Chapter #3

THE DIGITAL AGE OF ASSESSMENTS – NATIONAL BENCHMARK TEST RECONFIGURED TO ONLINE PLATFORM

Naziema Jappie & Ashley Van Niekerk
University of Cape Town, South Africa

ABSTRACT
The sudden shift from contact to remote digital learning platforms and the facilitation of assessments via online platforms brought about unique challenges to the South African (SA) education landscape. The purpose of this technical research paper is to document the digitization project from the @NBT 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 (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, a software as a service (SaaS) solution, which combined proprietary software that uses various to deliver remote test proctoring, including verifying student identity and monitoring the room during an assessment. The first pilot @NBT Online was 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 SA. Thus, this project is envisaged to support the departmental CEA plans in highlighting the needs that require innovation and the adoption of new and emerging technologies.

Keywords: digital platform, technical report, emerging technologies, technical management.

1. INTRODUCTION

The NBT was commissioned by the Higher Education of SA 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. Frith and Prince (2018) state that the NBTs are administered in PnP format so as not to exclude any writers from participating and have testing venues in all nine SA provinces. The SA Government's Risk-Adjusted Strategy does not permit NBT testing at its national venues. Communiques from the Department of Basic Education indicate a phased reopening of schools from 1st June 2020. COVID-19 guidelines suggest that access to schools will initially be tightly controlled with no visitors or external personnel permitted. This has obvious implications for access to NBT venues at both schools and universities. 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 TL. TL had an online platform known as EdTest-AI. It 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, 2023). 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. 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 of, 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, and would be the first of its kind with an assessment of this nature which uses technology-enhanced items (TEIs). Leonard (2020) 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. This will ensure that writers will be able to participate in the assessment either digitally or via PnP which will allow for better uptake of the service(s) offered.

1.1. Project Schedule

The project manager of @NBT Online was the CEA Director and the project lead was the DSM. The DSM was responsible for translating all CEA requirements to ensure a smooth transition. CEA created the first online assessment for EdTest-AI SaaS solution within 33 working days. The first official pilot of this high-stakes assessment was pioneered on the 25th of July 2020. This was a full team effort of the CEA staff.

2. ADVANTAGES AND DISADVANTAGES OF SAAS

2.1. Advantages

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. Benefits of a SaaS Solution Adjusted from IBM CLOUD TEAM, 2020 are listed below:

Reduced waiting time – software as service (SaaS) differs from the traditional model because the software is already installed and configured. You can simply provision the server in cloud and in an hour the application is ready for use.

Lower costs – since SaaS resides in a shared or multi-tenant environment, where hardware and software licenses costs are low, including maintenance costs, there is a reduction in cost.

Scalability and integration – due to SaaS residing in Cloud it is scalable and is not like traditional models in which a new server is required.

New releases and upgrades – the provider upgrades the solutions and it becomes available to the user. Costs associated with upgrades are also much lower. Additionally, there is the flexibility to be able to scale SaaS use up and down depending on specific needs.

Easy to use and perform proof-of-concept – SaaS are easy to use because they come with baked-in best practices and samples. Users can do proof-of-concept and test the software functionality or new releases in advance.

2.2. Disadvantages

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 beneficial. Understandably, if writers do not have a reliable bandwidth connection, it is a disadvantage. 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 agrees to go with the TLs SaaS solution. These concerns are listed below:

Loss of control - TL administers everything, making CEA dependent upon their particular skills. The geographical location of the TL office in Mexico added to the availability of the team.

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.

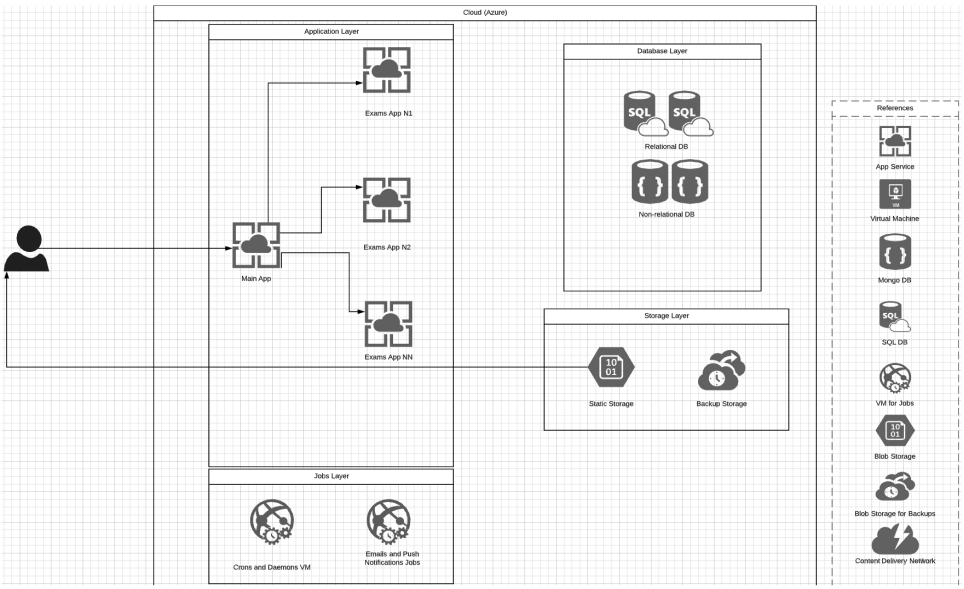
Security risks - while the EdTest-AI SaaS provider secures the application itself, rigorous measures should be taken especially with NBT writer data (CompTIA, 2021).

For CEA the benefits outweighed the challenges and therefore proceeded to move forward with the digitisation of the NBT using the EdTest-AI platform**.**

3. CEA EdTest-AI PLATFORM

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). A breakdown of the services and layers is provided below:

Figure 1.
High level Deployment Diagram.



1. The application layer consists of the following application services, Main application, Exams App NN, Exam App N1, and Exam App N2. The EdTest AI SaaS rests here and data is transferred and managed at client level, with the writer modifying data before sending it to lower levels for storage.

2. The DB layer has a non-relational DB and a relational DB. The non-relational DB utilised is a MongoDB (MDB). Taylor (2021) describes MDB as being a document-oriented NoSQL DB used for high volume data storage. Instead of using rows and tables as in the traditional relational DBs, MDB makes use of documents and collections. Documents consist of key-value pairs which are the basic unit of data in MDB.

3. The jobs layer consists of crons and daemons, virtual machines, email, and pushes notification jobs. The EdTest AI platform has many cron jobs in place which enable search engine indexing, generation of anomaly notice, data clean-up, and more.

4. The storage layer uses azure blob storage which is Microsoft's object storage solution for the cloud. This product is designed to render drawings or documents directly to a web browser, write to log files, store files for distributed access, stream audio and video content, store data for backup, and restore disaster recovery, as well as data archiving (https://learn.microsoft.com/en-us/azure/storage/blobs/storage-blobs-introduction).

In the following section, we review the technical requirements of supported devices and controls implemented to facilitate an error free experience for writers.

4. 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 camera. The same applies for device microphones. Table 1 lists the minimum technical requirements along with the recommendations of most used devices.

Table 1.
Pre-test preparation checklist.

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)

It should be noted that the platform doesn't support the use of android-based devices such as Google Chromebooks. However, this may be adapted to include such devices should a demand arise. To ensure writers are prepared, CEA has developed a pre-test preparation checklist which assists writers in setting up their workspace and configuring their device to allow for a seamless test experience. Figure 2 provides a copy of the checklist made available to writers within the online platform.

Figure 2.
Pre-test preparation checklist.

Am I ready to write the NBTs online?

Pre-test preparation checklist

Welcome to the NBT test session! While you wait for the session to start, please complete the "Biographical information" survey that is available on the platform now and make sure you complete all the steps on this checklist.

SETTING UP YOUR WORKSPACE	
☐	Make sure that the lighting in the room is good enough for you to be able to see your screen properly during the test.
☐	Make sure that the lighting in the room is good enough for the camera to recognise your face throughout the test.
☐	Keep some scrap paper and a pencil/pen in case you need to write something down or do a calculation.
☐	Make sure there are no books, notebooks, calculators, mobile devices, or other prohibited items on your desk or near you during the test.
☐	Use the restroom before the test starts. You are allowed to leave your desk for 5 minutes should you need to use the restroom during the test but remember: Just like in a normal test, your timer will continue even when you are not at your desk.
SETTING UP YOUR COMPUTER	
☐	Make sure that your computer is plugged in and that the outlets and plugs are within your reach.
☐	Check that your internet connection is stable and make sure that you will not need to charge the device you are connecting with or purchase additional data during the test.
☐	Did your device's web camera work during the simulation? If you are not sure or are using a different device, follow the instructions that are available on the online support chat.
☐	Check your computer's power settings and make sure that it will not switch off during your test. Check the instructions that are available on the online support chat.

REMEMBER! You are writing under exam conditions and no-one else should be in the room with you or should disturb you while you are completing the test(s). You are not allowed to use your phone, a calculator, or any reference materials or notebooks. You must be always visible and if the camera cannot see you, you need to fix that before continuing the test. The online support chat is available should you need assistance. Good luck with the test(s) today.

– The NBT Team

5. PLATFORM SECURITY

Coombe, Lester, and Moore (2020) state that, when introducing a digitised assessment will eliminate various risks traditionally associated with the paper-based approach, however, new risks are associated to the digital platform, for which equally or even more dynamic security protocols would be required (p. 13). Coombe et al. (2020) specifically suggest that misuse brings about unfairness, necessitating new structures being established in the management of the digitised platform to replicate the rigorous security processes that exist in the administration of the paper-based assessment. Sango, Prince, Steyn, & Mudavanhu (2022) agree and add that, test protection and reliability create a crucial part of the design scope for the @NBT assessment and the management processes, regardless of its modality (p. 216).

5.1. Information Security

CEAs test platform uses Azure Cognitive Service "Computer Vision" and natural language processing (NLP) to extract and make sense of text from an image. This is done using optical character recognition (OCR) which allows CEA to extract printed or handwritten text from images, such a green barcoded SA identity documents (ID), smart card ID, and passports to mention a few. Data curated by the platform is encrypted, validated through data sanity checks, authenticated, and stored for review. These security protocols are described below:

1. *Encryption of data*: Data is encrypted using transport layer security (TLS) v 2.0 while in transfer. Sensible data is stored and encrypted using a two-way algorithm such as Personal Data, Questions and Answers, and scoring. Passwords are stored and encrypted using a one-way algorithm.
2. *Data sanity*: Any input (text, files, media, etc) is filtered before being transferred and saved. Text is validated to prevent Injections such as OS, NoSQL, SQL and lightweight directory access protocol (LDAP). Text is validated to prevent cross-site scripting (XSS). Files are scanned to detect malware.
3. *Authentication and authorization*: Multiple implementations are considered within TL: Multi Factor authentication, Captcha v3, Weak password checks, Token based cross-site request forgery (CSRF), authorization for application program interface (API) calls, secure cookies, and session management.
4. *Data repository:* All files are stored and encrypted using an advanced encryption standard (AES)-256 algorithm.

5.2. Writer Verification

All writers are required to register and book a test session on the official NBT website (https://nbt.uct.ac.za) where writers are issued with a unique NBT reference number post registration. A list of these variables and attributes are available in Table 2. This data is then transferred to the online platform via a secure file transfer protocol (SFTP) site.

Table 2.
Registered writer data.

	Variable	Description
1	**NBT Reference no.**	A unique ID that is automatically generated by the official NBT website and will remain with a writer indefinitely
2	**Writer Surname**	This is the writers last name
3	**Writer First Name**	This is the writers first name
4	**Initials**	This refers to the writers initial
5	**South African ID**	This refers to the writers 13-digit South African issued identity (ID) document
6	**Foreign ID / Passport no.**	This refers to writers Foreign ID and/Passport should they not be a SA citizen
7	**Date of birth**	This refers to the writer's date of birth
8	**Gender**	This refers to the sex disclosed on the official identify document
9	**Classification**	This refers to the writer's ethnicity
10	**AQL & Math**	indicates which test(s) the writer has registered for
11	**Language**	The language of choice the test will be presented in
12	**Venue**	Refers to the venue where the writer will be taking the test
13	**Date of test**	This refers to the official date of the test.
14	**Mobile**	Refers to the writer's mobile contact number
15	**Home**	Refers to the writer's home contact number
16	**E-mail**	Refers to the writer's email where all communication will be sent.

5.3. Lockdown Browser

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. With that having been said the platform implicitly inherits the protocols listed in Table 3.

Table 3.
Features of Lockdown Browser.

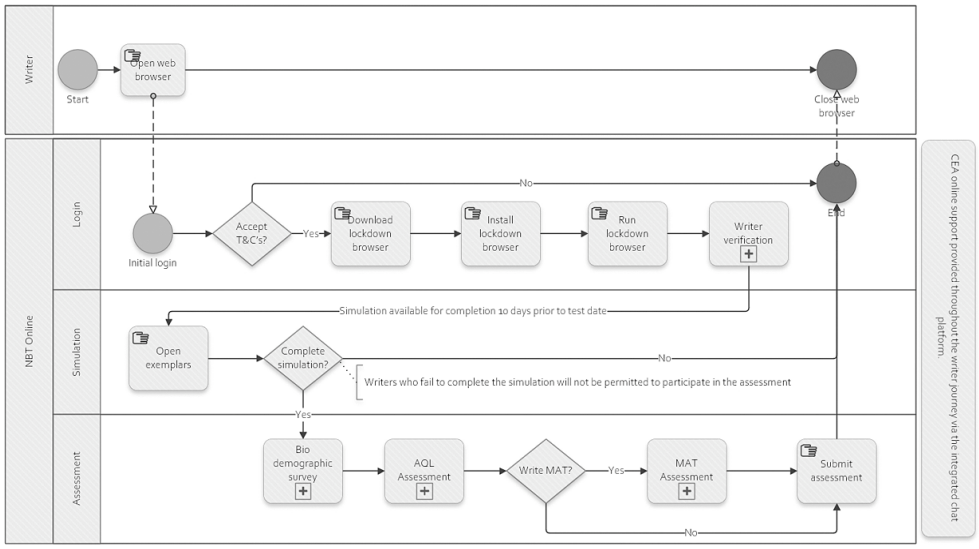
	CETAP EdTest.AI (@NBT Online)
1	Assessments are displayed full-screen and cannot be minimized
2	Browser menu and toolbar options are removed, except for Back, Forward, Refresh and Stop
3	Prevents access to other applications including messaging, screen-sharing, virtual machines, and remote desktops
4	Printing and screen capture functions are disabled
5	Copying and pasting anything to or from an assessment is prevented
6	Right-click menu options, function keys, keyboard shortcuts and task switching are disabled
7	An assessment cannot be exited until the student submits it for grading
8	Assessments that are set up for use with LockDown Browser cannot be accessed with other browsers

All writers who intend on participating in the NBT Online sessions will be required to download the application to continue. The writer's journey is explained in the next section.

6. 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 3.

Figure 3.
BPMN of writer journey.

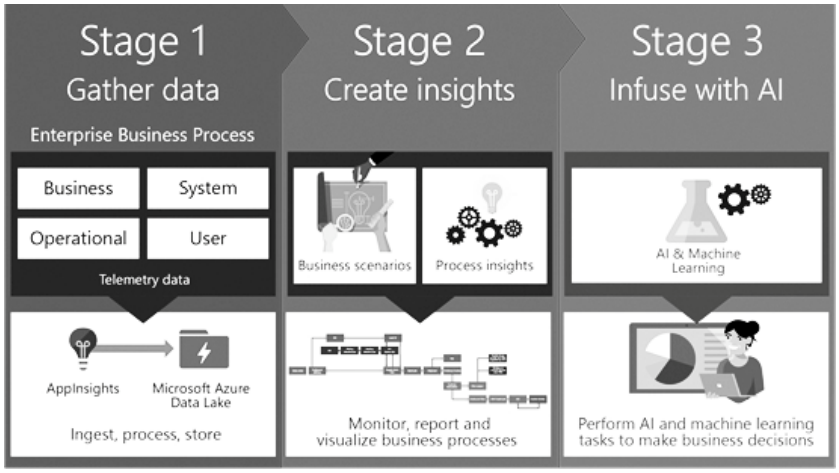


The writer's journey is initiated by accessing the online platform via web browser. As displayed above, writers are provided with online support through means of an integrated chat facility. The chat facility also assists the CEA online support identify exactly where in the process the writer is in real-time. 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's journey there is a lot of data being collated and this data is processed through data mining which will be discussed in the next section.

7. DATA MINING

CEA's SaaS solution incorporates data mining by using data analytics tools from the Microsoft Azure Services as displayed in figure 4. 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 4.
Data mining to accelerate digital transformation (Microsoft Inc, 2019).



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 when 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.

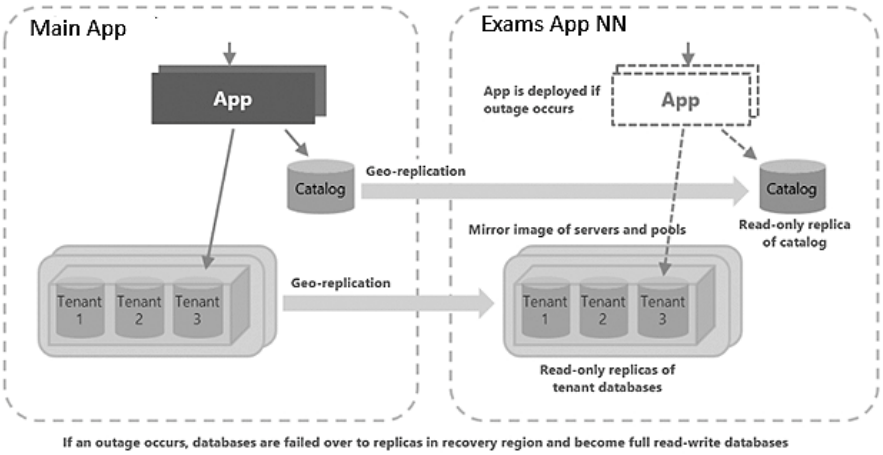
8. BACKUPS

Due to the TL cloud-based SaaS solution, CEA no longer controls the hosting, backup, and recovery of the solution. The Disaster Recovery Journal (2021) adds that while SaaS providers assume the responsibilities, organisations, and departments, such as CEA, would be responsible for retaining the protection and recovery of the data stored in the cloud. The solution dashboard is one method used to download the data from the cloud platform and import the data to CEA DB servers following every online session. However, the disaster recovery (DR) plan displayed in figure 1 is elaborated on below.

8.1. Disaster Recover

With reference to figure 1 there exists a Main App as well as 3 additional environments which are Exams App NN, Exams App N1, and Exams App N2. These Exams Apps are all recovery environments which allows for the failover of the application and DB from the primary hosting region to the secondary recovery environment. Figure 5 provides a visual of how this process would occur.

Figure 5.
Disaster Recover image adapted from Microsoft Inc (2022).



Azure DB for MySQL facilitates the maintenance, backup, and replication of the solution components and all associated data. This allows the writers to have an uninterrupted experience should the solution ever experience downtime. The change between the main application to any of the recovery environments is seamless and writers are none the wiser to the real-time switch. Table 4 provides details on how MS Azure service/platform achieves this.

Table 4.
Disaster recovery for a multi-tenant SaaS application adapted from Microsoft Inc (2022).

Disaster recovery for a multi-tenant SaaS application		
1	Azure Resource Manager templates	Reserves all needed capacity as quickly as possible. These templates are used to provision a mirror image of the production server(s) and elastic pools in the recovery region.
2	Geo-replication	Is used to create asynchronously replicated read-only secondaries for all databases. During an outage, you fail over to the replicas in the recovery region. After the outage is resolved, you fail back to the databases in the original region with no data loss
3	Asynchronous	All failover operations are sent in tenant-priority order, to minimize failover time for large numbers of databases.
4	Shard management recovery features	Is used to change database entries in the catalog during recovery and repatriation. These features allow the app to connect to tenant databases regardless of location without reconfiguring the app.
5	SQL server DNS aliases	Enable seamless provisioning of new tenants regardless of which region the app is operating in. domain name server (DNS) aliases are also used to allow the catalog sync process to connect to the active catalog regardless of its location.

Sync database and elastic pool configuration info into the tenant catalogue. Set up a recovery environment in an alternate region, comprising application, servers, and pools. Use geo-replication to replicate the catalogue and tenant databases to the recovery region. Fail over the application and catalogue and tenant databases to the recovery region. Later, fail over the application, catalogue, and tenant databases back to the original region after the outage is resolved. Update the catalogue as each tenant database is failed over to track the primary location of each tenant's database. Ensure the application and primary tenant database are always collocated in the same Azure region to reduce latency. In the coming section we discuss the solution and view the previous state of the CEA assessment offering and its improvements.

9. HIGH-LEVEL VIEW OF THE SOLUTION

This section describes the previous state of the assessment as well as the improved state after introducing the SaaS solution.

1. NBT assessments are only offered via PnP with proctoring conducted by CEA staff on-site (test venue).
    a. Introduced the NBT assessment digitally with integrated AI proctoring and ML.
2. Access to test venues and gatherings were prohibited during lock-down levels 5 – 3.
    a. Introduced a digital product that allows writers to participate in the NBTs online and remotely.
    b. Introduced innovative technology (AI proctoring; etc.) to assist with test monitoring.
    c. Introduced online chat support service to writers during both the simulation and live test sessions.
3. Validating writers and ensuring test security and storage of test material in test venues.
    a. Introduced digital check-in and multifactor authentication of writers.

   b. Introduced digital test content that can be edited/authored via the platform interface delivering changes in real-time.
   c. Introduced lock-down browser to ensure no other application and/or services are running in the background ensuring the test cannot be exited until complete.
4. Invigilators assigned through use of 1:50 ratio where 1 refers to the invigilator and 50 to the number of writers.
   a. Introduced AI proctoring which implements a ratio of 1:500.
   b. Real-time alerts/notifications inform writers of any test contraventions.
   c. Video and audio data is available to consult either in real-time and/or post-test session.

The above are only a few of the notable improvements since the adoption of this solution. In the coming section we will discuss some of the lessons learnt during this journey.

10. LESSONS LEARNT

The following is a list of lessons realized during this project that can be used to inform impending digitization endeavours:

1. Authorize and detail all concessions to the specifications.
2. Organize routine consultations with the project team to confirm that the project is accomplished within the timeframe and that all constituents are cognizant of their various roles and responsibilities.
3. The geographical location of the service provider had a huge impact on the time these meetings were scheduled as there is a nine-hour time difference (SA was ahead).
4. Follow up on project deliverables.
   a. Training of the AI service took time to refine as it had to learn to exclude items that have been classed as anomalies.
5. Frequent reporting to patrons and the CEA management team.
6. Oversee projects within budget.
   a. Inform stakeholders and management timeously where budgets have been surpassed.
7. Ensure the delivery of products in a timeous manner.
   a. The SaaS solution is published on Microsoft data centers located in Cape Town.
8. Ensure that human resources are available when required.
   a. Upskilling of staff.
   b. Repurpose staff.
   c. Adapt staff job descriptions.

The above are just a few of the lessons learnt during this project. In the coming section we will discuss some of the recommendations.

11. RECOMMENDATIONS

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 randomize items/questions. For the CEA team to take advantage of this facility research leads will need to digitize more test items. 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. This will need to be discussed with stakeholders and require adapting existing MOUs.

12. CONCLUSION

The onset of the global pandemic forced many industries to embrace the digital age. This created an opportunity for CEA to take a high-stakes assessment digitally. The platform is the first of its kind in SA that incorporates a fully functional AI-Proctoring that incorporates ML. This was made possible using Microsoft's Azure Cognitive Services. Which ensures the platform is utilising the latest technologies which has afforded CEA to remain relevant and in the forefront of the assessment arena. This has allowed CEA an opportunity to offer additional support in real-time to all writers via its integrated chat functionality.

The online platform has provided new insights into existing data which has implicitly expanded the list of services and products CEA has available. Furthermore, the new hybrid model has given writers a chance to choose the test delivery that best suits their needs. Some of these new products have been used to identify a writer's readiness for higher education and assist HEIs with the opportunity to get to know the ability of an incoming cohort. In addition, these products have also offered HEIs to identify at-risk student(s) and guide them to resources readily available. The most popular new diagnostic product has assisted HEI faculties the chance to better understand courses inhibiting graduation and to mitigate them.

Additional research identifying the differences between the traditional pencil and paper assessment revealing the difference, if any, in writer performance. CEA may offer look to offering the AI-Proctored online assessment as a service to its stakeholder in the future to determine the need for such a product.

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AUTHORS' INFORMATION

Full name: Naziema Begum Jappie, PhD
Institutional affiliation: University of Cape Town (UCT)
Institutional address: Rondebosch, Cape Town, South Africa
Short biographical sketch: Dr Naziema Jappie holds a PhD; Masters and Honours in Social Science and Bachelor of Social Science; Higher Diploma in Education; Certificate in Executive & Management Coaching. She has worked as a schoolteacher; a National Education Officer for the Clothing & Textile Workers Union; a lecturer at the ML Sultan Technikon, Durban and the Institute of Women's Study Lahore (IWSL), Pakistan. She served as Dean of Students at the Durban University of Technology and the University of the Witwatersrand between 1995 and 2011. Her research interests include educational policy, leadership, management, and governance with a focus on social justice. She has received many awards during her career including a Fellowship at the University of Iowa, USA and an Emerging Scholar Award from the Common Ground Research Network at Queen's University in Belfast, Northern Ireland and has a visiting scholarship at Rutgers University, USA.

Full name: Ashley Van Niekerk
Institutional affiliation: University of Cape Town
Institutional address: Rondebosch, Cape Town, South Africa
Short biographical sketch: Mr Ashley Niekerk holds a postgraduate qualification in Management Information Systems (MIS) and worked at the University of Cape Town. He has been working in the capacity of Data Systems Manager at the Centre for Educational Assessments, previously he occupied the position of Clinical Data Manager, at the University of Stellenbosch (US) at the Desmond Tutu TB and HIV centre. He has also contributed to the national Climate Change white paper during his 6-years at National Department of Environmental Affairs as Assistant Director, Data Management. During this time, he contributed to the curation of large volumes of data collected by devices (Data Buoys, Wind sensory devices, etc) and the transmission of this data securely to servers where the data went through vigorous data sanity checks before being imported and mined to generate data visualisation aids to assist senior managers in making informed decisions.