



Linear on the Fly Testing: Risk-Free Testing Success

A Prometric/Society of Actuaries Case Study

Emerging technologies within the testing industry are swiftly changing the ways in which organizations approach industry certification. Some of the more advanced solutions are, unfortunately, not yet widely applied, as groups carefully watch for successful implementations to model. The Society of Actuaries (SOA) is one organization that has taken the lead on applying advanced testing models by implementing an updated version of Linear on-the-fly (LOFT) testing to speed up and expand its process. This is their success story.

Financial Risk Experts: About SOA

The Society of Actuaries (SOA) is the largest actuarial professional organization in the world, dedicated to serving 18,000 members and the public. SOA's vision is for actuaries – business professionals who deal with the financial impact of risk and uncertainty – to be recognized as the leading professionals in the modeling and management of financial risk and contingent events. SOA administers several tests to measure professional qualifications; two of its most important exams are the P/1, which measures probability, and the FM/2, which measures financial mathematics.

SOA collaborates with the Casualty Actuarial Society (CAS) and the Canadian Institute of Actuaries (CIA) on the development and administration of these examinations. In 2001, Prometric began working with CAS to support its test development needs, which eventually led to a Prometric relationship with all three Societies. Prometric has identified subject matter experts and hired exam authors; concurrently, the global testing and assessment leader has handled all test item editing and banking at the direction of exam committees comprised of representatives of all three organizations.

SOA's Migration to CBT and LOFT

In 2005, Prometric migrated the P/1 exam from a paper-based test (PBT) to a computer-based test (CBT). In the PBT format, the review and logistics of exam delivery were time consuming, allowing only two test windows to be offered annually. Testing in the computerized format streamlined item review, resulting in the addition of four more test windows. In May 2008, it followed suit by converting to a computerized FM/2 exam. Since the transition to CBT, Prometric has helped SOA deliver more than 30,000 exams annually – both in the U.S. and internationally. Culturally, there was a significant paradigm shift when SOA migrated from PBT to CBT. With paper and pencil each item was "score-able" but the need to

have item statistics available prior to the test administration meant that not all items would necessarily "count" in scoring. Then why make the move? The SOA organizational leadership felt a high degree of responsibility to report pass and fail status as soon as candidates finished the test. This capability was made possible by having item statistics available before the test administration and by switching to CBT. This capability was a key indicator of success.

As part of the move from PBT to CBT, Prometric suggested SOA adopt the dynamic forms generation testing model called Linear-on-the-fly Testing (LOFT). The solution exploits "Item Response Theory" statistics to produce a unique exam for each candidate. The method adjusts the item selection routine to account for item exposure. This makes the memorization of significant portions of the overall exam extremely difficult. It also assures that a high degree of test security is maintained during the test window as no candidate can tell another which items will be on the test. It allows the maximum use of each item which maximizes both the economic investment in items as well as committee time.

SOA was a probable candidate for LOFT testing because it wanted to increase its number of testing windows annually and because the collaboration with exam

committees yielded a sufficient number of test items in the item bank. Success of LOFT exams is highly dependent on having an appropriate number of items with IRT statistics within the bank to support the model; ideally eight-to-ten times the number of items in the bank as would appear on the test form for a "normal" computer based test. SOA decided to accept Prometric's suggestion and administered its first LOFT P/1 exam in May 2008.

Why? The major motivation was a focus on the test takers; timely access to score results and an increase in the frequency of testing opportunities was key. Bob Alps, SOA's general examination officer for P/1 and FM/2, explained: "A significant part of reaching this decision was the idea to eventually take all our exams to a LOFT model, primarily to provide immediate results and give our exams more frequently."

Risk Averted: SOA's Success Story

LOFT has proven to be hugely beneficial to SOA and its membership. The P/1 exams are delivered to 3,500 candidates per test item window (administrations occurred during five windows in 2008). Candidates have expressed favorable impressions of the more frequent availability of tests, but also because of the availability of testing results as soon as the test is completed. According to Alps, "CBT and LOFT benefit our candidates in three important ways: immediate results, frequent administrations and flexible scheduling. Speed of reporting has been immensely popular among candidates. In the past, candidates waited eight to ten weeks for results. Now, results are communicated

almost immediately. This is the most significant thing Prometric has done for us."

Prior to CBT and LOFT, the P/1 exam was given twice each year, with each administration given on a single day at a single time. Under CBT and LOFT, there are five administrations in 2008 and six are targeted in 2009, with each administration open for a one-week period and several available daily time slots. This has provided much more flexibility for candidates to register for the exam.

Another important benefit for the SOA is the efficiency with which exams can be reviewed for balance by the committee. "Balance" ensures that specified subject areas have the appropriate coverage of certain topics to adequately test knowledge. For PBT tests SOA's process of reviewing exams to ensure they were "balanced" was a labor-intensive process. Thanks to LOFT, exams created "on-the-fly" automatically meet test specifications and achieve the required "balance," yet remove SOA's need for committee review of each form. This is a critical element for enabling the SOA to increase its number of test windows.

"This represents a huge number of exams for us, and it would be entirely too difficult to accomplish this goal without LOFT," added Alps. "We now have every indication that the planned increased frequency of testing windows is also going to be possible."

Furthermore, each P/1 exam is now truly individualized. Tests display a total of 30 items, and with more than 10 times this number of items in the bank, not one aspiring actuary takes the same exact test. The risk of item overexposure is mitigated. SOA is on the cutting-edge

of assessment testing, as LOFT exams generate unique forms in real-time. This represents the testing of the future.

One Plus One Equals Three: An Added Bonus to the Equation

While the technological methodology is at the heart to this success story, an added bonus to SOA has been the support from Prometric's psychometricians, experts trained to determine the validity and fairness of tests across a wide range of candidate segments, ensuring fairness and legal defensibility among certification exams. These experts apply math, science and statistics to the testing programs and scoring models of Prometric's exams. While psychometricians apply this expertise to all exams, SOA brought a new level of appreciation, comprehension and collaboration to the role.

"I suspect our relationship with Prometric is not quite typical. Because statistics are at the heart of our profession, we really wanted to understand the mathematics of how the scoring model works. Having someone available to provide technical insight was very helpful and impressive," said Bob. "We've been extremely pleased with Prometric in this regard."

SOA and Prometric recently committed to continuing their relationship by extending their contract – a promising resolution thanks to the emerging technology testing practices quickly coming to market. Thanks to these cutting-edge technological testing methods and collaboration with Prometric's psychometricians, SOA members will continue to measure risk... but their P/1 and FM/2 exams are risk free.