AI-Driven Framework for Academic Program Evaluation and Accreditation Standards

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Abstract

Academic accreditation plays a vital role in ensuring that educational programs meet high standards of quality, foster trust among stakeholders, and enhance institutional credibility. This research leverages artificial intelligence (AI) to develop a comprehensive framework for academic program evaluation and assessment to meet the accreditation standards and to provide data-driven recommendations for continuous quality improvement. To evaluate various aspects of an academic program, five key standards are considered: program management and quality assurance, teaching and learning, students, faculty, and learning resources, facilities, and equipment. Each standard is assessed using specific criteria and a clear rubric to categorize practices effectively. Following the evaluation, strength and weakness areas of the program are depicted and tailored recommendations are provided to enhance the quality of each standard based on program scores with emphasizing relevant key performance indicators (KPIs) for consideration to monitor progress within each standard. Finally, action plans on different levels are proposed to guide the leaders of the program and help them fulfill the set goals and be better prepared for the accreditation. This AI-driven framework facilitates the creation of a detailed report on the program's accreditation assessment, which can be utilized by the program leaders for self-assessment or by external evaluators to identify areas for improvement.

Keywords: artificial intelligence, accreditation, quality assurance, assessment, key performance indicators

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Introduction

Academic accreditation of an academic program plays an important role in the assessment of this program against several well-defined standards to ensure its high quality and to provide suggestions and recommendations for the continuous improvement of different aspects of the program.

The accreditation process typically involves several key steps. First, it begins with defining clear standards and criteria for evaluation. Next, institutions conduct thorough self-assessments with input from experts and practitioners to evaluate compliance with these standards. This leads to identifying strengths and areas needing improvement. Subsequently, actionable plans are developed to achieve the desired performance, utilizing specific indicators to guide progress. Finally, regular reviews are implemented to ensure that high standards are maintained within a framework of continuous improvement. This structured approach fosters accountability and encourages ongoing enhancement of educational quality. Stakeholders in the accreditation process include universities, government bodies, employers, students, and professional institutions. Quality assurance processes can occur at various levels, including internal (department or university), external (professional bodies), national (national agencies), and regional or international (international agencies) (Gray et al., 2009; WASC, 2023). In engineering education, accreditation serves as a vital quality assurance tool that promotes international mutual recognition of both academic credentials and professional experience, while also facilitating national quality assurance systems (Dodridge, 2002; Eaton, 2010). It enhances classroom and laboratory facilities by developing quality educational programs and raises institutional prestige and academic standards globally (Patil & Codner, 2007). Despite these clear objectives, significant variations exist in accreditation practices across different countries. Notable accreditation authorities for engineering education include ABET (USA), ABEEK (South Korea), JABEE (Japan), CTI (France), ASIIN (Germany), CEEAA (China), CEAB (Canada), AEAC (Australia), ECUK (England), NCAAA (KSA), and AEER (Russia). Each of these organizations applies different standards and procedures for accreditation.

In most cases, the accreditation process is rigorous and tedious, and goes through a strict, thorough, and accurate approach, and involves a lot of repetitive work. This encouraged researchers to investigate the possibility of creating a tool to automate the process and provide an overview of an academic program, considering the different standards of a specific accreditation body for self-assessment or as an external evaluator. In this regard, a tool was proposed considering the standards of NCAAA by Mansour et al. (2022).

Artificial intelligence (AI) is beginning to transform the conception, design, and management of engineering systems, enhancing the likelihood of achieving project goals. Engineering educators should make students aware of AI's potential, teach fundamental concepts, and guide them in applying these technologies to real projects as essential components of modern curricula. Moreover, “AI-aided engineering education” focuses on using AI to enhance the teaching-learning process in higher education, particularly in scientific and technological fields. Considering the accreditation of engineering academic programs and according to Steele (2018), AI could enhance the quality and quantity of reviews. By training AI with data, evidence, and past reviewer decisions, it could evolve alongside peer reviewers, comparing recommendations for final adjustments. Ultimately, AI could provide consistent identification of key improvement areas and misalignments with standards.

AI can automate administrative tasks, such as analyzing learning guides and ensuring compliance with admission rules. With suitable interfaces and centralized data, accreditation reports could be generated automatically. For this to succeed, universities must commit to digitizing their processes, like trends in Industry 4.0. This automation would provide quality managers with real-time information on accreditation compliance, allowing them to focus on problem-solving rather than identification. Moreover, AI can be utilized efficiently in several aspects of engineering education such as personalizing education and enhancing learning, sustaining teaching-learning activities, supporting educational and curricular planning, and accreditation processes (Nuñez & Lantada, 2020).

Sun and Yao investigated the application of the AI tools in the preparation for the ABET accreditation in different stages including the preparation for the documents, providing suggestions for improvement, generating action plans to achieve the set goals and address identified shortcomings to enhance the program, and proposing training plans for specific ABET criteria (Sun & Yao, 2023). It was concluded that the AI tools can significantly enhance the quality of the preparation for the ABET accreditation.

This paper presents an AI tool designed to evaluate various aspects of an academic program, including program management, quality assurance practices and levels, the teaching and learning process, student experience, faculty quality, and the adequacy of learning resources, facilities, and equipment. By utilizing this tool, programs can identify areas for improvement to better align with accreditation standards. The tool is developed in accordance with the accrediting standards established by the National Commission for Academic Accreditation and Assessment (NCAAA) in Saudi Arabia. It offers robust recommendations and effective key performance indicators (KPIs) that can be implemented to enhance compliance and meet the expectations of various stakeholders involved in the program.

Methodology

In this study, an AI assessment tool was developed to assess the readiness of an academic program to undergo academic program accreditation. The tool was designed considering the standards and sub-standards of the NCAAA that evaluate and assess the various aspects of the program. These standards are 1: Program management and quality assurance, 2: Teaching and Learning, 3: Students, 4: Faculty, and 5: Learning resources, facilities, and equipment. Although the tool is designed specifically for the NCAAA, it can be easily adjusted to evaluate academic programs based on different accreditation bodies, which could be implemented as a future enhancement.

This AI assessment tool integrates OpenAI's existing reliable model with domain expertise to generate a comprehensive evaluation and recommendation report. All NCAAA questions were added to a static file, and the tool presents those questions to the user to provide responses ranging from 1 to 4. The tool was prompted and tested intensively to generate satisfying results that successfully resemble a report generated by an accreditation professional. The reason behind utilizing OpenAI's model is that it was trained on a huge amount of accreditation literature, and using its complex architecture, it can capture deep underlying patterns between different ratings provided by the user. Therefore, the tool is able to generate an action plan that prioritizes addressing the crucial weaknesses and implementing feasible actions. To overcome any vague or generic recommendations, the tool was explicitly prompted to generate detailed and actionable recommendations in the action plan. This ensures that the academic programs receive meaningful feedback and valuable

insights. Overall, the model is able to create a workflow that streamlines the academic program evaluation process, allowing professionals to attain a comprehensive evaluation for their academic programs without consuming time or resources.

The tool starts with collecting general information such as the name of the institution and the academic program, the year of establishment, the tracks, the number of graduates, number of current enrolled students, and the year of the first batch of graduates. These questions are solely for generating a structured report, but they do not affect the program evaluation. After these general questions, the user is asked 51 specific questions, split between the different standards and sub-standards. For every question, the user is requested to evaluate the performance of the program through a well-defined rubric for four categories: 1: Non-Compliant, 2: Minimal Compliance, 3: Substantial Compliance, and 4: Full Compliance. While it may seem like a considerable burden, the process is streamlined by using a straightforward 4-point scale ranging from Non-Compliant to Full Compliance. This approach minimizes the time required for responses, allowing users to efficiently assess their compliance.

Moreover, because the assessment is designed for experts and practitioners familiar with the program, they can quickly provide informed responses. This ensures that the self-assessment not only captures the necessary information but also aligns closely with the accreditation review requirements. Ultimately, the structured format facilitates a comprehensive yet efficient evaluation process, enhancing the quality of the self-assessment while reducing the overall burden on users.

Table 1
Compliance Categories

Compliance Category	Characteristics
Non-Compliant (Score: 1) The program does not meet essential requirements	Significant deficiencies are present, leading to a failure to meet basic criteria. No evidence of policies or practices in place to support compliance. Lack of engagement with relevant stakeholders or failure to address their needs. Serious issues that could impact the quality of the program significantly.
Minimal Compliance (Score: 2) The program meets some basic requirements but has notable areas needing improvement.	Some elements are in place, but many are inadequate or outdated. Inconsistent application of policies and practices related to compliance. Limited feedback collection from stakeholders, with few actions taken based on feedback. Basic support mechanisms are available but are underutilized or poorly communicated.
Substantial Compliance (Score: 3) The program meets most standards and shows a commitment to continuous improvement.	Adequate resources and practices are generally effective, with minor gaps. Policies are mostly applied consistently and support compliance. Regular collection and analysis of stakeholder feedback, with some improvements made. Support mechanisms are accessible and used by a majority of relevant parties.
Full Compliance (Score: 4) The program fully meets all standards and demonstrates excellence in practices and outcomes.	Comprehensive availability of high-quality resources and practices. Well-defined policies that are effectively implemented to support compliance. Proactive engagement with stakeholders, with consistent actions taken based on feedback. Robust support mechanisms that are widely utilized and lead to positive outcomes.

Once the user responds to all the questions, the user's responses are sent to an existing AI model, OpenAI GPT-4. OpenAI's reliable AI model is used for analyzing the user's responses. The model is prompted to generate a structured report by analyzing the responses. The report begins with a summary of the general information about the program that the user provided. Following is an overview of the main strengths, weaknesses, and recommendations for the program as suggested by the AI model. The report also includes a more detailed analysis of the strengths, weaknesses, recommendations, and relevant KPIs Finally, the report concludes with a comprehensive action plan, which can be followed to enhance the program. The action plan has tangible suggestions to follow along with the timeline for implementing them and the priority of each suggestion. The report is displayed to the user on the website and is also available as a PDF for the user to download. The tool has been developed and is currently in the pre-launch phase, with public deployment forthcoming.

AI-Tool Standards

Program Management and Quality Assurance

In this standard, the program is assessed to ensure that it has effective leadership to apply institutional systems, policies, and regulations. Good practice here is to have a program management that plans, implements, monitors, and activates quality assurance systems to ensure continuous improvement in all aspects. Also, a supportive organizational climate is to be ensured through applying a framework of integrity, transparency, and fairness practices. This standard consists of the following sub-standards: Program Management and Program Quality Assurance.

Program Management. This substandard is responsible for assessing the alignment and consistency of the program's mission with that of the institution and is effectively utilized to guide all of its operations. An ample number of qualified staff is needed to run the administrative tasks in an effective way and to ensure the achievement of the program goals in a supportive and encouraging environment. Concepts of the integrity, fairness, and equality are assessed and ensured its application in all the aspects of the program. Different opinions of experts and stakeholders should be considered for the improvement of the program. A credible program should ensure the activation of the values of the scientific integrity, intellectual property rights, rules of ethical practices, and proper conduct in all academic, research, administrative, and service fields and activities. All the program information should be publicly disclosed to the community through reliable sources such as websites, handbooks and other official materials.

Program Quality Assurance. The program is assessed on the implementation of an effective quality assurance and management system consistent with the institutional regulations and policies. The set of KPIs utilized in monitoring the program and the decision making is evaluated. The program is supposed to use this system and the set of the KPIs to perform periodic revision of all aspects of the program for the sake of the continuous improvement.

Teaching and Learning

In this standard, the learning outcomes of the program are evaluated in terms of its definition and consistency with the program mission and the job market. Effective teaching and learning strategies and assessment methods should be appropriate to the selected learning outcomes.

The achieving of the courses' learning outcomes and the program learning outcomes is examined in this standard and a robust quality assurance system should be there for the continuous improvement of the achievements of these learning outcomes.

Learning Outcomes. In this substandard, the learning outcomes of the program are investigated to examine their alignment and consistency with the program's mission and its graduate attributes and their suitability to the job market that is continuously checked. The achievement of the intended learning outcomes is supposed to be assessed through well-defined robust strategies, tools, and rubrics.

Curriculum. The achievement of program goals and learning outcomes should be considered in the curriculum design of the program. All important aspects should be considered in curriculum design including the educational, scientific, technical, and professional advancements in the field of specialization. This curriculum must be periodically reviewed and updated to consider the updated job market, emerging technologies in the field, and feedback of different stakeholders.

Quality of Teaching and Students' Assessment. The section is utilized in assessing the performance of the program in terms of its teaching and learning strategies and assessment methods that are practiced achieving the intended learning outcomes of the program. The faculty members of the program should be capable and knowledgeable about the assessment methods of the learning outcomes. Educational experience should be enriched through the use of modern techniques, collaborative tools, and interactive learning platforms.

Students

This standard evaluates the admission criteria for program students. The number of enrolled students should align with the planned number considering the available facilities and resources, including classrooms, labs, and teaching staff. Essential information about the study plan, graduation requirements, services, and tuition fees should be publicly disclosed on the program website and brochures. There should be a clear and fair announced criteria for the transfer students admitted to the program. The program should provide orientation programs for its new enrolled students to help them well adapt. Academic guidance and support should be available at all levels. Extracurricular activities should be offered to develop skills and showcase talents. The program should monitor student progress to ensure timely graduation and provide support for students with special needs. Student representation in councils and committees is encouraged, alongside maintaining good communication with alumni.

Faculty

The performance of the program's faculty members and their periodic evaluation are assessed in this standard. An ample number of faculty members with relevant sound background is crucial to offer any academic program. A clear policy and practice should be followed in hiring qualified faculty members in the program to fulfill the program's mission and its goals. A well-designed orientation program should be provided to the new recruited faculty. All program's faculty members are supposed to have continuous professional development plans and activities to fulfill their intended performance in all aspects of teaching, research, and administrative duties.

Learning Resources, Facilities, and Equipment

The program must provide an effective learning environment with adequate classrooms and technological resources. Laboratories and equipment should support research and meet program goals. Faculty and staff should receive training on these resources, and there should be plans for regular updates. Safety guidelines for labs must be established, including emergency contact information. The library should offer a sufficient variety of accessible resources tailored to student needs. Faculty and students should be involved in assessing these resources. A sample assessment tool is provided to evaluate the quality of this standard.

Results

The tool generates a report based on the responses given by the user. The generated report includes a summary of the general information about the institution provided by the user followed by an analysis of the strengths, weaknesses, recommendations, and relevant KPIs for every standard in the academic program. Then, the report includes a comprehensive action plan that considers all the strengths and weaknesses of the academic program. To evaluate the outcomes of the standard analysis, a set of responses was created for the 51 questions based on a hypothetical program. This example was prepared solely for testing purposes and does not represent a real program. The responses were made considering different compliance categories for the various standards to examine the areas of strength, the proposed recommendations and its relevance to the areas that are in need for improvement, proposed KPIs to be tracked to ensure improvement over a specific period, and finally the short- and long-term action plans for each standard. Table 2 shows a sample output for the report's analysis for standard 3: Students. To test the action plan generation and ensure that the action steps are not vague or generic, a different set of inputs were given to the tool to generate an action plan as shown in table 3. Note that the two tables are not linked; They represent outputs for two separate inputs.

Table 2

Outputs of the AI Tool (Standard 3: Students as an Example)

Strength	Weakness	Recommendations	Key Performance Indicators (KPI)
Comprehensive information provided to students about study requirements and services	Inadequate criteria for admission, registration, and graduation Insufficient guidance and counselling services Limited engagement with alumni Poor evaluation of student services	Develop and implement comprehensive criteria for student processes Enhance guidance and counselling services Improve mechanisms for alumni engagement Evaluate and enhance student services quality	Average of student satisfaction rate with the program services (Target: 90%) Student satisfaction with academic supervision/ counselling (Target: 85%) Percentage of new students in orientation activities (Target: 100%) Student Retention rate (Target: 95%) Percentage of students receiving awards/honours (Target: 15%)

Table 3
Generated Action Plan

Weakness	Action Step	Responsible Party	Timeline	Success Indicator
Limited stakeholder involvement	Conduct semi-annual stakeholder meetings	Program Director	Year 1 Quarter 1	4 meetings held per year
Inconsistent stakeholder feedback	Implement annual surveys for all stakeholders	Quality Assurance Team	Year 1 Quarter 2	90% stakeholder satisfaction rate
Courses with low satisfaction rates	Curriculum review and revision	Curriculum Committee	Year 1 Quarter 3	85% course satisfaction rate
High student-to-faculty ratio	Initiate faculty recruitment campaign	Human Resources	Year 1 Quarter 4	Student-to-faculty ratio of 15:1
Low faculty retention rate	Develop and launch a faculty retention program	Faculty Affairs Office	Year 2 Quarter 1	Faculty retention rate of 90%

Discussion and Conclusions

Seeking high-quality education is considered a main objective for each academic program. As a result, there is a worldwide trend of seeking national and international accreditation for different academic programs to ensure obtaining the high-quality education that enables students get the best education that helps them secure better job opportunities upon graduation. This paper presents a generic assessment tool that can be used in self-assessing or reviewing the readiness of any academic program to seek academic program accreditation. The tool is developed based on the accrediting standards developed by the National Commission for Academic Accreditation and Assessment (NCAAA) in Saudi Arabia. Based on the score received by each program through answering relevant questions about the practice and statistics, the tool provides recommendations and possible KPIs that can be adopted in order to enhance the quality of the program and make the accreditation process easier and more successful. This generic assessment tool will be available to be used through a platform that can be accessed for interested program leaders and accreditation evaluators. Results will be investigated and analyzed to plan and conduct continuous tool improvement.

This AI tool can significantly help assess the readiness of an academic program for the accreditation and spot the strength and weakness points in different aspects of the program. Also, it is a powerful tool to provide recommendations for weak areas and design action plans to overcome the shortcomings of the program to seek continuous improvement considering several proposed KPIs.

It is worth mentioning that several factors are needed to enhance and integrate the outcomes and findings of this AI tool including qualitative feedback from stakeholders, contextual factors representing the specific circumstances, conditions, and environment in which the academic program operates, and deep analysis from experts to ensure the attainment of the educational objectives and the students learning outcomes. Moreover, ensuring data security is crucial as some of the program information might be confidential.

There is a need to examine the relevance and accuracy of this proposed AI tool by assessing several academic programs to ensure the robustness and efficiency of the tool.

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