both scientific and applied merit. From a research perspective, understanding the theoretical mechanisms behind performance metric relations adds to the scientific literature. From a business perspective, developing assessments that identify key facets that are related to performance serves organizational interests, for example, in monitoring the quality of the workforce or in identifying areas of strength and areas in need of improvement. And from a policy perspective, assessing the degree to which workers are succeeding sheds insight on how schools are preparing students for the workforce.

In this way, the first phase of the Call Center Study provided foundational research results that ETS can use for scientific reports, new business products, and policy papers. Additional projects associated with this study include the development of structured interview protocols for CSRs based on the critical incident technique or interviews of managers and workers for specific real-world examples of effective and ineffective workplace behaviors.

The next phase of this research program involved the examination of cutting-edge psychometric and applied solutions to faking, which is a long-standing problem with self-report personality measures. In addition to publishing a book on this topic (Ziegler, MacCann, & Roberts, 2011), CAWRS staff conducted research through both internal allocation funding and external grant funding to explore and test the efficacy of different methods for controlling faking. The methods that were either researched or tested include using a multidimensional forced choice format (Stark, Chernyshenko, & Drasgow, 2005); using one's estimates of how others will respond (Prelec, 2004); using vignettes to anchor the self-assessment (King, Murray, Salomon, & Tandon, 2004); using biographical data (e.g., Mumford & Owens, 1987); situational judgment tests (McDaniel, Morgesen, Finnegan, Campion, & Braverman, 2001); conditional reasoning tests (James, 1998); and other-report ratings (MacCann, Wang, Matthews, & Roberts, 2010).

Bennett (2009) described how new paths of allocation research at ETS should start small before expanding to larger paths. By piloting assessments with small internal samples of CSRs, ETS was able to assemble the necessary foundational validity data before expanding to additional organizations for both research and business purposes. Our objective is for ETS to leverage this research into partnerships with much larger companies and organizations that will not only provide crucial validity evidence and have an impact in the market, but also address larger policy goals of evaluating workforce readiness.

### **Future Directions**

Aside from the follow-up associated with the existing Call Center Study, which includes plans to expand to additional internal ETS samples, there are a number of specific concrete steps ETS can take in terms of future directions in workforce readiness research.

One plan derives from an effort in 2010 that resulted in CAWRS staff planning and holding a miniconference: Building Better Students: Preparation for Life After High School. The purpose of this conference was to address college and workforce readiness issues from both policy and research perspectives. CAWRS staff invited experts, thought leaders, and policy figures from a diverse set of fields to identify and assess key college and workforce readiness skills. Each presentation was disseminated on a successfully launched conference website in both PowerPoint and video formats (<http://www.ets.org/c/15481/index.html>) and plans for further dissemination include a published book. The planning efforts for this conference and the forthcoming book will allow ETS to approach expanding workforce readiness research from a prepared and knowledgeable perspective.

Toward this goal, CAWRS staff are also planning to follow up on a small Workforce Readiness Exploration study recently completed in order to better understand how students transition from four-year or community colleges to full-time jobs after graduation. The purpose of this small project was to conduct an exploratory investigation of colleges and universities with existing ties or relationships with large companies (e.g., University of Memphis and FedEx, University of Washington and Microsoft). The goal was to identify companies and universities ETS could partner with to assess whether students are prepared for success in their jobs after graduation. A small database has been completed, and work continues to identify and follow up with additional schools, career center staff, and appropriate contact persons. Identifying universities that send large numbers of graduating students to a single company will allow for

greater potential sample sizes, access, and standardization to help improve the validity of research studies.

ReadyEdge is another prototype assessment system ETS has developed in order to directly assess workforce readiness. ReadyEdge is intended to measure communication skills, interpersonal skills, and critical thinking skills, constructs that were deliberately selected to match feedback from employers indicating the importance of these skills for workforce readiness. Pilot versions of the assessment were administered in the fall of 2009, and a follow-up study examined the adjustment and self-reported readiness and job satisfaction of students who had graduated and were currently fully employed. Validating the ReadyEdge prototype in this way contributed to the goal of developing a complete assessment battery that can be turned into a product marketed to both graduating students seeking jobs and colleges and universities seeking to assess the workforce readiness of their students.

In terms of further ties with schools, ETS currently provides the ETS<sup>®</sup> Proficiency Profile assessment for college accountability. The ETS Proficiency Profile includes assessments of math, reading, writing, and critical thinking and provides a measure of the quality of education provided by a particular college or university (Liu, 2008). ETS could extend the ETS Proficiency Profile to include proficiencies needed for various workforce careers. For example, businesses such as FedEx routinely offer scholarship programs to business students for new employers. ETS could provide workforce assessments based on the needs of businesses such as FedEx to guide the curriculum at particular departments within universities. In this way, workforce readiness research can be tied back to school curriculums and the educational community.

Noncognitive workforce assessments could be provided by the student as well as through peer and advisor ratings. ETS already has an advisor report system—the ETS PPI (Kyllonen, 2008). A variation of the ETS PPI (measuring various workforce-related noncognitive constructs) could be used as a predictor of workforce performance in colleges, as well as an outcome measure used by employers in particular workforce settings. This model of outcome assessment is aligned with the evidence in employment settings that suggests that supervisors are the most reliable source of job performance ratings (Hogan, 1991; Viswesvaran, Ones, & Schmidt, 1996).

Additional opportunities to develop, codevelop, or expand on assessment systems and selection batteries derive from the work being accomplished by Maria Krockner, Executive

Director of Business Innovation and Growth, reporting to Linda Tyler, Vice President of New Product Development. This work has involved evaluating several industrial/organizational firms for potential acquisition. The strategic benefits of an ETS acquisition include access to an existing network of clients for ETS workforce assessment batteries, as well as acquiring existing ready-made products that can be improved or augmented by CAWRS research and ETS psychometric expertise. The potential for further research and product development is thus considerable. Opportunities for additional samples to pilot any new assessment batteries include large international testing organizations and global companies willing to provide samples of job applicants for testing.

Finally, future research can be based on the malleability of noncognitive/personality factors. Despite the perception that personality is a fixed trait, meta-analytic research has shown that this is not the case (Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006). Results show that the correlation between personality tested a year or more apart is only moderate, suggesting that while there is some consistency in personality, there is also change. Personality also changes at the mean level over the lifespan, including tendencies to become more conscientious, considerate of others, socially dominant, and emotionally stable through adolescence and into adulthood. Evidence that personality and noncognitive factors can be improved is found in intervention studies, which include exercises and training in critical thinking (openness), study skills (conscientiousness), test and math anxiety reduction (neuroticism), teamwork and leadership (extroversion and agreeableness), and attitudes. Interventions along the lines of those described here have been implemented by CAWRS staff in the Lawrenceville (NJ) high school studies, and future work with adult learner samples from Graduate! Philadelphia and 1199c can also contribute to the goal of developing a comprehensive psychosocial assessment system. This work should also lead directly to further workforce-system related goals including the development of ETS product suites focused on training, promotion, and succession planning.

In short, there are many steps ETS might take to advance workforce readiness research, both in terms of short-term knowledge goals and long-term policy directions. And almost without exception, each of these research directions seems consistent with ETS's mission, advancing the scientific status of the field of psychoeducational assessment and the status of ETS as a nonprofit organization.

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