MOVING HIGH STAKES ASSESSMENTS TO DIGITAL PLATFORM IN SOUTH AFRICA

Naziema Jappie, & Ashley Niekerk
Centre for Educational Assessments (CEA) University of Cape Town (South Africa)

Abstract

Student success is critical in higher education. Measuring student success in higher education comprises of student support for retention, achievement and throughput, and to ensure employability of students. In addition, it can also be viewed through the important lens of transformation, equality and diversification. In South Africa the National Benchmark Test was developed to ensure that student was ready for university and through a diagnostic analysis it is able to provide an early warning system. The assessment has always been a pencil and paper format, however the sudden shift during the 2020 pandemic, from contact to remote digital learning platforms brought about unique challenges to the South African (SA) education landscape forcing learners into unfamiliar pathways. Similarly, the facilitation of assessments via online platforms presented new, uncharted challenges. The purpose of this technical research paper is to document the digitisation project from a paper-based test to an Online perspective and describe the @NBT Online system migration from a project and technical management perspective. Consultations were held with stakeholders to brainstorm possible solutions that would assist the Centre for Educational Assessments in responding to the global pandemic which led to a partnership with Territorium Life. Territorium had an online platform known as EdTest-AI, a software as a service (SaaS) solution, which combined proprietary software that uses Microsoft Azure Cognitive Services, Azure App Service, and Azure Database for My Standard Query Language (SQL) to deliver remote test proctoring, including verifying student identity and monitoring the room during an assessment. The digitisation of the NBT assessment was initiated on 1 June 2020 and completed by 12 July 2020, thus taking a total of 35 days to complete with the first pilot @NBT Online successfully administered on Saturday, 25 July 2020. The cost-effective and innovative SaaS approach implemented for this project is the first of its kind to be used in South Africa. Taking a high-stakes assessment digitally allowed the Centre for Educational Assessments' department to expand the types of services, reports, and products offered. Thus, this project is envisaged to support the departmental and institutional plans in highlighting the needs that require innovation, new approaches, new service models and the adoption of new and emerging technologies.

Keywords: Assessments, digital platform, innovation, technical report.

1. Introduction

The NBT was commissioned by the Higher Education of South Africa to assess the extent to which incoming students might be said to be ready to cope with the conventional demands of academic study (Cliff, 2014). Prince (2016) agrees and adds that the NBTs are based on academically researched test specifications which use modern test theories to evaluate scores of students and prospective students in the three domains of Academic Literacy (AL); Quantitative Literacy (QL) and Mathematics (MAT) in the language of instruction, namely English and Afrikaans. In 2020 Covid changed the way in which teaching, learning and assessments were conducted. Moving this high-stakes assessment online, meant that certain considerations had to be made to retain the credibility and security of the NBT tests, without compromising the validity and reliability of the scores. Digitizing the paper-based assessment(s) and adapting them for online delivery in the NBTs' context, meant that this implementation required an innovative, flexible, and robust solution to complement the paper-based implementation. Consultations were held with stakeholders to brainstorm possible solutions that would assist CEA in responding to the global pandemic which led to a partnership with Territorium Life (TL). TL had an online platform known as EdTest-AI combined proprietary software that uses Microsoft Azure Cognitive Services, Azure App Service, and Azure Database (DB) for MySQL to deliver remote test proctoring, including verifying student identity and monitoring the room during an assessment (Microsoft Inc, 2021). With a global

customer base, TL had developed a product that already had existing rules and business processes that were easily implemented, demystifying several concerns raised by CEA leading to the partnering with this strategic technology partner that specializes in secure, proctored online assessments. CEA was intended to not re-invent the wheel by partnering with this technology partner that specializes in secure, proctored online assessments, TL. This cloud-based digital assessment solution has a collection of features that were developed to service international institutions. These features and/or services are not restricted to, but comprise, artificial intelligence (AI), video and audio proctoring of writers, live chat support services, and multiple authentication layers to mention a few. However, the digitization of the NBT had a significant impact on the business workflow of the Research, Data Management, and Logistics team within CEA. In response to these challenges, CEA had to fast-track its plans for a secure, proctored online assessments with the pilot commencing on 25th July 2020. This project was initiated on 1 June 2020 and completed on 12th July 2020, would be the first of its kind with an assessment of this nature which uses technology-enhanced items (TEIs). Leonard (2021) explains that "TEIs are computer-delivered assessment items that involve higher-order thinking skills and leverage specialized interactions for capturing test-taker response data" (p. 01). An online survey was also conducted following the initial pilot of the NBT assessment, to gauge writer understanding as well as to adapt the platform to improve writer engagement and experience. While the writing experience is important to CEA, the team also needed to develop new terms and conditions regarding the new solution while remaining compliant with both Protection of Personal Information Act (POPIA) and general data protection regulations (GDPR). The digitization of this high-stakes assessment allows CEA the opportunity to offer the product via a hybrid model.

2. Advantages and disadvantages of SaaS

To most developers, SaaS is the sacred treasure of a recurrent revenue model which provides quicker deployment time than traditional on-premises software solutions. In keeping with other cloud service industries, TL's EdTest-AI, SaaS offers small business units like CEA an opportunity to interrupt existing markets while taking advantage of their fair SaaS pricing model, thus lower costs. It also allows flexibility to scale SaaS use up and down based on specific need. It is easy to use and performs proof of concepts and test software functionality.

The advantage to using TL SaaS is also its number one challenge – demanding an internet connection. If writers have a solid, dependable connection, then it is a pro. Understandably, if writers do not have a reliable bandwidth connection, it is a con. However, with the progressively wide availability of high-speed broadband and networks, not unlike 5G, this is becoming less of a concern. However, there are a few other situations to consider before CEA agreed to go with the TLs SaaS solution. These concerns are loss of control because of geographical location of service provider. Limited customisation, TL's EdTest-AI SaaS application offers little in the way of customization and clients are offered a standardised template and/or duplication of an already existing environment. Slower Speed: TL's EdTest-AI SaaS solution can have more latency than client/server apps. With TL offices being located outside of SA this was a problem. However, this was mitigated by publishing the solution on Microsoft Azures server centres based in SA.Finally security risks.

3. CEA EdTest-AI platform design

On 1 June 2020, this phase started taking a total of three days and was concluded on 3 June 2020. TL during this time started the process of creating the development environment and setting up the platform. Figure 1 looks at the deployment of the SaaS solution and as displayed, the solution is hosted on the cloud (cloud computing).

The CEA EdTest-AI solution integrates the respondus lockdown browser which is currently regarded as the "gold standard" for securing online assessments by higher educational institutions. The platform implicitly inherits the protocols like full screens which cannot be minimized; prevents access to other applications, printing, screen capture, right-click menu options and task switching were disabled.

3.1. Data mining
CEA's SaaS solution incorporates data mining by using data analytics tools from the Microsoft Azure Services. Microsoft application insights facilitates the capturing of CEA business process data and transforming it into a digital footprint which is stored in Microsoft Azure Data Lake nodes. This enabled the team to use data mining techniques to synthesize the data curated by the solution and gain insights, analysis, and/or real-time process monitoring on performance. This was only possible utilising Microsoft Cognitive Services, Azure Bot Service, and the Microsoft Azure Machine Learning Studio.

Figure 1. Deployment of the SaaS solution and as displayed, the solution is hosted on the cloud (cloud computing).
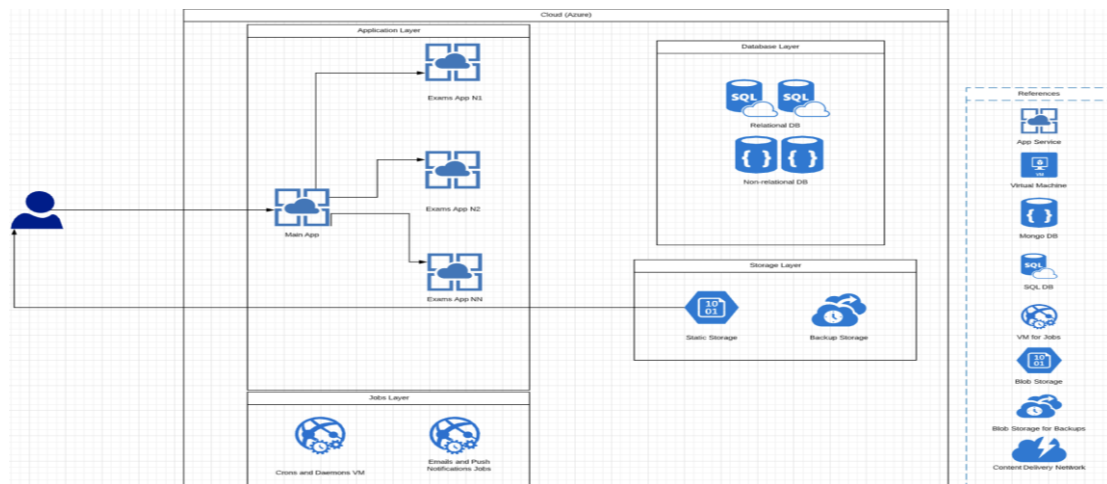
Data quality/sanity is crucial to any industry as the results are only as good as the data received. The quality of data was examined upfront to ensure the curation of accurate results through the data mining process. This allowed CEA the opportunity to establish several practices—including the creation of policies to enable appropriate logs, regular data checks, and ensuring that data sources were connected appropriately—to allow for relational data flow across the entire dataset. However, CEA found several places in our processes where we had whitespace in the form of no data or not enough data being recorded by the system. For example, if we didn't receive any information from a writer, video streaming had started and when it ended, that was considered whitespace in the continuum of our data stream. After identifying whitespace in our processes CEA suggested fixes for the issue wherever possible. TL had hard-coded business rules commonly applied by international HEI's. However, many of these rules were not applicable to CEA and the team embarked on creating and using dynamic rulesets that account for what's happening within CEA to continuously adjust these metrics within the processes. With the collation of all this information it is important that the data is backed up in real-time to avoid any data loss. In the coming section we elaborate on the backup and disaster recovery process for the solution.

3.2. Minimum technical requirements

CEAs EdTest-AI platform delivers remote proctoring and monitors the writer's workspace during an assessment. The platform therefore requires access to either an integrated camera or peripheral. The same applies for device microphones.

Table 1. Lists the minimum technical requirements along with the recommendations of most used devices.

Minimum device requirements to write the NBT test online			
	Desktop/Tower	**Notebook/Laptop**	**iMac/Macbook**	**Apple iPad**
Operating System	Windows 10; 8; and 7	Windows 10; 8; and 7	Mac Operating System 10.15 – 10.12; Mac OSX 10.11 and OSX 10.10	iPad iOS 11.0 and more recent are supported
Microphone	Microphone/Headset with mouthpiece (inserted to aux point or sound input)	Microphone/Headset with mouthpiece (inserted to aux point or sound input)	Microphone/Headset with mouthpiece (inserted to aux point or sound input)	Microphone/Headset with mouthpiece (inserted to aux point or sound input)
Webcam/Camera	Minimum of 480p, however, 720p is recommended	Minimum of 480p, however, 720p is recommended	Minimum of 480p, however, 720p is recommended	Minimum of 480p, however, 720p is recommended
Memory (RAM)/Permanent Hardrive Space	Minimum memory (RAM) required is 75 MB	Minimum memory (RAM) required is 75 MB	Minimum memory/hard drive space is 120 MB	N/A
Bandwidth/Internet line speed	512 kpbs (recommended 1 MB)	512 kpbs (recommended 1 MB)	512 kpbs (recommended 1 MB)	512 kpbs (recommended 1 MB)

4. Writer journey

TL has adapted the EdTest-AI platform for many international higher education institutions (HEI). This allowed the CEA team to select a standardised web interface which has previously been tested, adapted, and implemented for existing HEI's. This is better understood through the writer's journey displayed in the business process mapping notation diagram displayed in figure 2 below.

Figure 2. Writers Journey.
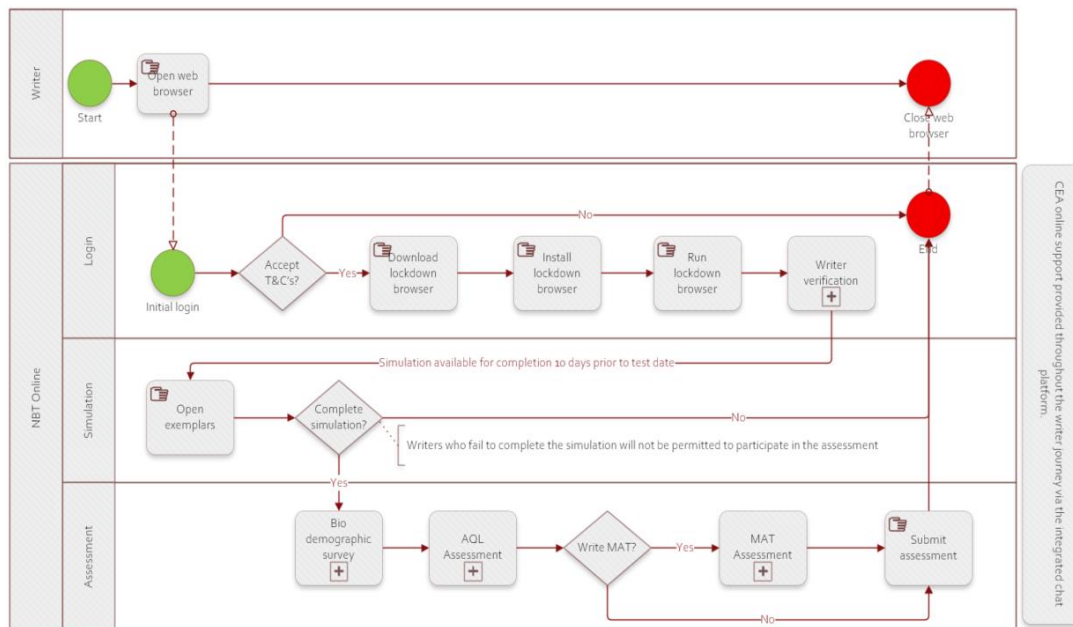
The writer's journey is initiated by accessing the online platform via web browser. As displayed above writers are provided with online support through means of an integrated chat facility. The chat facility also assists the CEA online support identify exactly where in the process the writer is in real-time. This has afforded the CEA the opportunity to create saved responses to frequently asked questions. The solution also records and archives all chat history for future analysis. A detailed guide has been developed to assist writers in navigating the solution. During the writer journey there is a lot of data being collated and this data is processed through data mining which will be discussed in the coming section.

5. Conclusion

The SaaS solution provides scoring and marking facilities that may need to be reviewed to allow for faster scoring of writer tests. Following the feedback received from writers, CEA will require additional staff to assist with responding to writer queries and possibly shorten the period in receiving a response. Additional collaboration may be required to assist in providing writers with alternative verification processes. The TL SaaS solution also has the facility to randomise items/questions. Additional reports may also need to be developed to assist the CEA team with post-session mitigation when reviewing the anomaly reports. It was also clear from the pilot that writers having the test section/session invalidated would impact writer score sets.

In South Africa, like other countries, switching to the online mode of teaching, learning and assessments has exposed us to challenges. Some of these challenges are:
- Very poor or no internet connection and data is very expensive
- The disadvantaged students cannot afford high internet contracts
- Absence of computers/laptops/tablets/smartphones that support online or remote learning
- The universities have experienced online instruments, platforms, and websites being disrupted due to an unexpectedly high number of students and staff getting connected. In addition, there are logistical, social, and psychological challenges.

Considering the above, the immediate support to the existing ways of assessment meant that new online platforms, and instruments had to be used to ensure the continuity and functioning of the NBT assessment. It was critical to ensure the development and adaptation of the tests for online accessibility to students. Reaching out to partners and collaborators, like Territorium strengthen our

preparedness, with dedicated support. This was not just an immediate crisis reaction, but it gave us the inspiration to move ahead with digitization and was helpful to move us beyond the crisis. A recognition of commitment, high pressure, and workload on staff to initiate new aspects of assessments, for the sake of continuity cannot be underestimated during the pandemic.

References

Cliff, A. (2014). Entry-level students' reading abilities and what these abilities might mean for academic readiness. Language Matters, 45(3), 313-324.

CompTIA. (2021). What Is SaaS?. https://www.comptia.org/content/articles/what-is-saas

Frith, V., & Prince, R. N. (2018). The National Benchmark Quantitative Literacy Test for Applicants to South African Higher Education. Numeracy: Advancing Education in Quantitative Literacy, 11(2).

Making Moves. (2021). Simulation Preparation Package. https://www.assessment-training.com/simulation-preparation-package

Microsoft Inc. (2019, January 16). How Microsoft uses process mining to accelerate digital transformation. https://www.microsoft.com/en-us/insidetrack/how-microsoft-uses-process-mining-to-accelerate-digital-transformation

Microsoft Inc. (2021, June 14). From No. 2 pencils to the cloud, Territorium transforms testing, helping universities open doors for students. https://customers.microsoft.com/en-us/story/859803-territorium-higher-education-azure-cognitive-services

Microsoft Inc. (2022, April 26). Disaster recovery for a multi-tenant SaaS application using database geo-replication. https://docs.microsoft.com/en-us/azure/azure-sql/database/saas-dbpertenant-dr-geo-replication?view=azuresql

Myers, T. (2021, March 30). Introduction to Azure Blob storage. https://docs.microsoft.com/en-us/azure/storage/blobs/storage-blobs-introduction#next

Prince, R. (2016). Predicting Success in Higher Education: The Value of Criterion and Norm-Referenced Assessments. Practitioner Research in Higher Education, 10(1), 22-38.

Sango, T., Prince, R., Steyn, S., & Mudavanhu, P. (2022). High stakes online assessments: A case study of National Benchmark Tests during COVID-19. Perspectives in Education, 40(1), 212-233.