

Quality Evaluation Tools For Learning Objects: A Case Of Engineering Tuition in an ODL Setting

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Abstract: This research investigates the application of Learning Objects (LOs) in enhancing the delivery of educational content through multimedia approaches, particularly within the contexts of Open Distance Learning (ODL) and engineering education. The quality of LOs employed in these settings is critical, as it can significantly impact student comprehension, influencing both successful qualification completion rates and attrition rates within specific fields of study. The study aims to evaluate whether the current criteria used to assess LOs are sufficient and appropriate for the teaching and learning (T&L) of engineering disciplines. A technology scorecard for various LO technologies is developed, and the assessment is conducted using the Learning Object Review Instrument (LORI) criteria. The findings from this assessment are then analysed against the Engineering Council of South Africa (ECSA) module outcome criteria to determine whether the existing LORI criteria are suitable for measuring the acceptable quality levels of LOs in engineering T&L. The research adopts a qualitative methodology, with the establishment of a technology scorecard being a key component. The study's outcomes will reveal whether the LORI criteria are adequate and appropriate for assessing the quality of LOs in engineering education. If inadequacies are identified, the research will highlight these gaps and propose recommendations for addressing them. Ultimately, the study aims to establish a new, refined framework for assessing the quality of LOs in engineering T&L contexts.

Keywords: LORI, LO, Engineering, Technology scorecard, ODL

1. Introduction

The technology scorecard will systematically evaluate various educational technologies, particularly those utilized in industrial engineering (IE) tuition. The evaluation criteria applied within the scorecard are derived from the Learning Object Review Instrument (LORI), a framework specifically designed for the assessment of Learning Objects (LO). The scorecard focuses on key issues addressed by LORI, applying these criteria to assess the effectiveness of the technologies in question. Significant challenges exist in the evaluation process, primarily due to the inherent difficulty in developing a universal review tool. Thus, it is essential to balance assessment validity to ensure comprehensive evaluation. Similar to LORI, the scorecard is based on broadly interpreted dimensions that aim to support and emphasize the strengths, weaknesses, opportunities, and threats (SWOT) associated with the technologies evaluated. Evaluation methods are rarely chosen without considering the specific context (Georghiou & Roessner, 2000), and LORI represents a globally recognized, unbiased approach to LO assessment. The general dimensions of the scorecard encompass the functionalities of the technologies, captured through thematic categories and corresponding evaluation scores, which are represented by specific indicators. For example, when evaluating a particular technology, the indicator will reflect a value (ranging from 1 to 5, as stipulated by Krauss and Ally (2005) for LORI) that quantifies the significance of a particular attribute of the technology as defined by the theme. This research seeks to address the question: Are the current criteria employed in the Learning Object Review Instrument (LORI) adequate and appropriate for assessing the quality of Learning Objects (LO) used in industrial engineering teaching and learning within an Open Distance Learning (ODL) environment?

The research objectives are as follows:

- To evaluate the effectiveness of the LORI criteria in assessing Learning Objects specifically used in Industrial Engineering education within an ODL environment.
- To develop a technology scorecard to classify various LO technologies used in engineering teaching and learning.
- To compare the results of the LO assessment against the Engineering Council of South Africa (ECSA) module outcome criteria to determine alignment with engineering educational standards.
- To identify any gaps in the LORI criteria concerning engineering-specific Learning Objects.
- To provide recommendations for refining the LORI criteria or developing a new assessment framework to ensure the adequacy and appropriateness of LO quality assessment for engineering education.

2. Literature Review

The literature review conducted for this study synthesizes insights from various scholarly articles to inform the development of a technology scorecard and the selection of evaluation criteria. Among the various frameworks considered, the Learning Object Review Instrument (LORI) emerged as particularly suitable for the task due to its comprehensive and well-established criteria. The evaluation process outlined in this study is grounded in a systematic approach that emphasizes key aspects such as accessibility, operability, and support. These dimensions are crucial for ensuring that the technologies assessed can be effectively utilized in educational settings, particularly within the context of Industrial Engineering (IE) and Open Distance Learning (ODL). To maintain consistency across evaluations, the criteria used in the scorecard were adapted from LORI, as suggested by Krauss and Ally (2005), to create a more uniform assessment tool. The variables and criteria chosen for this scorecard are operationalized by asking targeted questions that facilitate the assessment of risks associated with the strengths, weaknesses, opportunities, and threats (SWOT) confronting the technology in question (McGrath & McMillan, 2004). The evaluation criteria are rooted in the behaviourist model of learning, similar to the LORI framework, which is based on the theory of stimulus and response (Krauss & Ally, 2005). This theoretical foundation aligns with the focus on measurable outcomes and observable behaviours, which are central to both behaviourist pedagogy and effective technology assessment. Moreover, to address the diverse learning needs of students and to enhance the learning experience, a variety of resources including digital technologies are integrated into the assessment framework. These resources employ a mix of media and methods, allowing for adaptability to different educational contexts and the accommodation of learner differences (Akkpınar, 2008). However, it is important to acknowledge that the scorecard, while valuable, is not an exhaustive evaluation tool. It is not based on rigorous scientific evidence, and it does not account for potential human errors, as its assessments are largely dependent on the subjective opinions of users (Hodges & Repman, 2011). In recent years, the integration of digital technologies in education has gained momentum, particularly in engineering and distance learning environments. For instance, Martin et al. (2020) underscore the importance of adaptability and usability in educational technology assessments, highlighting the need for frameworks like LORI that can be tailored to specific contexts. Similarly, Sanchez et al. (2019) argue for the inclusion of user experience (UX) as a critical component in evaluating educational technologies, reinforcing the emphasis on accessibility and support in technology assessments. Cheng et al. (2018) have extended this framework by integrating cognitive and constructivist elements into the evaluation process, thereby enhancing its applicability across diverse educational settings. Their work demonstrates that a multi-dimensional approach, which includes behaviourist, cognitive, and constructivist perspectives, provides a more holistic assessment of educational technologies. Moreover, to address the diverse learning needs of students and to enhance the learning experience, a variety of resources including digital technologies are integrated into the assessment framework. However, it is important to acknowledge that the scorecard, while valuable, is not an exhaustive evaluation tool. It is not based on rigorous scientific evidence, and it does not account for potential human errors, as its assessments are largely dependent on the subjective opinions of users (Hodges & Repman, 2011). Wang & Kang (2022) caution that subjective biases and the lack of empirical validation can limit the effectiveness of such tools, suggesting that future research should focus on developing more objective and evidence-based evaluation methods.

3. Methodology

3.1 Research Design

This study employs a qualitative research design, integrating a literature review and the development of a technology scorecard to evaluate Learning Objects (LO) used in Industrial Engineering (IE) and Open Distance Learning (ODL) environments. The research is exploratory, focusing on the applicability and adequacy of the Learning Object Review Instrument (LORI) criteria in assessing educational technologies. The methodology includes a detailed examination of existing literature, the selection and adaptation of evaluation criteria, and the application of these criteria through a structured scorecard.

3.2 Development of the Technology Scorecard

Based on the insights gained from the literature review, a technology scorecard was developed to assess the quality of Learning Objects in IE and ODL settings. The scorecard was designed to evaluate key dimensions such as accessibility, operability, and support, following the criteria outlined in the LORI framework. To ensure consistency, the LORI criteria were adapted, as suggested by Krauss and Ally (2005), to better fit the context of this study. The scorecard was further refined to include questions that assess the SWOT (Strengths, Weaknesses, Opportunities, Threats) of each technology, as per the methodology proposed by McGrath and McMillan (2004).

3.3 Application of the Scorecard

The developed scorecard was applied to various educational technologies used in IE and ODL environments. Each technology was evaluated against the modified LORI criteria, with specific attention given to the behaviourist learning model, which underpins the LORI framework. The evaluation process involved assigning scores to each technology based on predefined indicators, which measure the significance of attributes such as accessibility, operability, and support. Scores were assigned on a scale of 1 to 5, in line with the scoring system recommended by Krauss and Ally (2005).

3.4 Data Analysis

The data collected through the application of the scorecard were analysed to determine the adequacy and appropriateness of the LORI criteria in assessing the quality of Learning Objects in IE and ODL settings. The analysis involved comparing the evaluation scores with the Engineering Council of South Africa (ECSA) module outcome criteria to assess alignment with engineering educational standards. Any gaps identified in the LORI criteria were documented, and recommendations for refining the criteria or developing a new assessment framework were formulated. In order to factor in a wide variety of averages an inclusive range is developed and applied. The range divides the scores from meet or exceeds (3.0) to excellent (5.0) into six categories. It was highlighted in the discussion that some the technologies assessed above could actually score higher once proficiency in using the tool is achieved. Therefore the experimentation time can disadvantage the technology rating in that it is scored a 3.5 but it can actually be a scored a five. This is due to the ability of the user to navigate through the technology in the early stages of the experiment. When ranking is spread over a wider average most the technologies assessed above are upgraded to a higher score, as depicted below.

Table 1: Rating scale description (Cochrane, 2005)

Rating	Comments
4.5 – 5.0	Excellent
4.0 – 4.5	Very Good – Definite recommended
3.5 – 4.0	Good – will be recommended to use again
2.5 – 3.5	Adequate – meets minimum stds
2.0 – 2.5	Difficult – likely would not apply
2.0	Difficult - Does not meet minimum standards
1.0	Unsatisfactory - Not worth using

The technologies evaluated in this scorecard encompass a range of tools and platforms across different categories. These include content curation tools such as Content Gems and List, Web 2.0 tools like Diigo and Edmodo, disruptive technologies represented by MOOCs, mobile technologies exemplified by PDA, and asynchronous technologies such as Google Classroom. Additionally, the scorecard assesses synchronous technologies, specifically audio clips, digital game-based learning platforms, exemplified by educational games, learning management systems (LMS) like A-Tutor, and multimedia tools such as podcasts.

The scorecard uses eight themes, weighing equally and they are explained below.

Content Quality: Veracity, accuracy, balanced presentation, ideas, and appropriate level of detail. A learning resource is of no use if it is well designed in all other respects, but its content is inaccurate or misleading (Leacock & Nesbit, 2007). Quality is defined, in this case, as content validity, potential effectiveness as a teaching tool and ease of use.

Learning Goal Alignment: Alignment among learning goals, activities, assessments, and learner characteristics. Frequently a learning and assessment mismatch is found, especially in instances where students are tested in in concepts that are remotely related to the course activities (Leacock & Nesbit, 2007). Improving instructional alignment between teaching and assessment can boost student achievement. Goal alignment provides a more efficient heuristic approach suitable for digital resources at a moderate level of granularity (Leacock & Nesbit, 2007).

Feedback and Adaptation: Adaptive content or feedback driven by differential learner input or learner modelling. Generating effective feedback and adapting to learner characteristics have been understood as

important goals for educational technology, this goal is partly motivated by the belief that adaptive teaching strategies are the key to reproducing very high achievement levels (Leacock & Nesbit, 2007).

Motivation: This aspect of technology affects the amount of effort that the user is willing to invest in working with the technology. Motivation is a function of value one places on a technology (Leacock & Nesbit, 2007).

Presentation design: Design of visual & auditory information for enhanced learning and efficient mental processing. Presentation design refers to the quality of exposition in technology or digital resources and it applies to all expository media (Leacock & Nesbit, 2007). Much of the science behind presentation design follows from the properties of human working memory, as addressed in cognitive load theory (Leacock & Nesbit, 2007).

Interaction Usability: Ease of navigation, predictability of the user interface, and quality of the interface help features. Usability has been recognized as a critical issue in software quality because usability efforts focus on error prevention (Leacock & Nesbit, 2007). To reduce the effort learners must invest in learning the technology; usable designs build on learner’s prior knowledge of common interface patterns and require recognition (Leacock & Nesbit, 2007).

Accessibility: Design of controls and presentation formats to accommodate disabled and mobile learners. There is an apparent widespread disregard for accessibility among developers of educational software (Leacock & Nesbit, 2007), a survey of major providers of instructional software found that there was no access provision in most products (Leacock & Nesbit, 2007). Therefore, people with a disability are disadvantaged.

Reusability: Ability to use in varying learning contexts and with learners from differing backgrounds. When a technology is designed for a diverse use, it is more likely that it is reusable. Reusability includes a consideration for the needs of diverse learners for example, those with different backgrounds, abilities and disabilities (Leacock & Nesbit, 2007).

3.5 Limitations

The study acknowledges that the technology scorecard is not an exhaustive evaluation tool. It is based on a qualitative assessment and relies on the subjective opinions of users, which may introduce bias. Furthermore, the scorecard does not account for human error, and its findings should be interpreted with caution.

4. Discussion

The technology scorecard provided a comprehensive evaluation of various Learning Objects (LOs) across multiple criteria relevant to engineering education within an Open Distance Learning (ODL) context. Each LO was assessed on dimensions critical to effective teaching and learning, including content quality, learning goal alignment, feedback and adaptation, presentation design, interaction usability, motivation, accessibility, and reusability. The average scores reflect the overall performance of each LO, offering insights into their strengths and weaknesses.

Table 2: Technology scorecard

5 = excellent 4 = very good 3 = adequate 2 = difficult 1 = unsatisfactory	Content-Gems	List	Diigo	A-Tutor	PDA	Classroom	Edmodo	Pot-cast	MOOC
Content Quality : Veracity ,accuracy , balanced presentation ideas, and appropriate level of detail	4	3	4	4	3	3	3	3	4
Learning Goal Alignment: Alignment among learning goals, activities, assessments, and learner characteristics	2	2	4	4	3	4	4	2	4

5 = excellent 4 = very good 3 = adequate 2 = difficult 1 = unsatisfactory	Content-Gems	List	Diigo	A-Tutor	PDA	Classroom	Edmodo	Pot-cast	MOOC
Feedback and Adaptation: Adaptive content or feedback driven by differential learner input or learner modelling	4	3	5	3	3	3	4	1	3
Presentation Design: Design of visual & auditory information for enhanced learning and efficient mental processing	2	2	4	3	3	3	4	2	3
Interaction Usability : Ease of navigation, predictability of the user interface, and quality of the interface help features	3	3	4	4	3	4	4	3	3
Motivation: amount of effort	4	4	5	4	4	4	4	4	4
Accessibility : Design of controls and presentation formats to accommodate disabled and mobile learners	3	3	3	3	2	3	3	2	2
Reusability : Ability to use in varying learning contexts and with learners from differing backgrounds	4	4	5	4	4	4	4	5	5
Average Score	3.25	3.0	4.25	3.62	3.13	3.5	3.75	2.75	3.5

The assessment of content quality, which emphasizes the veracity, accuracy, and balanced presentation of ideas, yielded generally favourable results. Most LOs scored well in this area, with Content-Gems, A-Tutor, and MOOC each receiving a score of 4, indicating a high level of content quality. However, List and PDA lagged slightly behind with scores of 3, suggesting adequate but potentially improvable content accuracy and detail. The results suggest that while the content across most LOs is reliable and well-presented, there may be room for enhancing the depth and precision of content in some cases. Learning goal alignment, which assesses the coherence among learning objectives, activities, assessments, and learner characteristics, showed more variability. A-Tutor and MOOC achieved high scores (4), demonstrating strong alignment. In contrast, Content-Gems and List scored a low 2, highlighting potential misalignments that could hinder effective learning. These discrepancies indicate that some LOs may not be adequately tailored to meet the specific goals and needs of learners in an engineering education context, which could impair the effectiveness of the learning experience. In terms of feedback and adaptation, Diigo and A-Tutor stood out with a top score of 5, indicating excellent provision of adaptive content or feedback driven by learner input. This capability is crucial for personalizing the learning experience and ensuring that it meets the diverse needs of students. However, the poor performance of Pot-cast, with a score of 1, underscores a significant gap in its ability to provide meaningful, adaptive feedback. This lack of adaptability could result in a less engaging and effective learning experience for students, particularly in a field as dynamic as engineering. The design of visual and auditory information, essential for enhanced learning and efficient cognitive processing, was another area where variability was evident. A-Tutor again performed well, with a score of 4, suggesting that it offers a well-designed user experience that supports learning. Conversely, Content-Gems and List both scored 2, indicating potential difficulties in the presentation design that could hinder efficient

learning. These results suggest that while some LOs are effectively leveraging design principles to enhance learning, others may need to refine their visual and auditory elements to better support student comprehension and retention. Interaction usability, which measures the ease of navigation and the quality of the user interface, showed that most LOs are generally user-friendly, with scores ranging from 3 to 4. However, Pot-cast, with a score of 3, indicates adequate but not optimal usability, suggesting that improvements could be made to enhance user interaction. This is particularly important in an ODL setting, where the ability to navigate learning materials seamlessly can significantly impact student engagement and success. Motivation, assessed by the level of effort required from students, was consistently rated high across most LOs, with scores of 4 or 5. This suggests that the LOs are generally effective in engaging students and encouraging them to invest the necessary effort to achieve their learning goals. The uniformity in high motivation scores implies that the LOs are well-designed to sustain student interest and commitment, which is essential for successful learning outcomes in an ODL environment. Accessibility, focusing on the design of controls and presentation formats to accommodate disabled and mobile learners, showed mixed results. While most LOs scored around 3, indicating satisfactory accessibility, PDA and Pot-cast both scored 2, pointing to potential limitations in accommodating diverse learners. This is a critical area for improvement, as accessibility is paramount in ensuring that all students, regardless of their physical or technological constraints, have equal opportunities to engage with and benefit from the learning materials. Reusability, which measures the ability of an LO to be used in varying contexts and with learners from different backgrounds, was one of the highest-scoring categories, with several LOs, including Diigo, Pot-cast, and MOOC, receiving top scores of 5. This indicates that these LOs are versatile and can be effectively employed in multiple educational settings, enhancing their value and utility in diverse learning environments. However, PDA and Pot-cast's slightly lower scores in other areas suggest that while they are reusable, their overall effectiveness might be compromised by other factors. The average scores, which ranged from 2.75 to 4.25, provide a general indication of each LO's performance. Diigo and A-Tutor emerged as the top performers with scores of 4.25 and 3.75, respectively, reflecting their strengths across most evaluation criteria. On the other hand, Pot-cast and PDA scored lower overall, with 2.75 and 3.13, highlighting areas where significant improvements could be made to enhance their effectiveness as educational tools in engineering ODL contexts. All the technology tools chosen and assessed have a high motivation factor, which means the amount of effort that the user is willing to invest in working with the technology is high, this is a positive attribute for the technology because motivation is a function of value one places on a technology. Note that the reusability of technologies is high. Reusability includes a consideration for the needs of diverse learners for example, those with different backgrounds, abilities and disabilities (Leacock & Nesbit, 2007). PDAs have a consistent score across all themes in the scorecard, whereas podcast have the lowest score in the report. It must be noted that lowest score of the podcast does not rule out the use of multimedia podcast in learning, this is because the multimedia podcast are highly reusable and therefore desirable in teaching and learning. The consist scoring of PDAs is attributed to a wide spread of the technology and the fact that most users have gone through the learning curve in using the technology, there is some comfortability in using the technology. In terms of the product life cycle, the PDAs are at the maturity level. The scorecard is an objective and quantitative assessment tool. All themes carry equal weight, and the indicators reflect the same scoring for all themes. It is major finding to note that accessibility scored low amongst most technologies, but it is not surprising for there is an apparent widespread disregard for accessibility among developers of educational software, and in a survey of major providers of instructional software, it was found that there was no access provision in most products (Leacock & Nesbit, 2007). A very distinctive pattern of high scores in experienced with Web 2.0 technologies, i.e. Diigo and Emdodo. This supports the notion that Web 2.0 technologies have developed and have become accepted enough that transition to new ones is the next apparent move (Alexandra, 2006). One significant limitation of the scorecard is that scoring does not consider the effect of unfamiliarity with a particular technology application. The fact that when experimenting with the technology for the first few times, it is difficult, But once the user has gained proficiency in the application of the technology tools, then scoring can be upgraded to a 4 or 5. This lag in application proficiency is the time taken through a learning curve. Unless this biasness is factored out by widening the rating range of by any other statistical decision making method, rating and scoring will be skewed and might not reflect the true pictured as intended in the scorecard.

A-Tutor is an open-source web-based Learning Management System (LMS) designed for the development and delivery of online courses. This system allows instructors and administrators to install or update the software within minutes, create custom themes for aesthetic modifications, and extend its capabilities through various feature modules. Educators can efficiently compile, package, and disseminate web-based instructional content, import pre-packaged materials, and facilitate online courses. Students benefit from an accessible, adaptive, and social learning environment, making A-Tutor a suitable LMS due to the inherently social nature of educational

experiences (Kolowich, 2012). Its open-source foundation renders A-Tutor a cost-effective solution for both small and large organizations involved in content creation and web-based course delivery. Comprehensive assistance is available via documentation, support functions, or community forums. A-Tutor is utilized across multiple contexts, including online course management, continuous professional development for educators, career advancement, and academic research. The software is distinguished by its accessibility features, which are particularly beneficial for visually impaired and disabled learners and meets educational software evaluation criteria established by The American Society for Training and Development (ASTD). A-Tutor has international usage and has been translated into over fifteen languages, with support for more than forty additional languages under development. Initially released in late 2002, A-Tutor emerged from research conducted by the developer, which highlighted the inadequate accessibility of existing online learning systems for individuals with disabilities. The findings indicated that popular LMSs of the time did not meet basic accessibility guidelines, hindering full participation for visually impaired students and failing to support a holistic educational experience (Batson, 2012). The authoring tool within A-Tutor includes a web service for evaluating content accessibility according to various international standards. Additionally, the tool is designed to be accessible itself, enabling blind learners to create content. A-Tutor's design supports adaptability across various teaching and learning scenarios, with key features including customizable themes, privilege management systems, tool modules, and group functionalities. The theme system allows administrators to modify the system's appearance and layout to meet specific needs. The privilege system enables instructors to assign tool management rights to specific course members, such as assistants or tutors with limited control. A-Tutor's design prioritizes accessibility, incorporating features to support users of assistive technologies and conforming to international accessibility standards. The IMS/ISO Access for All support enables learners to customize the environment and content to their specific needs. At the University of South Africa (Unisa), a distance education institution employing a blended learning approach, A-Tutor will be implemented in an engineering module with 500 students. The module operates on a semester basis, with registration occurring biannually. The student demographic is diverse, ranging from 18 to 55 years, including both employed individuals and recent high school graduates. Students will need internet access, which Unisa provides through its ad hoc centres across South Africa. Assignments, tutorials, and course communications will be managed via A-Tutor, requiring students to download the LMS onto their computers, PDAs, and smartphones. Upon completion of the semester, all grades and assignment marks will be transferred to SAKAI for formal communication with students. The social learning aspects of A-Tutor are anticipated to facilitate student enrolment in the module, although current limitations include the lack of course material development for mobile devices.

Diigo is a tool designed to streamline the management of online information, addressing inefficiencies in browsing, researching, annotating, storing, organizing, and sharing digital content. This tool enhances productivity by offering features for effective reading and annotation, personal cloud-based library creation, webpage archiving, feedback provision, information organization, and collaboration. Users, ranging from individuals to teams, benefit from Diigo's functionalities, which include: annotation tools, Cloud-Based Library, Webpage Archiving, Feedback and Attention, Information Organization, Sharing Capabilities, and Collaborative Features. At Unisa, Diigo will be implemented in an engineering module with 500 students. The module operates on a semester basis, with registration occurring twice a year. The diverse student demographic, ranging from 18 to 55 years, will use Diigo to complement the SAKAI LMS. Traditional instruction will remain on SAKAI, while Diigo will enhance research and information management for the course.

Massive Open Online Courses (MOOCs) are self-paced, freely available online courses offered by leading universities. MOOC platforms, such as edX, facilitate technology-enhanced teaching and learning through a streamlined registration process and well-organized course materials. MOOCs typically feature video lectures, online discussion forums, and asynchronous Q&A platforms. Participants often form self-selected groups based on background or interest outside the MOOC platform, utilizing social media tools like Google Hangout and Facebook for additional collaboration (Kirschner, 2012). MOOC platforms offer anonymous course evaluations for participant feedback. MOOCs, such as the Analytics Edge, demonstrate the potential for global adult learning by accommodating large numbers of participants and scaling educational architecture. Given that the SAKAI LMS does not support MOOC functionality, an external LMS like Moodle or A-Tutor is required. Moodle, in particular, is recommended for its compatibility with SAKAI and document format consistency. At Unisa, MOOCs will be applied in an engineering module with 500 students, operating on a semester basis with biannual registration. The student demographic is diverse, ranging from 18 to 55 years. Students will need internet access, provided by Unisa's ad hoc centres across South Africa. The MOOC LMS will handle assignments, tutorials, and course communications, requiring students to download the LMS onto their computers, PDAs, and smartphones. At semester end, grades and assignment marks will be transferred to SAKAI for formal communication.

5. Conclusion

The findings from the technology scorecard suggest that while several LOs are well-suited for use in engineering education within an ODL framework, there are notable gaps, particularly in areas such as learning goal alignment, presentation design, and accessibility. Addressing these gaps will be crucial for ensuring that the LOs not only meet the quality standards required for effective teaching and learning but also support the diverse needs of students in this field. The variability in scores across different LOs underscores the importance of carefully selecting and possibly customizing LOs to align with the specific demands of engineering education, thereby optimizing student outcomes and reducing attrition rates. While the current assessment criteria provide a useful framework for evaluating LO quality, the results suggest that further refinement may be necessary to fully capture the unique requirements of engineering T&L in an ODL context. Future research should focus on developing and validating more targeted assessment tools that address these specific needs, ensuring that LOs effectively support the educational goals of both instructors and students in engineering disciplines. This paper provided an accurate and in-depth overview of the nine technologies, many of which were used for the first time and therefore new and unfamiliar. At the beginning, the capabilities of these technologies were not known and navigation through each of them was a daunting task but at the end, all of them were found adequate, good and excellent in application. The task of reviewing how these technologies can be applied in education led to an in-depth understanding of the attributes of each of the technologies and therefore an understanding of how they can benefit learners in an educational setting. Various rating were assessed and reviewed but the LORI criteria were found adequate to evaluate the technologies. The criteria include eight themes and an evaluation rating scale of 1 –to- 5. The widening of the rating scale range, proved to be able to reduce the effects of biased evaluation due to unfamiliarity to the capabilities of the technologies, and therefore different or more criteria could have been added to the evaluation score card. Based on suggestions of the various literature that encouraged an inclusion of system requirements, operability, interactivity, learner support and control, fun factor and achievement.

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