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Article Summary: Psychological testing and assessments are going high-tech

Synopsis:

Recent advancements in technology, such as VR and video-based assessments, are allowing medical professionals to use these tools in their diagnosis of psychological differences such as ADHD, dementia, traits of addiction, and more. Although there is not yet plenty of research on the use of these technologies for diagnosis, professionals are optimistic about their use. The article goes on to demonstrate various testings using high-tech materials and their results.

Neuropsychological tests used today have been around for nearly a century, and professionals believe an update is overdue. What the article refers to as the “virtual classroom”, goes further by measuring distractions through the subject’s precise movements. For example, one test can see if a child is looking directly at the target or elsewhere. Another test, used to study Alzheimer's uses a virtual store, and has the subject navigate it. Patrick Bordnick, PhD, dean of the Tulane University School of Social Work, used VR to test how an environment affects the subject’s nicotine cravings. He showed them virtual environments that are designed to make them crave nicotine, such as office courtyards and convenience stores, and was able to record that those visuals did create an increased craving for the smokers. VR can also be used to analyze how effective different coping mechanisms are.

Other researchers have also delved into the potential of virtual games as a means to enhance cognitive abilities. One prominent figure in this field is Adam Gazzaley, a professor at the University of California, San Francisco (UCSF). He is currently developing an innovative game called ACE, which is designed to evaluate various cognitive functions, including sustained attention, selective attention, working memory, and task switching. A unique feature of ACE is its adaptive difficulty level, which adjusts based on the player’s performance, ensuring that users are continually challenged at an appropriate level. This dynamic approach not only keeps participants engaged but also allows for a more accurate assessment of their cognitive capabilities. Gazzaley’s ultimate goal is to use ACE as a tool to evaluate cognitive abilities in relation to mental health issues such as depression, anxiety, post-traumatic stress disorder, and dementia. To validate the efficacy of this tool, he is conducting randomized controlled trials aimed at confirming that ACE functions as intended. While there is great excitement surrounding next-generation assessment tools like ACE, experts emphasize the importance of rigorous validation. These new tools must demonstrate reliability, meaning that individuals should

achieve consistent scores across multiple assessments. Such consistency is crucial for establishing their credibility and utility in both clinical and research settings.

Organizational psychologist Sarena Bhatia points out that before tech-based assessments become commonplace, security issues need to be resolved. Administrators must guarantee test integrity and protect user data in digital assessments, especially when testing remotely. This entails confirming test-takers' identities and prohibiting content sharing. Despite these obstacles, experts such as Adam Gazzaley think that technology will eventually transform assessment techniques, making it possible to develop fresh and creative tools that go beyond conventional paper-and-pencil assessments and provide advantages that are still unimaginable.

The paper discusses the possibility of a "failure of system of systems" with reference to digital evaluation tools. It highlights security vulnerabilities, such as securing test-taker data and guaranteeing test integrity during remote assessments. These worries draw attention to the interrelated problems with technology, data privacy, and the validity of assessments. The efficacy of technology-based assessments may be undermined if the system of systems—which includes digital platforms, security measures, and assessment protocols—could not produce outcomes that are accurate, safe, and equitable.

Strict adherence to privacy rules and strong data security protocols, such as encryption, are necessary to prevent 'system of systems' associated with digital assessments from failing. Biometrics and multi-factor authentication are two identity verification techniques that help guarantee the right individual is taking the test. Test integrity can be protected by AI-based proctoring technologies that keep an eye on user behavior. Regular audits and stress tests can help discover vulnerabilities, while ethical norms around data usage protect user rights. Together, these actions fortify the digital assessment infrastructure while lowering hazards and enhancing dependability.

One major ethical dilemma that transfers across disciplines, including software engineering, is **cutting corners to save time or costs**. In the ValuJet case, cutting safety protocols for financial reasons had fatal consequences. In software development, this could translate to developers skipping crucial testing, neglecting security vulnerabilities, or ignoring proper code reviews under pressure, leading to critical failures or data breaches.

Engineering Faults:

Similar to the aviation disaster, **failure in systems integration and communication** can occur in software engineering. When different subsystems (e.g., third-party services or microservices) don't function cohesively due to poor oversight or lack of clear ownership, the entire system can

collapse. This mirrors the “systems of systems” failure in ValuJet, where miscommunication between companies led to disaster.

Ethical Transfer:

Both industries face the ethical challenge of **balancing innovation with user safety**. For example, prioritizing speed in delivering software may compromise security, while in aviation, prioritizing cost-efficiency compromised safety protocols. Both industries require maintaining ethical standards to prevent harmful outcomes.

The lessons from the ValuJet disaster offer critical insights into software engineering, particularly in the context of "systems of systems" failures. The crash resulted from multiple organizations not effectively managing their roles within a larger, interconnected system, leading to catastrophic outcomes.

To prevent similar disasters in software, engineers must emphasize:

- **Comprehensive testing:** Just as in aviation, software must undergo rigorous, end-to-end testing to detect integration issues early.
- **Clear ownership:** Each team member or group should have a well-defined responsibility to avoid gaps in accountability.
- **Communication:** Teams must actively communicate to ensure that all components and stakeholders are aligned, preventing missteps in complex projects.
- **Ethical vigilance:** Engineers must consider the potential risks of cutting corners, especially when it comes to security and reliability.

By learning from the ValuJet case, software engineers can better appreciate the importance of systems thinking, clear responsibility structures, and ethical discipline in building safer, more reliable software.