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REVIEW OF FASTTEST FOR ELECTRONIC ITEM BANKING FOR STANDARDISED ASSESSMENTS: IMPLICATIONS FOR THE FOURTH INDUSTRIAL REVOLUTION AND COVID-19 INTERJECTIONS

Jumoke I. Oladele[1]*
[1] University of Johannesburg, South Africa

Article Info

*Corresponding Author
Email Id: jumokeo@uj.ac.za

Abstract

Educational assessment in developing nations has suffered considerable setbacks with the Covid-19 Pandemic lockdown measures evident with the postponement of standardised examinations. This occurrence is due to heavy reliance on the table development procedures, which calls for innovative solutions such as electronic item banking. This study evaluated FastTest being an electronic item banking solution premised on the Connoisseurship and Criticism evaluation model. This model was deemed appropriate, grounded on the evaluator's professional expertise for describing, critically appraising, and illuminating FastTest as an electronic item banking platform, based on which a conclusion was drawn. The evaluation shows that FastTest for electronic item banking has carefully integrated algorithm, data analytics, and internet of things (IoTs), which are pillars of 4IR in the functioning of the application. Premised on the evaluation, this study concluded of FastTest as an appropriate platform that can be adopted for electronic item writing for the educational sector in terms of standardised assessments based on which a recommendation was made. This study is not without implications for 4IR, which is a current wave in today's world.

Keywords

Standardised assessments, FastTest, Electronic, Item development, Item banking, 4IR

1. Introduction

Standardised assessments are tests deliberately designed to achieve specific objectives for use in a defined environment. It involves a set of procedures that cover its construction, including item writing and validation leading to the establishment of psychometric properties, method of administration, scoring, and the process of interpretation of test scores. It is essentially used for certification, usually conducted and published by a recognised body/agency or a public examination body. With standardised assessment, candidates are presented with the same questions scored consistently; comparing the relative performance of students usually practised with large-scale tests administered to large populations of students (Hodder Education, n.d.). Standardised assessments follow a rigorous development process involving trialling the tests with a nationally representative sample of children, followed by statistical analysis of the results. Standardised testing refers to any assessment with a systematic set of analyses and improvements that provide high comfort levels to the user in their development, reference points for making interpretations (e.g., age, grade, or other norms). It can be used in many different situations by appropriately trained assessors (Brown & Hattie, 2012). A standardised test usually follows a systematic procedure for describing behaviours, whether in terms of numbers or categories, have an established format and set of materials, present the same tasks and requires the same response modes from all candidates; provide tables of norms to which the scores of examinees can be compared to ascertain their relative standing and are generally perceived as being fairer than teacher-made tests because everyone gets the same test and the same grading system. This study evaluates FastTest for electronic item banking for standardised assessments and implications for the fourth industrial revolution.

2. Literature Review

Educational assessment has a range of objectives and predicted effects (Mons, 2009). Firstly, the assessment must measure learners' attainment to indicate the extent to which educational objectives are achieved. It also serves as a link between schools and national level administrators. It is regarded as a management tool that influences the actions of the implementing agents and provides information about their performance to parents and the public used for audit and decision-making purposes (Woessmann, 2007). Standardised assessments are soughed for as they eliminate bias in assessment, provides data that can be aggregated, permitting comparisons of groups to a standard, provides uniformity in test administration, scoring and interpretation procedures and are widely used for large-scale testing situations. Another advantage of standardised assessment is that it removes the potential for favouritism, bias and subjective evaluations while providing valuable information that educators and school leaders can use to improve instructional quality. Its rigorous construction procedures make it more valid (the extent to which a test measures what it purported to measure) and reliable (consistency in measurement). It also provides some "standard score" or norm, which can help interpret how far an individual score ranges from the averages. The test results also indicate how a student (or group) performs in other schools. Standardised assessments aid in tracking

progress and can be used to ascertain the impact an intervention had experimentally (Hodder Education, n.d.). Despite these advantages, Standardised assessment has some weaknesses such as fixed and non-modifiable items, tests anxiety usually experienced with standardised testing, teaching is tailored to performance. It compares students rather than measuring the objectives of an innovative instructional programme tailored at providing a rich and broad curriculum experience. Furthermore, Standardised assessment is more likely to become an object of debate and controversy when test scores are used to make a consequential decision about educational policies. Also, repeated use may lead to loss of validity, which is one of its major advantages. Hodder Education (n.d.) further stressed that standardised assessments are largely summative; being a time-bound snapshot of students' performance and may not be a true reflection of their outcomes. It was recommended that standardised assessments be used alongside regular in-class formative assessments with diagnostic value.

Many countries are leveraging the gains of standardised assessment to evaluate organisational, classroom, and personal practices at various levels with standards and quality frameworks for describing education processes and outputs (Huber & Skedsmo, 2017). While developed countries employ technology for item banking as a major component of the test development cycle, with standardised assessment known as electronic item banking, many developing countries still engage in non-electronic procedures (Weiss, 2013, Oladele & Ndlovu, 2021). Electronic Item banking (EIB) refers to the purposeful creation of a database of assessment items to serve as a central repository of all test content, improving efficiency and quality. The term item refers to what many calls questions, though their content need not be restricted and can include problems to solve or situations to evaluate in addition to straightforward questions. As a critical foundation to the test development cycle, item banking is the foundation for developing valid, reliable content and defensible test forms (Assessment Systems Corporation, 2017). With EIB, a computer software program to store collections of test items and their associated classifications and statistics, which allows for easy storage and retrieval of items. A basic EIB platform includes a format-able space for writing items, allowing for item tags in line with a specified table of specification and the facilities to edit and subject the items to psychometric analysis. Items in an EIB should have a unique identifier; item types include multiple-choice questions (MCQ), short answer, matching, and essay, a classification scheme, source, author, as basic information, item status, comments, statistical history, testing dates, among others (Bergstrom & Gershon, 1995). They further stressed that an efficient EIB platform must include a basic database component that allows for sorting items by content schemes, test administration date, an item identifier, content classification, and status (new, used, retired, among others) to a fully a relational one which enables item writers to maintain all information associated with the life of a test item while enhancing the functionality of the item bank; allowing for establishing the psychometric properties of the items using classical test or item response theory as well as item statistics storing one record per test administration. Other issues raised are Maximising Computer Efficiency, which has to do

with the speed in which data can be moved from the hard disk to the program and ultimately to the screen, and found; the ability for text editing enabled by an integrated word processor, which also makes producing paper-and-pencil test versions easier; a platform that allows for graphics integration, multiple language support; automated item writing; a large item bank capacity; statistical analysis, and of course item bank security. Weiss (2013) stressed that when IRT item parameters are available in the item records, item banks can be searched for various combinations and ranges of the IRT discrimination, difficulty, and pseudo guessing parameters. More sophisticated IRT test assembly allows searches on the item information, thereby helping the test developer create tests with a desired test information function. Electronic item banking systems significantly reduce administrative time for developing/reviewing items and assembling/publishing tests. There are various electronic items banking systems such as PSI Dimensions, ExamSoft, Yardstick, X-Pro Milestone, Item Banking Management Platform (IBMP), and FastTest. This study evaluated FastTest, premised on the use of its full version for research.

3. Research Methods and Design

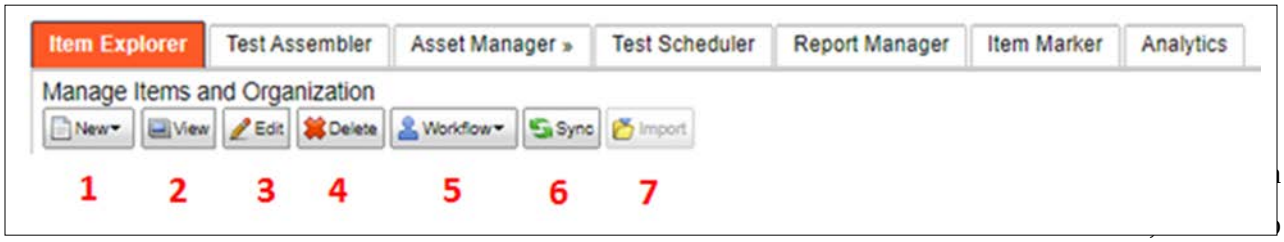
This research is an evaluation study situated using the Connoisseurship and Criticism Evaluation Model. Evaluation is the process of determining the extent to which objectives are attained or the worth of a process, product, or programme. Educational evaluation includes various activities like student assessment, measurement, testing, program evaluation, school personnel evaluation, school accreditation, and curriculum evaluation (Anh, 2018). Evaluation was more succinctly defined as "the process of delineating, obtaining, providing, and applying descriptive and judgmental information about the merit and worth of some object's goals, design, implementation, and outcomes to guide improvement decisions, provide accountability reports, inform institutionalisation/dissemination decisions, and improvement decisions, and understanding of the involved phenomena" (Stufflebeam, 2003). There are different evaluation models, some of which are the Content, Input, Process and Product (Daniel Stufflebeam, 1960s), Connoisseurship and Criticism (Elliot Eisner, 1979), Goals-Oriented/Objectives-Based (Ralph W. Tyler, 1949), Goals-Free (Michael Scriven, 1970s), Judicial/Adversary Evaluation (Robert L. Wolf, 1970s), and Kirkpatrick's 4-Level (Kirkpatrick, 1994) evaluation models (Olorunlero, 2013; Aziz *et al*., 2018; Anh, 2018; Picciotto, 2019). The Stake's responsiveness (Robert E. Stake, 1975) was also highlighted by Anh (2018). Any of these models can be adopted or adapted as deemed appropriate. Theories of science that have influenced the development of common educational evaluation models have been reviewed to increase researchers' confidence when choosing an appropriate evaluation model (Frye & Hemmer, 2012). They explained that this is accomplished by considering the model's theoretical basis against their program's complexity and their own evaluation needs. This study adopts the Connoisseurship and Criticism Evaluation Model. This model is appropriate for describing, critically appraising, and illuminating a particular program's merits as determined by expert evaluators—the critics and authorities who have undertaken the evaluation. The major questions are the program's essence and salient characteristics and

the merits and demerits that distinguish the program from others of the same general kind (Stufflebeam, 2001). Connoisseurship and Criticism evaluation model involves an expert in a field of study estimating the worth of innovation. This model was developed based on an expertise-oriented programme evaluation approach, which is grounded on the professional expertise of the program evaluators while evaluating an institution, program, product, or activity (Yüksel, 2010). This approach can be used in a broad context from education to different areas by the evaluator and their expertise. In this sense, he explained that this model addresses a form of educational inquiry that is qualitative in character and sources from the work of the critics done in literature, theatre, visual arts, and education. Educational criticism, in Eisner's formulation, has three aspects. The descriptive aspect is an attempt to characterise and portray the relevant qualities of educational life—the rules, the regularities, the underlying architecture. The interpretive aspect uses ideas from the social sciences to explore meanings and develop alternative explanations. The evaluative aspect makes judgments to improve the educational processes and provides grounds for the value choices made so that others might better disagree. The chief contribution of the Eisner model is that it breaks sharply with the traditional scientific models and offers a radically different view of what evaluation might be. Doing so broadens the evaluator's perspective and enriches their repertoire by drawing from a rich tradition of artistic criticism. Although Eisner has attempted to refute such charges, critics have faulted it for its lack of methodological rigour. Critics have also argued that using the model requires a great deal of expertise, noting the seeming elitism implied in the term connoisseurship (Olorunlero, 2013). This model is employed for describing, critically appraising, and illuminating FastTest as an electronic item banking platform. *Ethical considerations:* This study was exempted from the requirement to obtain informed consent by the Faculty of Education Research Ethics Committee of a South African public university because the research does not involve human participants.

4. Features of FastTest for Electronic Item Banking

Item Banking refers to the process of developing, reviewing, and managing large sets of test questions over time. It is described as a key stage in the process of developing large scale or higher stakes examinations. It drives the quality of the assessment process and improves the overall business process, making it more efficient and thereby easier for the sometimes-large groups of people involved (Thompson, 2021). It is regarded as an important stage of a high-quality assessment life cycle where test questions are created and used to populate an item bank which involves careful work and requires the coordinated effort of several groups of experts to ensure that the final examination includes the right number of items, organised into the right categories (Yardstick, n.d.) There's so much more that goes into it besides writing a test question: storing metadata like a reference source, tracking statistical performance, tracking usage on various exam forms, inserting multimedia assets, managing users, requiring a quality assurance workflow, among others. Such steps aren't relevant for a teacher with a math quiz but are required for large-scale and high-stakes assessments (Thompson, 2021). FastTest

is a licensed internet application designed to support the entire test development cycle while improving the process of developing assessments and ensuring a rigorous psychometric analysis with a user-friendly and detailed manual on how to manage users, create item banks, assemble the items into tests, build test sessions to administer to examinees, schedule the examinees, deliver tests online, and generate reports (Cauldwell, 2020). The FastTest application has two parts which are the test development and delivery components. The test development component is authored, statistics specified, and tests built (with print options). All these are accomplished under the item explorer tab shown in Figure 1.



tabs two to four are meant for viewing, editing, and deleting an item or bank. The fifth sub-tab manages item workflow, while the sixth sub-tab helps to show the most up-to-date information. The seventh tab is used for importing items into the FastTest environment using specified formats. Clicking sub-tab 1 presents several steps to writing an item following a detailed procedure, as shown in Figures 2 to 9.

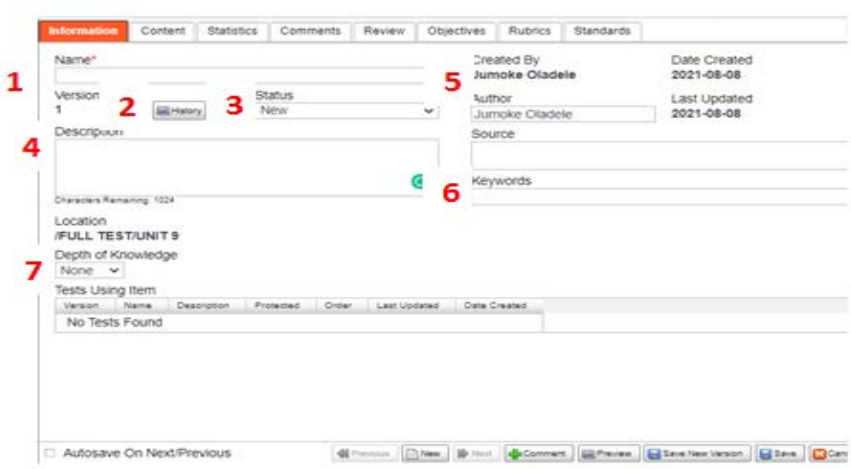


Figure 2: Information Tab; **Source:** FastTest, v3.75.43

As shown in Figure 2, the information tab has seven fields applicable to each item written in the FastTest environment. Field 1 is used to give each item a name as deemed fit by the item writer; with field 2, the history of each item can be viewed, while field 3 indicates the status of the item as new, reviewed, active or retired. Field 4 is used to describe an item, also determined by the item writer, while Field 5 automatically displays the general item information: item creator, author, date created the date the item was last updated, and source.

Field 6 presents a keyword box that facilitates searching for items from the pool, and field 7 helps determine the depth of knowledge from Level one to four. Having specified all fields, the item writer then moves to the content tab in Figure 3.

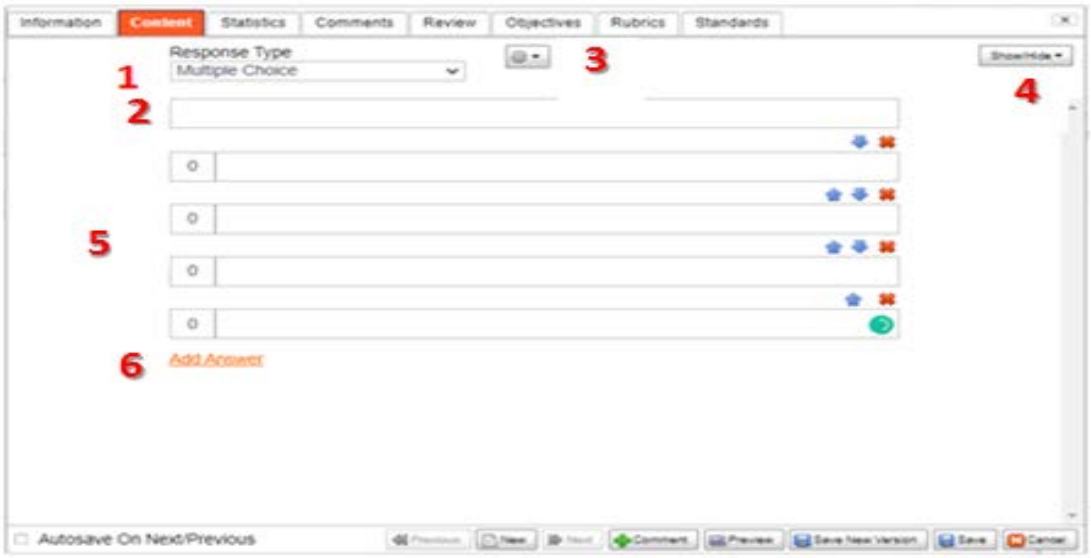


Figure 3: Content Tab; **Source:** FastTest, v3.75.43

As shown in Figure 3, the content tab has four major fields applicable to all item response types. Field 1 helps to determine the item response types. Clicking the drop-down arrow on the filed shows a list of options to choose from as displayed in Figure 3a ranging from multiple-choice, multiple responses (partial credit), multiple responses (All or nothing), drag and drop (All or nothing), short answer, scored short answer, Essay, Likert type, survey, instructions, drag and drop, proofing, fill in blanks, fill in blanks (All or nothing), counter and timer.

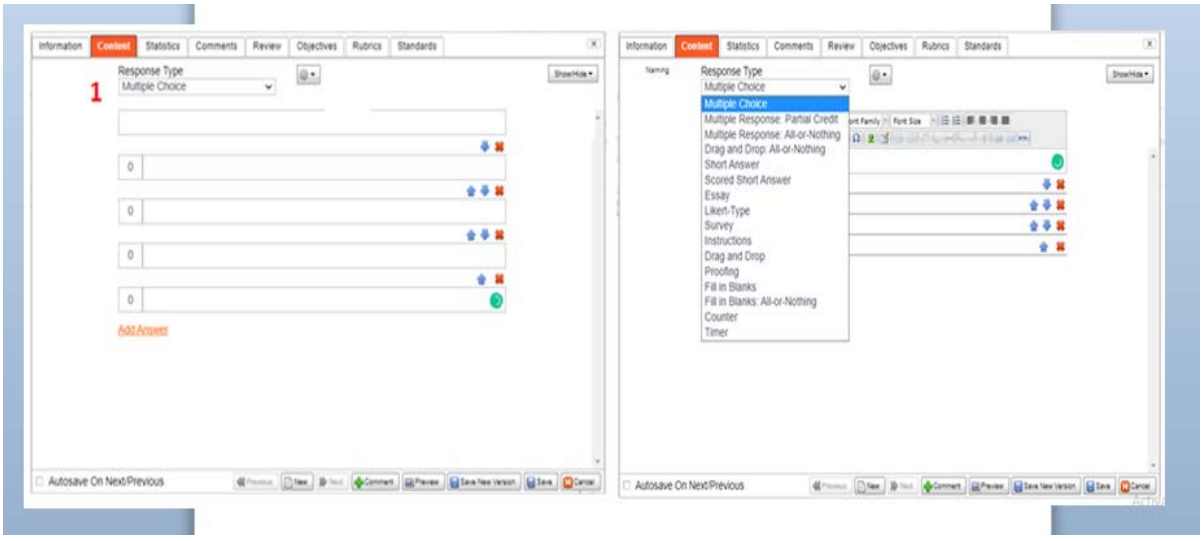


Figure 3a: Content Tab (Response Format-i); **Source:** FastTest, v3.75.43

This function shows that the FastTest platform provides a comprehensive response format that could be used for a test item (Bergstrom & Gershon, 1995). Field 2 of the content tab is the space for writing the stem, which is the question to which candidates are to provide answers. While the stem area is a plain box, the right part of Figure 3b shows the area with format functions like what is available in the Microsoft word application. The format function allows item writers to cut/copy and paste,

redo and undo, bolded, italicise and underline words, specify font family and size, insert bullets and numbering, align text to the left, right or centre, insert paragraphs, equations, symbols, images and tables among others revealing that FastTest has a fully functional format-able space for item writing (Bergstrom & Gershon, 1995).

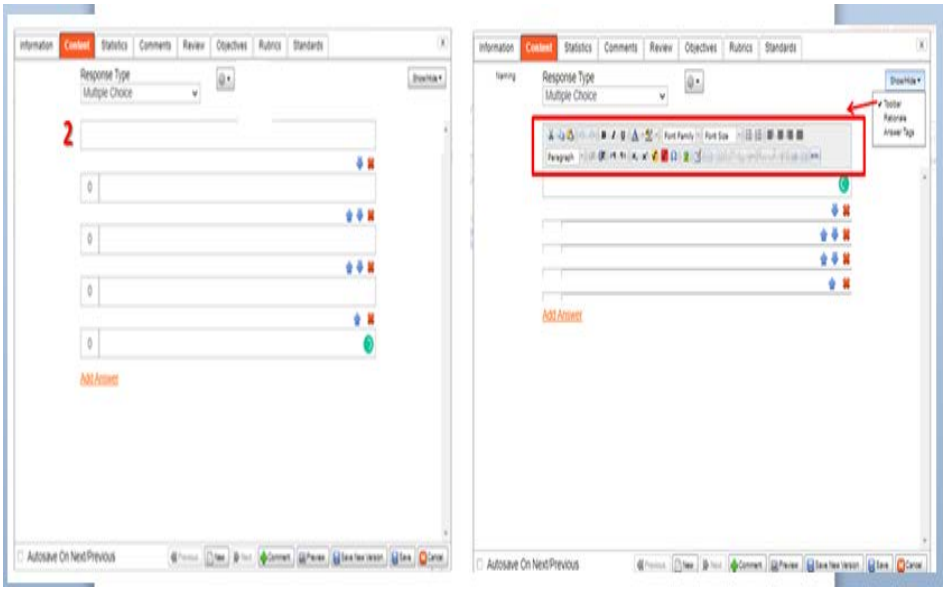


Figure 3b: Content Tab (Stem Area); **Source:** FastTest, v3.75.43

Field 3 of the content tab is a function with scoring, layout, scales, and answer markers options, as shown in Figure 3c.

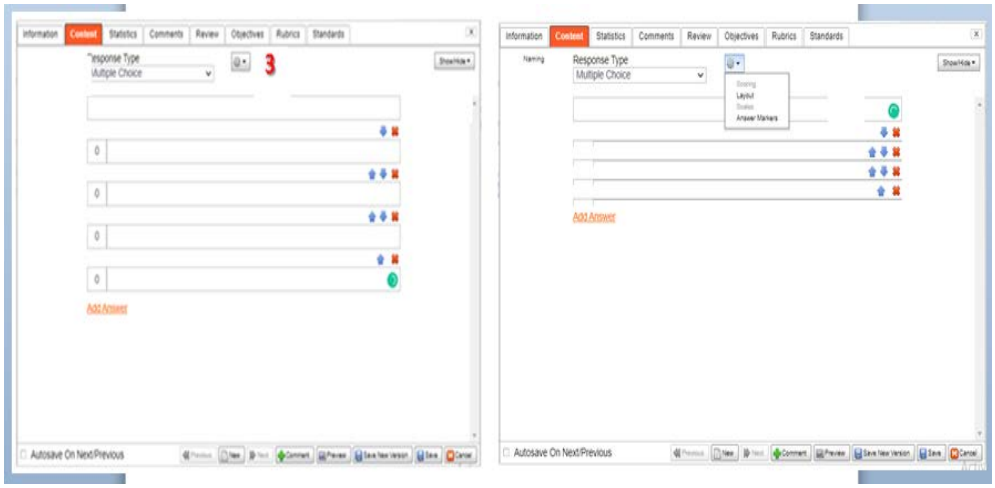


Figure 3c: Content Tab (Options); **Source:** FastTest, v3.75.43

These scoring options, layout, scales, and answer markers enable item writers to be innovative with given tasks, thereby being highly interactive. This functionality could go a long way to avert boredom during examinations and alley examination phobia associated with computer-based association (Glaister, 2007; Efendi, 2015; Siemieniecka *et al*., 2017; Ghofur & Youhanita, 2020). Field 4 of the content tab holds additional functions that can be shown or hidden, as shown in Figure 3d. The field has the toolbar, rationale, and answers tag functions.

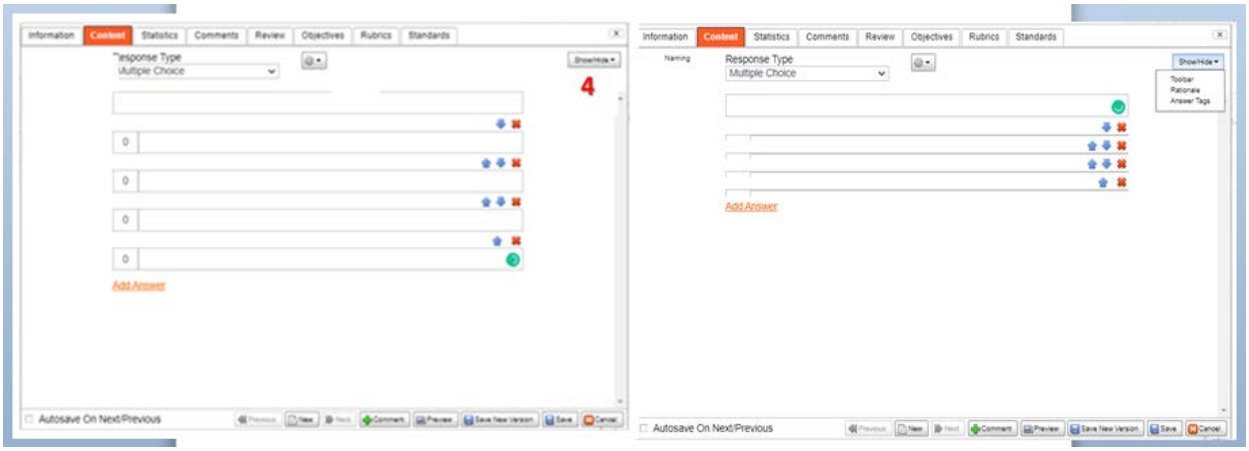


Figure 3d: Content Tab (Show/Hide); **Source:** FastTest, v3.75.43

As shown in the right part of Figure 3d, the first function is the "Toolbar", which enables item writers to have a fully format-able space for writing the stem, as shown in Figure 3b. The second option is the "Rationale", which displays response feedback/rationale to the student. This function is particularly useful for assessment for learning purposes. The assessment for learning approach aims to improve the learning outcomes in non-intrusive ways (Daramola *et al*., 2019). This function reveals that the FastTest assessment platform is useful for placement and certification but also aid decision making on tracking, promotion, or retention. The rationale option also makes the platform suitable for both formative and summative assessments. As shown in the right pane of Figure 3d, the third option is the "Answer Tag". Tags (also knowns as labels, related to hashtags) are the modern approach to organising saved objects. Fields 5 and 6 are specific to only some item response types, as shown in Figure 3e showing all the response types.

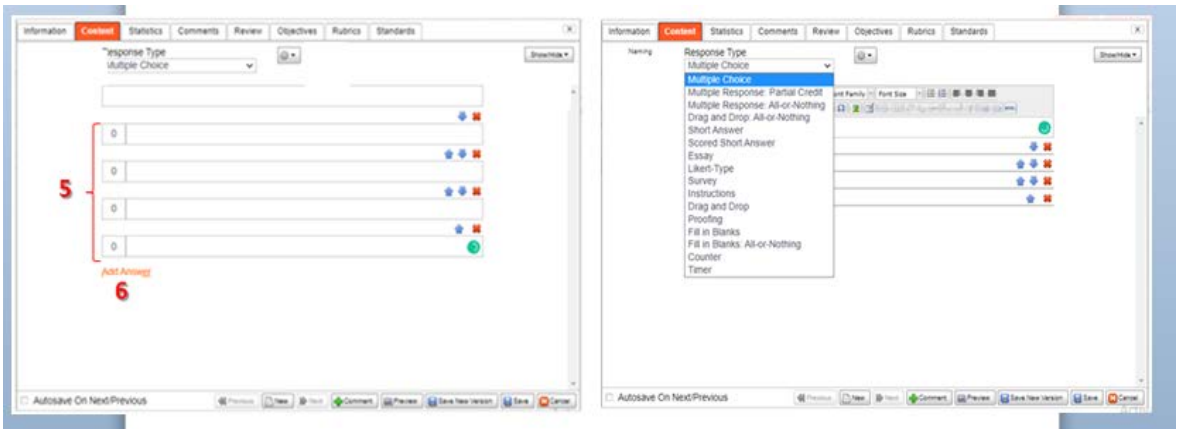


Figure 3e: Content Tab (Response Format-ii); **Source:** FastTest, v3.75.43

As shown in Figure 3d, while the multiple-choice, Likert Type, and survey options shown in the right pane require Field 5 where options to choose from would be provided, this field is not displayed with the Essay Response type. Field 6 is a function that allows item writers to increase the number of options provided. This function shows that FastTest provided a flexible platform that item writers can

leverage as desired. Having written the items, FastTest ensures that appropriate statistics are specified for each of the items using the statistics tab as shown in Figure 4.

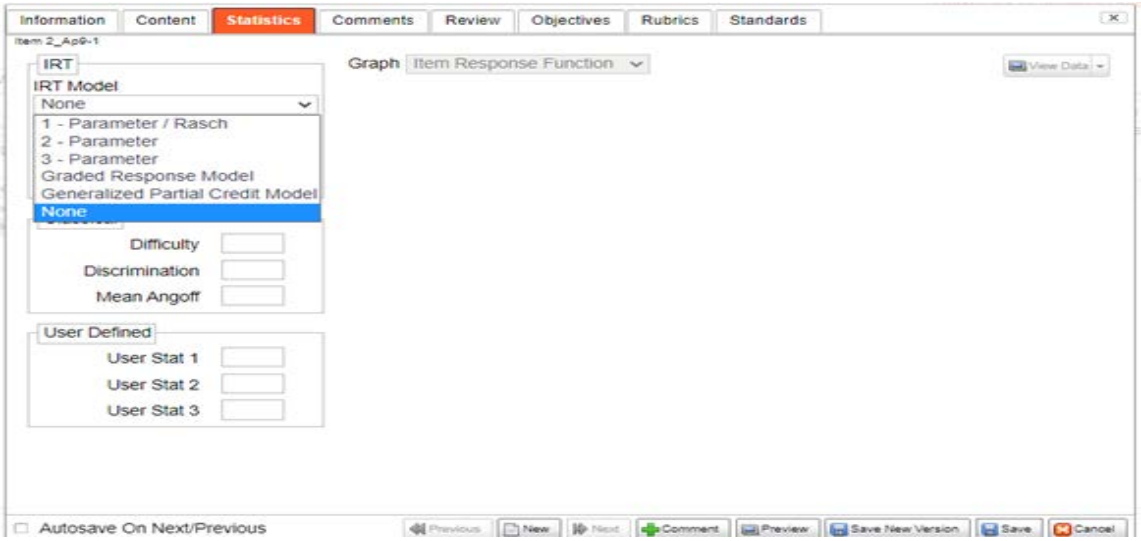


Figure 4: Statistics Tab; **Source:** FastTest, v3.75.43

As shown in Figure 4, FastTest is designed to provide item writers with the option of choosing either the Item Response Theory (IRT), also known as the modern test theory or Classical Test Theory (CTT) statistics. With IRT, item writers are provided with a range of models (1, 2, and 3 Parameter logistics models) applicable to multiple-choice item response formats or the (Graded Response and Generalised Partial-Credit models) applicable to open-response item formats, and this is made possible on the FastTest right from the item writing stage on the platform.

FastTest electronic item banking platform also produces item response graphs needed to ease the test quality reporting efforts. These functions are important for establishing the psychometric properties of items for Standardised assessments (Bergstrom & Gershon, 1995; Cauldwell, 2020). Establishing psychometric properties for Standardised assessments ensures that the information gained using the instrument could provide a firm foundation for making the right decisions (Muralidharan, 2018). It is also useful for subsidising the selection of valid and reliable tools to ensure assessment quality (Souza *et al*., 2017; Ghazali, 2017).

As shown in Figure 5, the fourth tab for each item developed on FastTest is the comment tab, which allows the item writer to leave comments on an item.

It also allows item writers to communicate with item reviewers by making comments on items during the item writing process, being an important stage in the item development process.

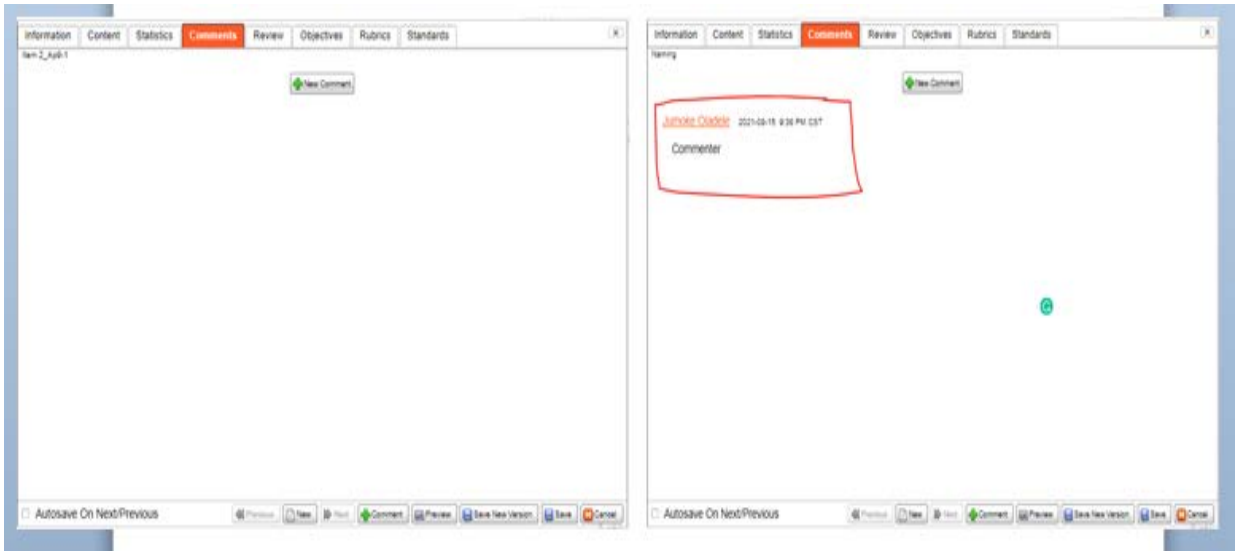


Figure 5: Comment Tab; **Source:** FastTest, v3.75.43

As shown in the right pane of Figure 5, each added comment identifies the ID of the commenter for record and tracking purposes. This function shows that the FastTest platform provides functionalities that help keep tabs on who did what, irrespective of operational distance, allowing for full accountability of all activities carried out on the platform in the test development process. With this, concerns with working from different locations are allayed as the record of each user on the platform is stored and trackable. This function gains more relevance in the Covid-19 pandemic era with restrictions to curb the spread of the covid-19 virus as work can continue from home to avoid the abrupt shut down of testing related activities as currently experienced in some countries such as South Africa (The Presidency, Republic of South Africa, 2020). As shown in Figure 6, the fifth tab provided for each item developed on FastTest is the review tab. Like the comment tab, the review tab allows item reviewers to give item writers feedbacks on an item. It also allows item reviewers to communicate with item writers by making review comments on items during the item review process, being an important stage in the item development process.

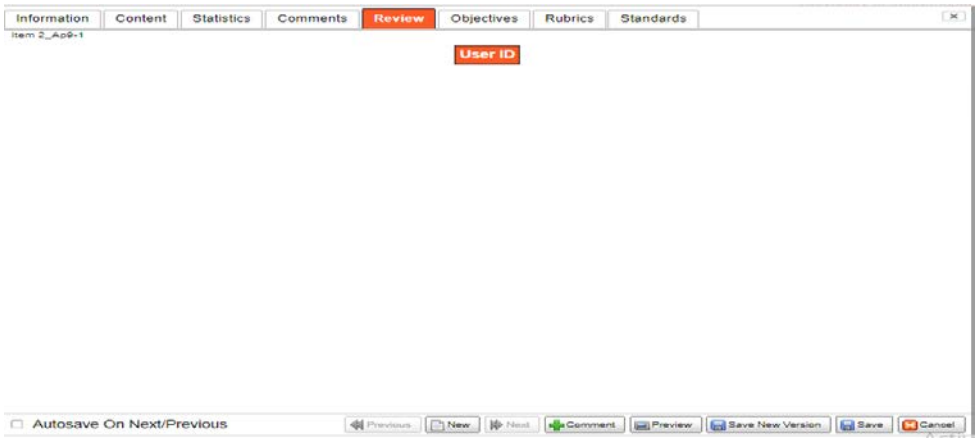


Figure 6: Review Tab; **Source:** FastTest, v3.75.43

As shown in Figure 6, the review tab shows the results of the Item Review process which is also an essential step in item banking. For example, a pool of experts could be required to leave an Angoff rating for each item as a review field. They can also be required to vote on things like Bloom's Taxonomy; Bloom's Taxonomy which is concerned with the plan for scripting items for a test using a table of specification (TOS) which is an operational guide to ensure that a test addresses what it sets out to address (Oladele & Ndlovu, 2021). Each reviewer will have their user ID saved for each item. FastTest being an online application, this function allows for seamless communication among item writers and reviewers assigned to the same task irrespective of their location, which goes a long way to support the rapidly changing world of work, some due to circumstance or happenstance. The sixth tab is the objective tab, as shown in Figure 7.

Figure 7: Objective Tab; **Source:** FastTest, v3.75.43

As shown in Figure 7, the objectives are created within item categories, and this can be linked directly with the specified learning objectives of the subject for which items are being developed. This function ensures written items have a direct relationship with pre-specified learning objectives, which impacts the quality of the items. It also goes a long way in informing the decisions made by item reviewers. The seventh tab is the Rubrics tab, as shown in Figure 8. A rubric is used to evaluate all open-ended response questions in FastTest. The rubrics function applies to manually scored items applicable to some response types such as short answers and essays.

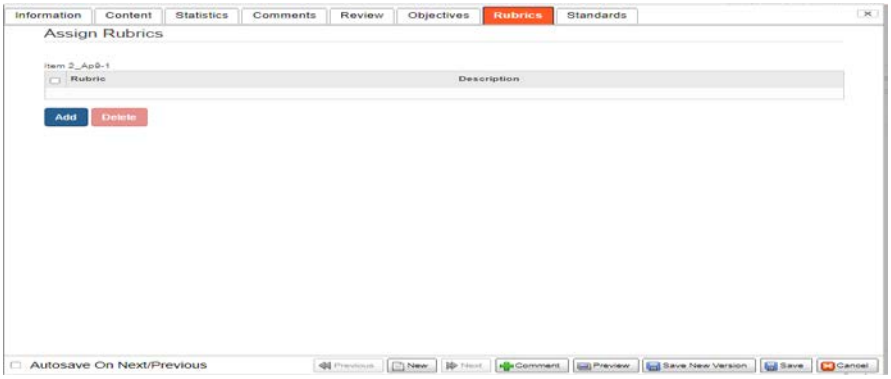


Figure 8: Rubrics Tab' **Source:** FastTest, v3.75.43

As shown in Figure 8, a test that includes this item type must attach a rubric to each item. The rubrics tab allows users to access rubrics, which can only be created when Item Marking has been activated. Once

the rubric is in use, you cannot delete or modify it from the Item Marker. Worthy of note is that one item can have multiple rubrics, and at any point in time, rubrics can be added or deleted from the item and can also be reused. The specified rubrics guide item markers and are useful when multiple markers are assigned to open response format items. This function shows that FastTest is carefully designed to cater to how items would be scored right from the item writing stage, which is an important procedure with standardised assessment. The eighth tab is the Standard tab, as shown in Figure 9.

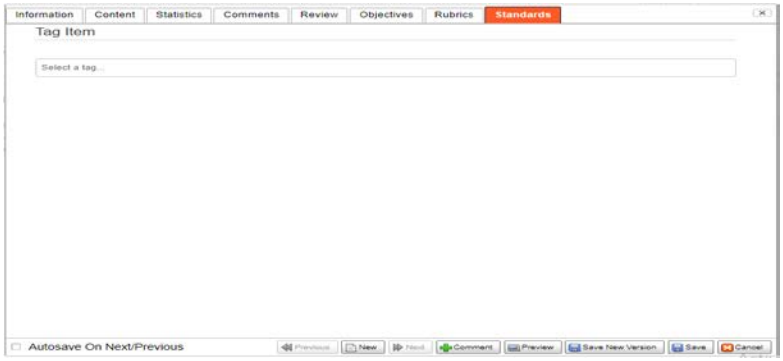


Figure 9: Standard Tab'; **Source:** FastTest, v3.75.43

The standard function is used to assign items to educational standards or curriculum, such as the Common Core in the United States of America. Administrators can upload the curriculum and then authors can assign the items they write. This function helps to ensure that written items aligned to the curriculum. It is also important in facilitating effective communication among item writers, editors and reviewers in the item development process, especially when the concerned individuals have to work remotely from different locations. As shown in Figure 1, sub tabs labelled 2 to 7 allow item writers to view, edit, delete, specify item workflow, and sync and import items, respectively. These functions allow the item writer to have full charge of item writing activities carried out on FastTest. FastTest defines user-specific roles for workspace and item bank, as shown in Figure 10.

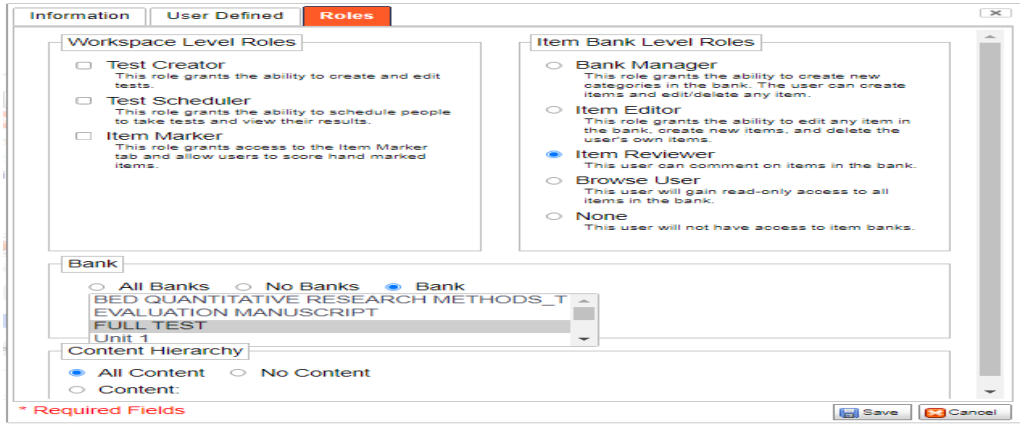


Figure 10: Standard Tab; **Source:** FastTest, v3.75.43

As shown in Figure 10, with the workspace level user-specific function in place, a high level of accountability is ensured in the workspace. This function shows that FastTest provides for the

collaborative effort of several experts to ensure that the final examination includes the right number of items organized into the right categories (Yardstick, n.d.). This function is especially useful for ensuring real-time monitoring of an organizational workforce in the face of remote operations as to whom to do what can be specified seamlessly. Similarly, the item bank-level user-specific function ensures item bank security, thereby eliminating the fear of undue exposure of items, which is an important factor with Standardised assessments. Furthermore, the FastTest electronic item banking platform has a comprehensive and easy to understand user manual and tutorials accessible with the licensed version of the application, as shown in Figure 11.

Figure 11: FastTest User Manual and Tutorial Links; **Source:** FastTest, v3.75.43

As shown in Figure 11, the user manual and tutorials are embedded as web links on FastTest as shown in the circled area, which is available to item writers at the point of need. It also encourages self-learning and resulting in cost-saving advantages for organizations concerning staff training and development. This function shows that FastTest provides an efficient ecosystem for electronic item development, which can be trusted by educational institutions and assessment bodies as a solution to the struggle to cope with the fast pace of digital innovations. This experience in the education sector has been compounded for many examination bodies by the Covid 19 pandemic lockdown measures (Oke & Fernandes, 2020).

5. Decision process for Electronic Item Banking

Electronic item bankers usually incorporate a complete point-and-click interface to allow the test developer to interact with a database structure designed specifically for item banking and test assembly, which can incorporate a range of types of graphic displays in items. With electronic item banking, it is important to decide on procedural implementations. Decisions can either be for developing a platform from scratch or adopt/adapt existing platforms. Penprase (2018) explained a significant time lag for the technology to be fully adopted or adapted to a level that provides quantifiable impacts on productivity whenever new technologies are introduced into an economy. This lag between technological innovation and productivity growth has been called a productivity paradox and has been attributed to the time it takes for training and experimentation with new technology to widely disseminate throughout society. The availability of item banking software is rather limited because developing an item bank can involve investing a great amount of time and effort. The availability of a good item banking software tool that facilitates instantiation and maintenance of high-quality item banks significantly reduces the effort and expense of preparing new items for educational assessment purposes (Bani-Ahmad, 2017). As such, a

decision for developing a platform from scratch must emanate from empirical evidence arrived at through Design and development Research on Products and tool, which typically involves situations in which the design and development process used in a particular situation, is described, analyzed, and a final product is evaluated. In the experimentation phase, provision must be made for necessary sections such as Item Identification, Item Type/classification, References, Authorship, Item Status/dates, Equivalent Items, comments and cases, Distractors, and other User-Defined Fields as deemed appropriate. These requirements show that much work goes into developing a platform from scratch with the need for software development experts and ample time to fully realise the impacts of technology on educational developments, as shown by past experiences (Atkeson & Kehoe, 2007). The procedure also requires a good number of times for the development and test run of such platforms. Another option is to opt to adopt or adapt existing platforms readily available in the software market. This option takes off the burden of time and error that comes with software design. A cost-benefit evaluation of the needed resources for developing a platform from scratch and purchasing existing platforms is needed to make final decisions.

6. Benefits of Electronic Item Banking

While there are no absolute standards in creating and managing item banks, best practice guidelines are emerging in the availability of electronic item banking platforms. According to Assessment Systems (2017) and Thompson (2021), some of the benefits of electronic item banking are listed below:

1. Items are reusable objects; when selecting an item banking platform, it is important to ensure that items can be used more than once; ideally, item performance should be tracked not only within a test form but also across test forms.
2. Item history and usage is tracked; the usage of a given item, whether it is actively on a test form or dormant waiting to be assigned, should be easily accessible for test developers to assess, as the over-exposure of items can reduce the validity of a test form. As you deliver your items, their content is exposed to examinees. Upon exposure to many examinees, items can then be flagged for retirement or revision to reduce cheating or teaching to the test.
3. Items can be sorted; as test developers select items for a test form, they must sort items based on their content area or another categorisation method to select a sample of items representing the full breadth of constructs we intend to measure.
4. Item versions are tracked; as items appear on test forms, their content may be revised for clarity. Any such changes should be tracked, and versions of the same item should have some link between them to easily review the performance of earlier versions in conjunction with current versions.
5. Review process workflow is tracked; as items are revised and versioned, it is imperative that the changes in content and the users who made these changes are tracked. In post-test assessment, there may be a need for further clarification and the ability to pinpoint who took part in reviewing an item and expedite that process.

6. Metadata is recorded; any relevant information about an item should be recorded and stored with the item. The most common applications for metadata that we see are author, source, description, content area, depth of knowledge, IRT parameters, and CTT statistics, but there are likely many data points specific to your organisation that are worth storing.
7. Electronic item banking is a sure door to a seamless electronic test delivery either as linear, sequential, or adaptive forms.

7. Implications of the Fourth Industrial Revolution for Electronic Item Banking

Technology innovations have impacted all the facets of human endeavor well responded to in business operations with gradually and compelling evidence on the education sector. The Fourth Industrial Revolution (4IR) was described as a fusion of many technologies, perceived to blur the boundaries between the physical, digital, and biological spheres (Oke & Fernandes, 2020). They stressed that digital technology underpinning 4IR is beyond the use of computers and e-materials and should be compatible with the learner-centered approach to enhance students' learning experience. They further explained that while the application of digital technology is gradually becoming a reality in many operations and services, the trends, and consequences, including the future of technological innovations, especially in the education sector, remain unknown. Without understanding the full capability of the new digital technology, it is unlikely to estimate its application and consequences, considering the scale, scope, speed, and complexity of its disruptive attributes. A framework for 4IR was described as systems-oriented, empowering, carefully designed and values laden (Aikman, 2017). There is no gainsaying the industrial revolutions from the very first must continue to make remarkable changes to the world of work, with the 4IR having an unprecedented and occurs at a faster trajectory compared to the past revolutions (Ringel *et al*., 2018; Penprase, 2018; Oke & Fernandes, 2020). Corporate leaders aren't the only ones who need to consider adjusting to the new world the 4th Industrial Revolution is ushering in. Educators, schools, government officials, and parents must re-think education and prepare the next generation to take advantage of the plethora of opportunities and overcome the challenges that are enabled by ever-increasing technological change (Butler-Adam, 2018; Marr, 2019). With future developments, particularly in the education sector, innovation can enhance human skills through artificial intelligence, data analytics, and algorithms to reduce time-consuming and complex tasks through modelling/simulations. This benefit is what FastTest application for item banking brings to the table for educational assessments. However, education providers are advised not to be complacent; instead, they should be forward-thinking in evolving with the ongoing digitalization, especially in harnessing its predictive capability, not to be left behind in the new adventure.

The components of 4IR, highlighted by Rüßmann *et al*. (2015), representing the nine pillars of digital innovation: autonomous robots, simulation, horizontal and vertical system integration, internet of things, cyber security, cloud, additive manufacturing, and augmented reality, and big data and analytics. FastTest application for item banking integrates these

pillars in its operations, making it at par with the 4IR for the educational sector in terms of Standardised assessments. Oke and Fernandes (2020) explained that the categorization of 4IR suggest that its adoption is not restricted to the use of a computer, especially in the education sector, and may involve other opportunities, such as the development of an ecosystem that may facilitate sharing of learning materials and data analytics to understand learners' teaching needs possible through assessments using technology-driven platforms, such as FastTest that enables the sophistication of connected platforms and network devices that can improve leveraging on possibilities that come with the 4IR. The education sector is struggling to cope with the fast pace of digital innovations, particularly experienced with the postponement of examinations in many sub-Saharan African countries due to the Covid-19 Pandemic (Oke & Fernandes, 2020; Oladele *et al.*, In Press). Studies showed that the education sector had leveraged the possibilities of 4IR with teaching and learning well the sub-Saharan African continent through adopting massive open online open courses and online, tech-enhanced teaching trial tested for higher education and student-centered learning pedagogies that priorities collaboration (Penprase, 2018; Oke & Fernandes, 2020). Item authoring and administration can be efficiently streamlined with the right education technology with timesaving and readily accessible report benefits (ExamSoft, 2021). Actualizing the gains for educational assessments are yet to be explored, evident in the continuous use of paper-pencil item writing and banking for both teacher-made and Standardised assessments. The legitimacy of electronic item banking further gains importance for the sub-Saharan African continent, with most of the region lagging in the bottom half of the Networked Readiness Index rankings; a measure of the propensity for Countries to exploit and benefit from the opportunities offered by information and communications technology which is an integral part of the 4IR (Rüßmann *et al*., 2015; Dutta *et al*., 2015). Therefore, adopting existing platforms would aid in catching up with other regions of the world while ensuring continuous learning in the adoption process. Adopting FastTest for electronic item banking could be one of the approaches for the education sector, especially in Africa, to ensure that 4IR capabilities are augmented in the teaching-learning process and resulting assessment practices for ascertaining the extent to which learning outcomes have been achieved and for certification.

8. Conclusion and Recommendations

This evaluation study reveals that FastTest for electronic item banking has carefully integrated algorithm, data analytics, and internet of things (IoTs) which are pillars of 4IR in the functioning of the application. Premised on the evaluation carried out, this study concluded of FastTest as an appropriate platform that can be adopted for electronic item writing to enjoy its benefits of 4IR for the educational sector in terms of Standardised assessments. Based on this conclusion, the following recommendation that FastTest should be embraced for electronic item banking in response of the education sector to changes that are happening in our world in transforming educational assessment practices as a reception to the trend of the 4th industrial revolution to catch up with the rest of the world. This recommendation will also help to equip

educational assessment bodies with the needed technology for continuing seamless work activities, which would avert complete short down of educational assessment activities in the face of the form of world happenstances that may result in world activity shut down as experienced with the Covid-19 Pandemic; FastTest being an online application. Also, adopting FastTest for electronic item banking would ensure a 4IR compliant educational assessment workforce with skills required to implement, manage and work collaboratively with the emerging technologies.

References

Advanced group for information technology-AGI (2014). *Item Banking Management Platform (IBMP) Basic Edition.* http://www.agiteq.com/Products/BasicItemBanking

Aikman, D. (2017). *The Fourth Industrial Revolution.* Paper presented at World Economic Forum, Annual Meeting in Davos.

Anh, V. T. K. (2018). Evaluation models in the educational program: Strengths and weaknesses. *VNU Journal of Foreign Studies, 34*(2), 92-103. https://doi.org/10.1177/1098214018783068

Assessment Systems (2017). *What is Item Banking? How can it improve my assessment?*https://assess.com/2017/04/12/item-banking-can-improve-assessment/

Thompson, N. (2021, Jul 22). *Introduction to Item Banking - How To Develop Better Exams With Professional Assessment Software.* Assessment Systems https://www.youtube.com/watch?v=HS-sJTwIGso&t=2s

Atkeson, A., & Kehoe, P. J. (2007). Modelling the transition to a new economy: lessons from two technological revolutions. *American Economic Review, 97*(1), 64-88. https://discovery.ucl.ac.uk/id/eprint/10054399/1/Kehoe_Modeling%20the%20transition_EDITED.pdf

Aziz, S., Mahmood, M. & Rehman, Z. (2018). Implementation of CIPP Model for Quality Evaluation at School Level: A Case Study. *Journal of Education and Educational Development, 5*(1), 189-206.

Bani-Ahmad, S. (2015). X(Chi)-Pro Milestone for Windows 7 and Windows 8. Version 5. For Windows Operating System. http://dx.doi.org/10.13140/RG.2.1.5053.8484

Bani-Ahmad. S. (2017). X-Pro Milestone: Comparative Evaluation against Similar Software Tools, Current Status, and Planned Future Directions". *Creative Education (CE), 8*(4), 627-649. http://dx.doi.org/10.4236/ce.2017.84048

Bergstrom, B. A. & Gershon, R. C. (1995). "8. Item Banking" Licensure Testing: Purposes, Procedures, and Practices. 13. https://digitalcommons.unl.edu/buroslicensure/13

Bergstrom, B. A., & Gershon, R. C. (1995). 8. Item Banking. https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1012&context=buroslicensur e

Brown, G. T., & Hattie, J. (2012). The benefits of regular standardised assessment in childhood education: guiding improved instruction and learning. *In Contemporary debates in childhood education and development* (pp. 301-306). Routledge.

Butler-Adam J. (2018). The Fourth Industrial Revolution and education. *South African Journal of Science, 114*(5/6). http://dx.doi.org/10.17159/sajs.2018/a0271

Cauldwell, R. (2020). FastTest User Manual Overview and Administration. Assessment Systems. https://assesshelp.zendesk.com/hc/en-us/articles/360042453531-Preliminaries- and-Overview.

Daramola, D. S., Oladele, J. I., & Owolabi, H. O. (2019). Effect of Assessment for Learning Strategy on Children's Learning Outcomes in Mathematics in Private-Owned ECCE Centers in Ilorin South Local Government Area, Kwara State. *International Journal of Psychology and Education, 3*(03), 83-96. http://publications.uew.edu.gh/2015/sites/default/files/Daramola%2C%20Jumoke%20and%20Ow olabi.pdf

Dutta, S., Geiger, T., & Lanvin, B. (2015). The global information technology report. In the World Economic Forum, 1(1), 80-85. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.357.1969&rep=rep1&type=pdf

Efendi, Y. (2015). Developing Interactive Multimedia for "Interlanguage: English for Senior High School Students Grade X" at SMAN 6 Yogyakarta. A Published Thesis, State University of Yogyakarta. https://core.ac.uk/download/pdf/33528647.pdf

ExamSoft (2021). *How to Leverage Education Technology to Improve Learning and Assessments*. https://examsoft.com/resources/leverage-technology-improve-learning-assessments

Frye, A. W., & Hemmer, P. A. (2012). Program evaluation models and related theories: AMEE guide no. 67. *Medical Teacher, 34*(5). https://doi.org/10.3109/0142159X.2012.668637

Ghazali, N. H. C. M. (2017). Exploring the Conceptual and Psychometric Properties of Alternative Assessment using the Rasch Measurement Model. *International Journal of Academic Research in Business and Social Sciences, 7*(11), 1213-1224. http://dx.doi.org/10.6007/IJARBSS/v7-i11/3559

Ghofur, A., & Youhanita, E. (2020). Interactive media development to improve student motivation. IJECA (International Journal of Education and Curriculum Application), 3(1), 1-6. https://doi.org/10.31764/ijeca.v3i1.2026

Glaister, K. (2007). The presence of mathematics and computer anxiety in nursing students and their effects on medication dosage calculations. *Nurse education today, 27*(4), 341-347. https://doi.org/10.1016/j.nedt.2006.05.015

Hodder Education (n.d.). RS Assessment. www.hoddereducation.co.uk/rsassessment

Marr, B. (2019, May 22). Things Every School Must Do To Prepare For The 4th Industrial Revolution. https://www.forbes.com/sites/bernardmarr/2019/05/22/8-things-every-school-must-do-to-prepare-for-the-4th-industrial-revolution/?sh=ae4622d670cd

Muralidharan, N. (2018, Apr 12). *Psychometric Properties of a Test: Reliability, Validity and Norming.* Mercer|Mettl. https://blog.mettl.com/psychometric-property-reliability-validity/

Oke, A. & Fernandes, F. A. P. (2020). Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). Journal of Open Innovation: Technology, Marketing and Complexity, 6(31), 1-22. https://doi.org/10.3390/joitmc6020031

Oladele, J. I., & Ndlovu, M. (2021). A Review of Standardised Assessment Development Procedure and Algorithms for Computer Adaptive Testing: Applications and Relevance for Fourth Industrial Revolution. International Journal of Learning, Teaching and Educational Research, 20(5). https://doi.org/10.26803/ijlter.20.5.1

Olorunlero, J. I. (2013). Evaluation of Access to Universal Basic Education in Kabba/Bunu Local Government Area of Kogi State Nigeria. An unpublished Masters Dissertation, University of Ilorin, Nigeria.

Penprase, B. E. (2018). The Fourth Industrial Revolution and Higher Education. In N. W. Gleason (ed.), *Higher Education in the Era of the Fourth Industrial Revolution,* https://doi.org/10.1007/978-981-13-0194-0_9

Picciotto, R. (2019). Is Adversary Evaluation Worth a Second Look? *American Journal of Evaluation, 40*(1) 92-103. https://doi.org/10.1177/1098214018783068

Richey, R. C., & Klein, J. D. (2014). Design and development research. In Handbook of research on educational communications and technology (pp. 141-150). Springer, New York, NY.

Ringel, M.; Zablit, H.; Grassl, F.; Manly, J.; Möller, C. (2018). *The Most Innovative Companies in 2018: Innovators Go All in on Digital.* The Boston Consulting Group. http://image-src.bcg.com/Images/BCG-Most-Innovative-Companies-Jan-2018_tcm38-179354

Rüßmann, M.; Lorenz, M.; Gerbert, P.; Waldner, M.; Justus, J.; Engel, P.; Harnisch, M. (2015). *Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries. The Boston* Consulting Group.

Siemieniecka, D., Kwiatkowska, W., Majewska, K., & Skibińska, M. (2017). The potential of interactive media and their relevance in the education process. Psycho-Educational Research Reviews, 1-10. https://files.eric.ed.gov/fulltext/EJ1254649.pdf

Souza, A. C. D., Alexandre, N. M. C., & Guirardello, E. D. B. (2017). Psychometric properties in instruments evaluation of reliability and validity. *Epidemiologia e Serviços de Saúde,*

26, 649-659. https://doi.org/10.5123/S1679-49742017000300022

Stufflebeam, D. (2001). Evaluation models. *New directions for evaluation, 89,* 7-98. https://wmich.edu/sites/default/files/attachments/u58/2015/Evaluation_Models.pdf

Stufflebeam, D. L. (2003). The CIPP Model for Evaluation. In T. Kellaghan, D. L. Stufflebeam, & L. A. Wingate (Eds.), International Handbook of Educational Evaluation (pp. 31–62).

The Presidency, Republic of South Africa (2020). Statement by President Cyril Ramaphosa on South Africa's response to the coronavirus pandemic. https://bit.ly/3mezqlz

Weiss, D.J. (2013). Item Banking, Test Development, and Test Delivery. In K.F. Geisinger (Ed.) The APA Handbook on Testing and Assessment. Washington DC: American Psychological Association. https://www.assess.com/docs/Weiss_Handbook_Chapter.pdf

Woessmann L. (2007), 'International Evidence on School, Competition, Autonomy and Accountability: a Review'. *Peabody Journal of Education, 82*(2-3), 473-497.

World Economic Forum. (2017). "Realising Human Potential in the Fourth Industrial Revolution – An Agenda for Leaders to Shape the Future of Education, Gender and Work". Paper presented at World Economic Forum, Geneva. Dordrecht: Kluwer Academic Publisher.

X-Pro Milestone (n.d.). Why X-Pro Milestone. https://sites.google.com/site/theexprosite/why-x- pro-milestone?authuser=0

Yardstick (n.d.). *Stage 2: Item Development.* Yardstick whitepapers. https://pages.getyardstick.com/hubfs/content/YS_Whitepaper_Stage%202.pdf

Yüksel, I. (2010). How to Conduct a Qualitative Program Evaluation in the Light of Eisner's Educational Connoisseurship and Criticism Model. *Turkish Online Journal of Qualitative Inquiry, Online Submission, 1*(2), 78-83. https://files.eric.ed.gov/fulltext/ED537765.pdf