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Improving I-O Science Through Synthetic Validity

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The purpose of this comment is to advocate for the development of a synthetic validity database along the lines described by Johnson et al. (2010), not only because of its practical utility but also because of its potential contribution to the science of industrial and organizational (I-O) psychology generally. Specifically, one of the core scientific pursuits of psychology is the understanding of individual differences (IDs). Knowledge of the context in which specific IDs matter (i.e., in terms of level of behaviors exhibited) can provide information about the nature of those IDs. For example, if the degree to which a job requires continuous learning of symbolic material is related to the predictive validity of general cognitive ability (*g*; i.e., learning context moderates the *g*–performance relationship), it is likely that *g* has something to do with the acquisition of new knowledge. Alternatively, or additionally, if the degree to which a job requires making decisions among large numbers of multiattribute options is related to the validity of *g* as a predictor of job performance, it implies that *g* involves information processing capacity (and perhaps it is via this mechanism that *g* is related to learning). That is, evidence of the moderator effects of context (i.e., conditions on which jobs or tasks vary) on ID–performance relationships provides information about the nature of the ID construct, as well as whether the ID construct is likely to be predictive of performance in any particular context. This is another reason to develop a database that indicates what context variables predict the validities of ID constructs.

Ironically, this approach to better understanding the nature of ID constructs involves focusing on context constructs in particular, those that might be moderators of ID–performance relationships. This should be I-O's strength. Indeed, the field has arguably done more to delineate context variables than any other subdiscipline in psychology (Harvey, 1991). Nonetheless, we could do better. For example, when thinking about *g*, we have concentrated on the possible subparts (Drasgow, 2003) when perhaps we would be better concentrating on the contextual moderators (e.g., information processing demands, learning demands, and speed of processing demands) rather than on some amorphous complexity concept (Steel & Kammeyer-Mueller, 2009). Of course, the contextual moderators I just listed derive from thinking about what *g* might be, so I am not suggesting that we ignore IDs when focusing on context constructs. Indeed, consider another example. Johnson et al. cited Meyer, Dalal, and Bonaccio (2009) that situation strength moderates the Conscientiousness–performance relationship, which makes sense given the personality literature, but it could not be found if context constructs are limited to existing job

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analysis instruments (e.g., the PAQ). Make no mistake, the PAQ is a good start and O*NET typology has its advantages, but given what is known about IDs, additional constructs should probably be added. Fortunately, I-O psychologists are the ones to do this. We know the significance of context, and we have been seeking to measure its psychological relevance for decades.

Of course, I would not want to discourage coming at context constructs from the context side. It seems that an important step is to assess the components of variance across levels of context. That is, to what extent does a context variable or construct vary across task, project, job, group, organization, or other level of context? Based on that analysis, one might identify potentially promising context variables as well as the best unit of analysis for the construct (i.e., will this be relevant for organization-level competency modeling, job modeling, group selection?).

In addition to focusing on identifying context constructs, we need to remember the level of analysis when measuring context. Although we are interested in context variables that moderate the ID–performance relationship, we have often shortcut the process by asking for inferences of the ID variable in the context analysis. Harvey (1991) pointed out that when the ID variables are knowledge or skills, this is likely a strong inference and therefore not problematic. However, when the ID constructs are abilities or other characteristics, we are essentially asking subject matter experts or job analysts to infer fields in the synthetic validity database. That is, they are to hypothesize to what extent some ID will determine performance in the context. It seems that science is about putting our (or someone else's) hypotheses to the test. Context measures should focus on measuring the context. Tests of the moderating role of those context measures on ID–performance relationships, and the stability of those moderating effects, are the work that goes into building the synthetic validity database.

There are two more hypotheses that we need to continuously test when constructing the database. First, we have tended to assume linear relationships between IDs and performance. Specifically, the default modeling technique is the correlation coefficient or regression weight. Yet, psychology is rife with important nonlinearities (e.g., learning curves and curved utility functions that influence change and decision making, respectively). To be sure, I-O psychologists have not ignored this (e.g., debates regarding the shape of cognitive abilities' predictive validity across levels of job complexity exist and have been tested), but my sense is that a closer understanding of the underlying processes that account for the relationship between ID and performance will lead to more expectations of nonlinearities and more findings of them.

The last hypothesis is that time does not matter much. Time is a specific context variable with its own level of analysis (i.e., occasion). Like synthetic validity, time, or the issue of dynamic criteria, has been long mentioned, but rarely examined (cf. Keil & Cortina, 2001). Yet, as one thinks about the underlying constructs and their operation, one should expect relationships to vary over time. A good example of this is Ackerman's (1988) theory regarding how relationship between performance and different dimensions of ability varies over time as a function of task characteristics. It would be a poor database without acknowledging the dynamics of the constructs involved.

The above advice will result in a database with three levels of equations. The first level will estimate performance and include the ID constructs, power terms for the constructs (to capture nonlinearities), and coefficients for the intercepts and slopes for these terms. The second level will estimate the intercept and slope coefficients using time and power time terms plus their slope coefficients and intercepts. Finally, the third level will estimate the second level coefficients using weighted context construct and intercept terms based on the analysis of validity coefficients across

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numerous jobs or tasks collected over long periods of time.

The above advice might undermine Johnson et al.'s plea to begin the synthetic validity database sooner rather than later. That is not my intention. Indeed, I am advocating that we start on this immediately, and my main argument bolsters the case for directing effort toward this endeavor: It will be good for the science of I-O psychology. Also, like Johnson et al., I believe the process can start and progress can be made without waiting for all the parts to be in place. That is, although I do think new constructs are needed across the domains (i.e., IDs, performance components, and especially context), that should not stop the collection of information on what is out there. For example, one might be able to come back and see whether a new measure of a context property applied to contexts within the database can be tested as a moderator after the fact. Likewise, the middle level (time) is likely to be the most difficult to assess and can be put aside initially. That said, my advice does imply some information storage and data collection that might not happen otherwise. In particular, we should record and store the individual's time in context, or better yet, obtain multiple measurement waves to assess for dynamic criteria.

In addition, endeavors to collect measures of ID constructs, even when the context analysis (e.g., job analysis) does not imply the predictor, will be useful. One reason tests of job component synthetic validity are not very impressive is because some cells are essentially missing from the design. If one wants to determine if a measure of interpersonal skills is useful to the extent the job involves people (as in People, Data, and Things), then one has to have measures of interpersonal skills and performance when the people rating is low. Otherwise, there is severe restriction of range on the moderator analysis because of missing validity data. Indeed, retaining full data sets, as opposed to merely the validity coefficients, seems prudent. If this is what the field is about, the field might want to maintain a solid knowledge base. Finally, the analysis method needs to reflect the multilevel nature of the data (i.e., individuals nested within context). The relatively recent explosion of multilevel analysis procedures makes this easily realizable.

At the end of their article, Johnson et al. noted that there are no theoretical obstacles left for synthetic validity—I agree. However, there are certainly theoretical opportunities of which we should take advantage.

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