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Contextualizing intelligence in assessment: The next step[☆]

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ABSTRACT

Intelligence theory and assessment in HR and I/O contexts are unlikely to make major advancements when intelligence continues to be treated as a decontextualized set of skills. Models of cognitive style, situated cognition, and practical intelligence present a more contextualized view of intelligence, but are either too broad or too embedded in context to guide HR and I/O assessment. We propose a new model that draws a closer link between cognition and context; the model builds on recent developments in cross-cultural personality research, where decontextualized and contextualized models are combined. We propose an assessment procedure in which social and cognitive characteristics of job situations are simulated, a method we label Controlled Situated Assessment. In order to be successful at the task, individuals need many different resources, cognitive skills, communication skills, and personality. By increasing the ecological validity of the tasks, we expect a higher predictive validity, as compared to decontextualized assessments of intelligence.

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1. Introduction

The gap between individual scores on an intelligence test and actual ability or potential in solving everyday tasks has been a theme in the research on psychological assessment for the better part of the last 40 years. Although the issue has been mainly studied in the field of cross-cultural psychology by examining the validity of intelligence tests across different cultures (e.g., Sternberg, 2004), it bears directly on HR and I/O psychology. On the one hand, HR and I/O psychology have a strong tradition of decontextualized assessment, dealing with intelligence and personality. On the other hand, HR and I/O psychology have a strong history in the application of contextualized assessment methods such as assessment centers, interviews, and simulations. Decontextualized approaches do not help to identify the specific elements that contribute to success in particular jobs or domains of life (e.g., Hunt, 2011). For example, many would agree that Bill Gates is highly successful, but an intelligence test would probably not have helped to predict his success in life. We describe an approach here that tries to reduce the gap between HR and I/O assessment and job performance by contextualizing the constructs being assessed. For example, rather than a general assessment of an applicant's communication skills, we propose to make a detailed analysis of the communication skills required for this applicant and to use an assessment procedure that closely resembles the communication skills to be used on the job.

In the present paper we describe prevailing models of intelligence and discuss how they relate to this differentiation in the meaning of intelligence across work settings. We conclude from this overview that a more contextualized view on intelligence comes closer to

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capturing complex variations in intelligence and has the potential to generate higher predictive validity coefficients. We then use the contextualized view as a starting point for our own model that draws a closer link between cognition and context/culture and an assessment method that uses context to simulate interactions in working contexts, an approach we label Controlled Situated Assessment (CSA).

1.1. Decontextualized models of intelligence

Intelligence research and assessment have come a very long way since the work by Sir Francis Galton and Alfred Binet. Models of intelligence have become more detailed and now include different components of intellectual ability. Still, the overriding definition of what intelligence is has remained fairly stable over time. We review this definition and pay particular attention to the Cattell–Horn–Carroll model of intelligence (CHC model). Having its roots in differential psychology, the traditional and most popular definition of intelligence has an implicit emphasis on decontextualized skills. Intelligence, often captured in a single IQ score, measures the ability to perform well across many different settings. The correlational way in which intelligence is analyzed supports the idea that people who do well in one particular setting do well in other settings too.

The CHC model is an integration of the models by Cattell (1943), Horn and Cattell (1966) and Carroll (1993). The models by Cattell and Horn had two dimensions of intelligence, namely fluid and crystallized intelligence. Fluid intelligence is the ability to process, classify, and transform novel information into something new. Inductive and deductive reasoning are prime examples of fluid intelligence. Crystallized intelligence is generally regarded the product of fluid intelligence and comprises habits, conclusions and knowledge stored in memory, allowing people to rely on existing data in a specific setting. Carroll later expanded this model, by including not only fluid and crystallized intelligence, but by capturing skills in areas as varied as reasoning, knowledge, visual and auditory perception memory, ideation, and general cognitive speediness in a single concept of general intelligence or *g*. Characteristic of this model of intelligence is the idea that intellectual skills, notably reasoning, are required in many everyday situations and that more skilled persons can on average better cope with the many job situations that involve reasoning. The same idea is also found in the radex models of Ackerman (1992) and Snow, Kyllonen, and Marshalek (1984). In such models, domains of intelligence are structured in concentric circles centered around a set of basic processes, with processes on the rings extending outward gradually less broad and more specialized.

The main reason for the popularity of such decontextualized intelligence models lies undoubtedly in their success of predicting school and job outcomes. Taken across multiple samples and contexts of application, broader dimensions are likely to show more predictive validity than the more specialized skills. By the same token, general intelligence comes out as the best predictor in meta-analyses; by aggregating scores from many different data sets, general intelligence, as the most decontextualized concept, will fare the best. Unless situational moderators are modeled, the broadest intellectual skills are very likely to have the best predictive validity of all the decontextualized abilities that are studied.

From a conceptual perspective, however, the huge popularity of decontextualized models of intelligence is surprising, given the fact that all cognitive processes take place in a cultural context (Cole, 1996; Gigerenzer, Todd, & The ABC Research Group, 1999) and that most cognitive processes are subject to learning and development (Anderson, 1987; Li, 2007). Variability in the level of fluid and crystallized intelligence during practice for the game Go (Masunaga & Horn, 2001), variability across the lifespan (McArdle, Ferrer-Caja, Hamagami, & Woodcock, 2002), and decreases in the speed of visual discrimination with ongoing practice (Fleishman & Hempel, 1955) are just a few examples to demonstrate that the level and form of intellectual abilities are shaped by experiences, which in turn are influenced by their cultural context. We suggest that intelligence theory and assessment, including HR and I/O assessment, will not make significant advancements if intelligence continues to be treated in a decontextualized manner and that we can make significant progress by “letting context in.”

2. Models of intelligence and context

A number of contextualized models of cognitive functioning have been developed and tested in the last four decades. We review examples from this history, starting with Witkin's cognitive style, followed by a description of situated cognition and practical intelligence. We conclude that each of these models has problems that inhibit their widespread acceptance by HR and I/O researchers.

2.1. Cognitive style

Cognitive styles are broad patterns in the way people process information, influenced by the way a cultural community occupies its ecological habitat. One example of cognitive style that was proposed is field-dependence/field-independence (e.g., Witkin, Goodenough, & Oltman, 1979). “The construct refers to the extent to which an individual typically relies upon or accepts the physical or social environment as given, in contrast to working on it, for example by analyzing or restructuring it” (Berry, Poortinga, Breugelmans, Chasiotis, & Sam, 2011, p. 145). Research with villagers and Pygmy hunter-gatherers in Central-Africa and different indigenous groups in Canada showed that hunter-gatherers are more field-independent than farmers. Although later studies, involving culturally closer hunter-gatherers and farmers, could not fully replicate the original findings (Berry et al., 1986), the cognitive style tradition clearly shows how intellectual abilities are influenced by their cultural context.

Cognitive style left its mark outside cross-cultural psychology. For example, Stanovich and West (2000) described individual differences in reasoning in terms of two systems of thought, one labeled interactional and the other analytic. The analytic system is what we know as general intelligence. The interactional system is much more contextualized though, not placing large demands on cognitive capacity and working relatively fast. Each system leads to different task construals, but the exact implications of

the distinction between the two processes for our grasp on contextualization are not exactly clear. On the one hand, some researchers conceive of the two systems as residing within any person, with the conditions leading to switches between them, creating a trade-off (Evans, 2008). On the other hand, some researchers relate the two systems to a cross-cultural East–West distinction (Nisbett, 2003), with people from China, Korea, Japan and other countries in the region relying more on an interactional or holistic system of thought and people from the US and Europe relying more on an analytical system of thought.

We believe that these dichotomies are too broad to be useful in assessment procedures. Much of the interest in these concepts comes from their relatively simplified view on cross-cultural differences. The models postulate qualitative differences in cognitive functioning across cultures, where a close inspection of the data used to illustrate these differences suggests the presence of only quantitative differences. There are interesting experiments that Chinese individuals take context more into account when they process visual information (e.g., Boduroglu, Shah, & Nisbett, 2009). It is questionable, however, whether these differences in means reflect fundamentally different ways of processing information. In our view, it would be more productive to view these differences as quantitative in nature. The so-called Great Divide Theories (Berry et al., 2011) in which qualitative differences between individuals from different cultures are postulated, do not easily lend themselves for assessment procedures in an HR or I/O context.

2.2. Situated cognition

The second movement to provide a more decontextualized view on intelligence was situated cognition, associated with Cole and colleagues (Cole, 1996; LCHC, 1982). The impetus for the movement came from various studies on the effects of schooling on cognitive development, which showed that skills learned in school do not easily transfer to everyday life. In one study, schooled adults and unschooled tailors from Liberia were asked to solve arithmetic problems related to either school or tailoring that were of the same nature and complexity for these groups (Lave, 1980/1997). Whereas the formally schooled adults were better able to solve the school-like problems than the tailors, the reversed pattern was found for the tailoring problems. There are many more studies in this tradition that demonstrated the relevance of context-specific knowledge for resolving problems in that context. For an example in the verbal domain, Malda, van de Vijver, and Temane (2010) found that embedding tasks of intelligence tests in stories that relate to well-known domains (such as a favorite sport as opposed to a sport one has less affinity with) significantly enhance test performance.

The body of observations similar to these examples led researchers to formulate the idea of situated cognition: even if there would be culturally invariant cognitive structures in the human mind (and there is strong evidence that this is the case; e.g., Van de Vijver, 1997), these structures are not very helpful for understanding how people resolve problems in everyday life. Cognition cannot be separated from the context in which it is applied. People develop unique intelligences and skills in each situation that only with increasing age may merge into higher-order units that lead to a greater overall control (LCHC, 1983). In this approach, skills are the endpoints of the development, based on much experience to resolve related tasks in various situations. In the conventional, decontextualized view on intelligence, the question to be answered is much more how available skills are combined to resolve a practical problem.

The idea of situated cognition has been expressed in various approaches related to the learning of job-specific skills, particularly cognitive apprenticeship. A powerful aspect of cognitive apprenticeship is intent participation (Rogoff, Paradise, Mejía Arauz, Correa-Chávez, & Angelillo, 2003). By listening and close observation, learners gradually begin to grasp all the elements involved in a job and to put them together; the actual cognitive processes involved strongly depend on the nature of the job. Assessment in a participatory learning paradigm then amounts to observing whether the learner starts taking initiative. Assessment is an integral part of this learning process and not a separate phase in which the retention of any transmitted knowledge is tested (Shepard, 2000). This type of assessment may not be feasible, though, in a setting where many new job applicants need to be tested at the same time, because reliability and validity of the results cannot be guaranteed. Furthermore, a number of the claims made by researchers from the situated cognition perspective are overstated (Anderson, Reder, & Simon, 1996). For example, not all knowledge is context dependent. Skills such as writing and reading do transfer across contexts. Therefore, training by abstraction can be of much use, contrary to what is claimed in situated cognition.

2.3. Practical intelligence

The third movement that tried to contextualize intelligence and its assessment is practical intelligence (Wagner & Sternberg, 1985). The starting point of practical intelligence is that success in everyday life requires more of people than what standard intelligence tests typically assess. Initially the main focus of practical intelligence research was on tacit knowledge. Tacit knowledge is knowledge that is not directly expressed or stated. It is usually not explicitly taught in schools or exchanged between colleagues at work, but it is important knowledge for the successful completion of one's job. In business management settings, tacit knowledge may consist of knowledge about managing self, colleagues, clients, and one's career. Items to assess tacit knowledge typically consist of an example of a work-related situation, with details of the background of the job and the protagonist's desire or goal for the near future. A list of responses describes the different actions the protagonist could take and the person being tested is asked to rate each response on its importance or likelihood that he or she would display that behavior. Using the approach among the Yup'ik in Alaska, Grigorenko et al. (2004) found that everyday life knowledge about fishery and hunting required in the community was the best predictor of traits valued in the respondent by other community members.

Sternberg developed his Triarchic Theory of Intelligence as part of his personal approach to practical intelligence (Sternberg, 1985, 1999). In the theory Sternberg postulates three different kinds of intelligence, namely creative thinking, practical thinking, and academic thinking. The combined assessment of the three kinds of intelligence is purported to give a more detailed and valid picture of someone's abilities and potential. The contribution of Sternberg's triarchic approach to intelligence assessment is not uncontested.

Gottfredson (2003) maintains that, because general intelligence is correlated to real-life outcomes such as income, it is in itself a good measure of practical intelligence, thereby making more detailed measures unnecessary. While Gottfredson may be correct in her claims, it is an attractive feature of Sternberg's Triarchic Theory that it includes a substantial degree of contextualization. Gottfredson's criticism implicitly refers to another aspect of Sternberg's theory that is problematic: The theory is broad and difficult to test. Specific components of the theory are much easier to test.

The three most prominent approaches to the contextualization of intelligence all fall short of modeling the relation between an invariant intelligence structure, intellectual skills, and context in a satisfactory way. It is therefore not surprising that HR and I/O researchers and practitioners have avoided these models. However, this does not imply in our view that contextualized approaches to assessing intelligence at work should be abandoned. Instead, we argue that with additional work and conceptualization, a decontextualized approach to assessment holds important promise for HR and I/O psychology. Below, we describe a model in which we reconceptualize the construct of intelligence itself as more contextual. The model builds on the idea that we should not start with putting the individual at the center of our analysis, but with context, by using a mixture of emic and etic models, as explained below.

3. Putting context center stage

Based on methods used in very recent research on the personality structure in eleven South African language groups (Nel et al., 2012; Valchev, Nel, et al., 2013; Valchev, van de Vijver, Nel, Rothmann, & Meiring, 2013), we develop an assessment model that gives context a much more prominent place. It is a key feature of the model that problem solving in job-related situations involves more skills than assessed in intellectual tasks. So, we do not start in our model from the center spot earlier occupied by general intelligence, but replace that by elements that are crucial in problem solving, such as style, apprenticeship, and tacit knowledge. In general, we are interested in all resources that individuals use to solve everyday problems. An essential part of problem solving in everyday life is that it is based on a combination of intellectual skills, communication skills, personality, motivation, and other resources that individuals bring to bear. We are interested in the success of resolving job-related problems; this implies that we are not so much interested in the contribution of specific components (intellect or personality), but more in how a person uses all his or her resources to resolve problems.

3.1. The emic–etic framework

The emic–etic distinction refers to the level of universality (etic) or cultural specificity (emic) of a concept (Pike, 1967). Etic studies are usually concerned with the replicability of universal psychological models across cultures. The models are typically created by the analyst and examine behavior from outside the cultural, linguistic or social system (Church & Katigbak, 1988). Emic studies are largely concerned with the identification of concepts that are especially relevant in one cultural context, irrespective of whether they are represented in a universal model. The analyst discovers the structure between concepts in the particular context and the criteria describing or causing the structure are conditional upon the different elements within this cultural context (Berry, 1969). It is interesting to apply the emic–etic distinction to HR and I/O psychology, notably to assessment procedures. Assessment in this discipline has a clear etic component, as many procedures have an implied universal component. Like in many other domains of psychology, theories and assessment procedures in HR and I/O psychology often have an implied universal nature. However, it is important to realize that most of HR and I/O psychology has been developed within a very specific cultural niche; on a global scale, industrialized Western countries where HR and I/O psychology originates and is applied are a very specific cultural environment, strongly influenced by Western values. From our perspective, HR and I/O psychology would benefit from appreciating its implicit cultural boundaries and by extending its work to non-Western cultures. Such studies are required to recognize the truly universal and culture-specific components of the discipline, including its assessment procedures.

In the personality studies by Nel et al. (2012), Valchev, Nel, et al. (2013) and Valchev, van de Vijver, et al. (2013), the emic aspect consisted of asking participants in South Africa to describe themselves and nine other persons that are close to them. The etic aspect was then to do this for all the 11 language groups at the same time and integrating statements from all languages. In several steps all the statements collected are then classified into gradually broader, more abstract categories, based on shared semantic content and connotations of the original response, thus making sure that both culture-common and culture-specific elements are present in the analysis in every step of the way. The results found also reflected this combined approach. On the one hand, the common universal model of personality consisting of five dimensions (Big Five; openness, agreeableness, extroversion, conscientiousness, neuroticism) is replicated, but four other dimensions, predominantly social, were also discovered. Examples are relationship harmony and soft-heartedness. These dimensions were broader than what is usually associated with agreeableness in the Big Five.

3.2. Success in a work context

The lesson of the combined emic–etic framework is that very specific contextual elements can be discovered and described without sacrificing any universal structures. For example, extroversion may well be universal, but this does not yet imply that all indicators of the construct will have universal validity. An item about being talkative may have a wider cross-cultural applicability than an item about being the entertainer at a party (as parties are quite different across cultures). We propose that this kind of framework would equally apply to analyzing success in a work context; analysis and assessment can be tailored to a specific work context. A good job analysis will most likely comprise a combination of universal as well as contextual components. These ideas are very much in line

the occupational competency movement of the 1960s: Moving away from traditional descriptions of competency in terms of individual traits and focusing instead on behaviors that typify outstanding performance in a given job or role (cf. Shippmann et al., 2000).

In our paradigm, we pursue a balance of these two components. Universal aspects can be derived from existing models. For intelligence, these are models such as the CHC Model and the Triarchic Theory of Intelligence, for personality the Big Five (McCrae, Terracciano, & 79 Members of the Personality Profiles of Cultures Project, 2005), and for emotion the Componential Emotion Theory (Fontaine, Scherer, Roesch, & Ellsworth, 2007). Contextual aspects of intelligence, personality, and emotion should follow from the thorough analysis of specific working contexts. The primary question for each job analysis would then be what it exactly is that makes someone more successful, prestigious, and credible in a particular job. Thus, the emphasis changes from broad constructs, such as memory, extraversion, and pride, to memory of specific content, extraversion concerning particular topics and pride about concrete achievements. The latter skills refer to the emic aspects.

Classifications of human task performance are typically theory driven and based on the description of observed behavior, behavior requirements, ability requirements or task characteristics (e.g., Fleishman & Quaintance, 1984). Overviews of human abilities (Fleishman & Reilly, 1992), even when very broad and inclusive, do not give a good idea of what people actually do all day in an office, in a production line, or in a shop. So, classifications focus either on what the tasks entail or on what particular human abilities are necessary (motor, physical, cognitive), but never on the concrete actions people have to undertake to make their job a success within the particular context they have to operate, how they deal with their own or other's emotions, how they come to terms with a neurotic tendency (Shippmann et al., 2000). Questions should thus ask: "What makes this a good car salesman?" "What does he do that makes him so successful?" "What makes a bad car salesman?" "What does *he* do wrong?" What we do has some resemblance to Flanagan's (1954) critical incident approach; we also want to identify critical features of a problem and its solution. However, we are not so much interested in an incident as such, but more in the leverage it gives us to understand task performance.

3.3. Pointers for HR practitioners

Three key strengths that HR practitioners can use as starting points for their own practices follow from the model of success in work context that were specified to this point, namely: (1) specificity of the work situation in which the intellectual, personal, and emotional processes are embedded, (2) dimensionality of success and (3) coordination of multiple tasks within a job context. We believe that HR practitioners have put much effort into enriching what could be called emic outcomes such as performance appraisals. However, like in other domains of psychology, the analysis of the human performance has been more advanced than the analysis of the context in which this performance took place. It is a critical feature of our approach that we pay as much attention to performance as to the context.

3.3.1. Situation specificity and success

We expect HR practitioners to be able to improve the predictive validity of instruments by combining conventional components of intellectual functioning, as assessed in batteries of intelligence, and context-specific components that go beyond the intellectual skills usually assessed. A powerful reminder that social conditions affect performance is the study of English language skills in underprivileged African-American youth by William Labov (see Cole & Bruner, 1971). Using standard testing procedures, these children were candidates for a diagnosis of linguistic and cultural deprivation, but when approached by the researchers in a way that is socially acceptable to them the same children showed strong reasoning and debating skills. Social and other non-cognitive skills are thus inextricably tied to the success with which people can perform in situations, with standard test procedures lacking in ecological validity and leading to a serious underestimation of their abilities (Greenfield, 1997).

A striking illustration of this weakness of standard test procedures is the study by Malda et al. (2010). For the study that took place among distinct cultural groups in South Africa, Malda developed parallel test versions for attention, short term memory, working memory and fluid reasoning, one version adapted to the Afrikaans speaking population and the other to the Tswana speaking population. Her manipulation consisted of using verbal and figural item content for both test versions that were highly familiar to one group, but not the other. Examples are "An alarm can make noise" for the Afrikaans test version of working memory (as alarms are more common in Afrikaans households) and "A soccer team has 11 players" for the parallel Tswana test version (as soccer is the most popular sport among the Tswana, rugby being the most popular among the Afrikaners). The manipulation was effective, with children performing the best on the test version that most closely aligned with their own cultural experiences.

The implication of these observations for our current aim of developing a more integrative model of intelligence and context is that HR and I/O practitioners should target the interrelated set of expectations, individual traits, and habits workers bring to their work setting. On the one hand, there is a crucial role for intentions and goals in establishing these interrelations (Barsalou, 1985). Personal goals and intentions lead people to value particular kinds of information over others, making some cases or instances and not others the better exemplars of a broader event or operation. For a car salesman, fuel injection is the best example of higher technology, while for a furniture salesman it might be the aging process of oak. On the other hand, personality structure has a vital role in vocational interests and hence, in the occupations people have as an adult (Mischel & Shoda, 1995; Woods & Hampson, 2010). Depending on whether one is more agreeable, open, conscientious, extraverted, or neurotic, some jobs appear to be more suitable than others, leading to the selection of one life context over another. Together, these two processes result in unique situation-specific combinations of personality, content, emotions, and intellectual skills.

3.3.2. Dimensionality of success

A second avenue for HR practitioners to enrich the emic quality of performance predictors is an analysis of the concept of work success itself. It is possible to talk about the success within isolated work tasks, but also about career success (Ng, Eby, Sorensen, & Feldman, 2005). Success in a work context is not related to just one dimension in the CHC model at a time and cannot be reduced to a single style. First, a successful car salesman will need a good judgment about the wishes of the client and when to say what, strong creativity and improvisational skills to think of new strategies and ways to increase the client's interest in the car, and social skills that help to appear friendly, competent, and generous. Second, the different skills do not exist in isolation, but form some kind of complex set. The way that people represent context in the mind as a whole relates to all the tasks and sources of information.

In terms of career, success can be viewed as the accumulation of positive work and psychological outcomes that result from work experiences (Seibert & Kraimer, 2001). Upward social mobility, the movement to a higher social level because of changing jobs, is an example of an important construct in this connection (cf. Wilk, Desmarais, & Sackett, 1995). It entails a class of distinct social skills, on the part of the individual as actor making the best social decisions, but probably even more so on the part of the individual observer, choosing to copy only certain behavior of only certain people, and thus selectively granting prestige to them (Atkisson, O'Brien, & Mesoudi, 2012). Success at work thus includes a large complex mix of tasks that can be very specific to a job or an occupational group. The ways a person deals with this kind of intellectual plurality and is able to deal with it is of essence to understand whether he or she will be successful. An emic approach to work success and task switching can help develop this kind of understanding. Understanding what it takes to be successful in a specific job is an important aspect of the analysis prior to assessment for the job. Contact with successful employees occupying a similar job is essential for collecting all the information that is necessary for developing an assessment procedure.

3.3.3. Coordination and success

A third avenue for HR and I/O practitioners to enrich the emic quality of performance predictors is to address the ways in which people at work coordinate the various task demands that present themselves, at the same time or in quick succession, to bring their tasks to a close. The idea of coordinating multiple tasks and switching between different sources of information, introduced into the intelligence literature by Yee, Hunt, & Pellegrino (1991; also see Morrin, Law, & Pellegrino, 1994) is relevant to our approach because it highlights the interrelated nature of different component tasks, that is: the different process elements of a broader task, such as encoding and transformation, that all need to be executed in order for the broader task to be brought to a close, with continued monitoring of goals (top-down) and the materials being processed (bottom-up) to revise processes and intermediate outcomes whenever necessary. For example, the product of a component task that took place early in the solution process is transferred to and accessed by a subsequent component task; the latter may feed back into the earlier component task. Where we deviate from the original model by Yee, Hunt, and Pellegrino, however, is that they saw the ability to coordinate multiple tasks as an internal psychological dimension that generalizes across different contexts and tasks. We view the ability to switch as a function of the mental representation of context. When someone knows all the different components of a job very well and has these all integrated in a clear idea of what needs to be done, switching between different tasks will be very effective and easy. In other cases someone might be able to accomplish one task well, but not know when to stop, change tactic or focus on different aspect of the context. A car salesman highly enthusiastic about the technical details of a particular car may alienate a client who is not technically savvy or finds that aspect uninteresting.

4. Towards a new assessment

In the last part of our contribution, we describe the coordination of multiple component tasks to achieve a complex goal into a new way of assessing intelligence, an approach that we label Controlled Situated Assessment.

4.1. Adaptive information during assessment

Our proposal draws from existing developments in the assessment of intelligence, namely: (1) the assessment of complex cognition that employs computer simulation of complex life-like situations in Microworld (Güss, 2011; Güss, Tuason, & Gerhard, 2010) and (2) dynamic assessment in which the simple test score does not reflect a static ability, but also the ability to learn and respond to changing conditions (Grigorenko & Sternberg, 1998), which recently has begun to explore the use of electronic devices to improve the life-like quality of the simulation of daily cognitive processes (Huang, Wu, Chu, & Hwang, 2008; Resing & Elliott, 2010).

Characteristic of both these approaches to assessment is that the respondent gets feedback during the problem-solving situation and has the opportunity to adjust his or her strategy. In microworlds, participants take a concrete role, such as being the commanding officer of a fire brigade who must prevent a forest fire from getting larger with help of helicopters, fire-fighting trucks, and water dikes, or a supermarket manager who must control the temperature of a cold store containing perishable goods. In each of the two roles, the respondent receives input from multiple sources. The commanding officer of the fire brigade, for example, can see on the computer screen how the fire is spreading and how the trucks are positioned to work together (Güss et al., 2010).

Dynamic testing has mostly been used for testing intelligence and the potential to learn in children, although its domain of application is broader. In dynamic testing, technological applications are often used that are adapted to the need of the specific group being tested; the equipment should be accessible and attractive. In one published example, a console includes a tabletop sensing board with different LED lights underneath and audio output (Verhaegh, Fontijn, Aarts, Boer, & van de Wouw, 2011). On this console, children can play games that were specifically created to improve cognitive, motor, and social skills.

Scoring of performance has produced various success measures. For the officer of the fire brigade, the use of think-aloud protocols could help to produce information on the description of the situation, identification of the problem, formulation of goals, and the gathering of information (Güss, 2011); each of the measures is scored separately. Also in the dynamic testing paradigm respondents get scores on the use of strategies (Resing & Elliott, 2010). For example, with a puzzle, performance might get scored for overall accuracy, inaccuracies for pieces of the puzzle, completion time and number of moves needed to produce the correct outcome. Scoring thus deviates rather strongly from classic intelligence tests, where success on an item is scored for accuracy or speed only, with all the item scores being summed up into a total score to represent general intelligence. We are reluctant to score strategies separately and opt for a general outcome score, in line with the classical intelligence paradigm. Our reasoning is that people use multiple strategies for any given problem and that they choose adaptively among alternatives (Siegler, 1999). Scoring for just a small subset of the many strategies people actually use may bias their assessment. In our paradigm the question is whether people are able to coordinate multiple tasks and multiple sources of information; not how they do it, but whether and how easy they are able to do it.

4.2. Contextualized simulation

The approaches briefly reviewed above go a long way to make the test paradigm richer and provide clues as to how to develop new assessment interfaces, but both also precisely show what the shortcomings in terms of operationalizing context are. In the case of the commanding officer of the fire brigade, the respondent has many controls available to manipulate the outcome of the game, but there are no spontaneous changes in the variables other than the fire (for example, a deputy is called away from the scene due to a family urgency). The effects of one's personality or emotions are not modeled. Only cognitive strategies regarding the size of the fire are tested. The same can be said about the dynamic testing paradigm, in which the respondents only receive feedback on solving the cognitive task. Thus while both paradigms go a long way to make the operationalization of problem solving more realistic, the true context is still absent, as well as the coordination of multiple tasks. The assessment we envisage uses similar types of consoles or interfaces, as in the two paradigms, but enriches the feedback by including information on changes in other context variables, making sure that being able to deal effectively with one source of information impacts how other information is dealt with and the entire outcome is affected. In addition, the task at hand should require more than just checking displays and manipulating controls.

The paradigm we have in mind is the “culture as garden” view of context (Cole, 1996). In this paradigm, each broader set of context variables is imagined as a new layer surrounding less broad variables. In our example the center would be the combination of the task and the individual with all of his or her personal resources; the next layer is formed by co-workers, bosses and clients and their personal emotions, personalities, and motivations, which on its own turn is surrounded by the mission and values of the organization in which one works. Social conventions and larger sociocultural expectations form the outer layer. Psychologically speaking, though, context does not “surround.” Instead, variables from each layer of context impinge on task related variables and thus need to be negotiated in the most fruitful way; the actor has to coordinate both the cognitive and non-cognitive elements.

The emic-etic approach can help us to identify the various aspects that should make up the simulation. By asking people in a particular job what makes people have success in their job or by ethnographic observation of a range of people with different degrees of success, researchers can get a detailed list of elements within each context that surrounds the cognitive operation in a gradually broader way, as well as grasp on the strategies in which the interplay between them may be most effectively dealt with. A stepwise classification of all the collected statements into gradually more inclusive groups will eventually provide a small set of parameters on which performance can be assessed.

4.3. Warranting ecological validity

The approach that we propose has strong similarities to assessment centers, but there are also important differences. An overall similarity between the approach we advocate and what assessment centers do is that both operationalize assessments through roleplaying games, case studies, and problem simulations. For both approaches the emphasis is on actual behaviors. The main differences are primarily in the distinctive way we would ensure ecological validity: (1) we maximize ecological validity; in our approach people receive feedback from multiple sources throughout an assessment procedure that mimics the work setting as much as possible; and (2) we score actual performance through the end result people achieve in the job simulation, thereby acknowledging the role of tacit knowledge. In the tasks we propose people have much more opportunity to draw on resources as they may see fit. Custom assessment centers of large companies are also more specific, but would still score on a fixed set of etic dimensions such as capacity, achievement, relationship building skills, and technical skills separately. The job analysis that we need in our approach should have a combination of fairly general cognitive components and other personal resources (etic aspects) as well as more job-specific features (emic), combined with a thorough analysis of how the actual job is performed. In this analysis it is important to get a good insight in the interplay of personality factors, motivation, and social skills that are required to perform well in the job. An emic job analysis will contain a rich description of cognitive, social, personality, and motivational components, which are converted into a task for the applicant.

The assessment of decontextualized skills, such as abstract reasoning skills, can be part of our procedure, but it is unlikely that such skills will be important for successful task performance on the job. It is more likely that such skills are needed as part of a larger process in which aspects like personality and motivation will also be important. For example, good abstraction skills will help a salesperson to make the best analysis of the situation in which he or she meets a potential customer. However, in the total sales process, abstraction skills will be relatively unimportant whereas adequately picking up implicit and explicit signals about the customer's preferences is probably more important. Resourcefulness in coordinating resources will be important in our assessment procedures: To what extent

are applicants capable of successfully using their own resources, including their cognitive and social skills as well as those of people in their vicinity, to reach a goal? Raters will be required to score the adequacy and success of the behaviors displayed by the applicants, in line with what is common in assessment centers and what is also used in the assessment of the Triarchic Theory of Intelligence.

5. Conclusion

We argued that models of intelligence focus on structure and processes and do not consider contextual factors; particular attention was paid to the CHC model. It is surprising that decontextualized assessment has been so popular, as all cognitive processes take place in a cultural context. We observed that intelligence theory and assessment will not make major advancements in the future if intelligence continues to be treated in a decontextualized manner and that we can make considerable progress by “letting context in.”

While contextualization is not foreign to I/O psychology and HR practitioners, we advocate for a richer modeling of work behavior in which the link with typical job outcomes is preserved. We noted three related areas where HR practitioners can make progress: (1) model the full specificity of the work situation in which the intellectual, personal, and emotional processes are embedded, (2) model the prevailing dimensions of success and (3) model the ways in which workers coordinate multiple tasks within their work context. Effectively, this comes down to a shift or broadening of the ways in which HR practitioners contextualize their assessments.

The ways by which HR practitioners today contextualize is by developing novel means of assessment and by enriching their outcome measures. Unfortunately, these important efforts are accompanied by a more rigid position towards the competencies they assess, general intelligence and personality, in custom assessment centers joined by social measures like relationship building skills. Our advice for HR practitioners is that evaluations of job performance and predictions of the future work success will be more successful when more attention is paid to the actual processing that goes when a task is addressed and the behaviors that workers typically perform when they do their job. Ergo, a shift from solely working on the improvement of assessment methods to the inclusion of job specific behaviors, the goals that workers try to achieve at a given moment, and the different ways by which they actively adjust the various processes in a job to one another.

A practical limitation of the approach we advocate here is that with occupation specific test assessments there cannot be any comparisons across different occupations; predictions are purposefully designed to be highly specific. An inevitable consequence of this specificity is that HR practitioners are limited in their recommendations to workers about career possibilities. The client would have to take tests that were designed specifically for those other occupations he or she is interested in to see how one would do; of course, the number of tests a client can take is constrained by time.

Contextualization of the processes that underlie successful job performance can be highly beneficial to I/O researchers and HR practitioners. Asking what it exactly is that makes some people in a job highly successful and others fail is a first step in this new direction.

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