Evaluation of ABET accreditation path for a representative African undergraduate computer science programme

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Abstract
As of the beginning of 2022, only four of 54 countries in Africa had programmes accredited by ABET—the widely used international accreditation body for tertiary education programmes in computing, engineering, applied and natural sciences, and engineering technology. This article provides results from an evaluation of a representative non-ABET-accredited African undergraduate computer science programme—the University of Namibia (UNAM) Bachelor of Science (BSc) in Computer Science—in terms of its potential for ABET accreditation. The study evaluates the UNAM programme against ABET's General Criteria (GC), and also against ABET's computer science Program Criteria (PrCr), in order to determine the steps UNAM would need to take were it to seek ABET accreditation for the programme. The authors also evaluate the level of difficulty that each of the steps would likely involve. The authors' evaluation aims to be replicable, so as to provide a potential tool for use by any African higher education entity seeking ABET accreditation for a learning programme.

Keywords
computer science, programme accreditation, ABET, curriculum development, quality assurance

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1. Introduction

Accreditation is fast becoming a vital component of quality assurance and an indicator of competent university graduates worldwide. Defined as a "recognition accorded to an institution that has met the standards or criteria established by a competent agency or association" (Blauch, 1959), accreditation was initially mainly thought of as a US phenomenon, designed to regulate education in the absence of centralised government control (Mullen, 2001). With numerous notable benefits, such as providing standards and programme criteria, facilitating inter-institutional transfers, raising educational quality and standards, and providing guidance on the prestige of institutions (Blauch, 1959), accreditation is now a widely accepted practice worldwide (Stensaker, 2011). Many professions, including auditing, accounting, and engineering, require students to graduate from accredited programmes before being able to practise as professionals. Programmes in science, technology, engineering and mathematics (STEM) areas often seek accreditation as a way to distinguish themselves and to inform the general public about their quality.

ABET accredits programmes in four main areas: computing, engineering, applied and natural sciences, and engineering technology.[1] ABET's accreditation criteria are developed by experts, member societies, and by ABET commissions. There is a separate commission for each of the four main areas in which ABET accredits programmes. When criteria are being created or updated, the public is able to provide input and suggest modifications. At the time of this writing in mid-2022, ABET accredits 4,361 programmes at 850 institutions in 41 countries (ABET, n.d.-a). Each year, more than 175,000 students graduate from ABET-accredited programmes (ABET, n.d.-a).

1 "ABET" originally stood for "Accreditation Board for Engineering and Technology", but the wording behind the acronym was discontinued when ABET expanded to include computing and applied sciences.

To qualify for ABET accreditation, a programme needs to satisfy both ABET's General Criteria (GC) and the particular programme area's specific Program Criteria (PrCr).[2] PrCr are informed by the latest curriculum developments in a specific discipline, and hence specify additional requirements beyond the GC. The PrCr typically focus on student outcomes, curriculum, and faculty, with the bulk of the requirements being in the curriculum area.

The questions addressed in this study are: How near to meeting ABET accreditation criteria is a typical Sub-Saharan African programme in computer science? And, by extension, what would it take for such a programme to become ABET accreditable? We evaluated and analysed a representative programme critically, to see how well it measured up to ABET's requirements. The programme we chose to focus on is the Computer Science programme at the University of Namibia (UNAM), because it is the one that we are most familiar with (as we both work at the UNAM) and because we found that it is a representative programme in Sub-Saharan Africa. Our aim was to develop an approach which is general enough that it will highlight the kinds of challenges that many programmes, including those not in computer science, could expect to encounter while seeking ABET accreditation.

Also, so as to be fair to UNAM and to the UNAM programme that we evaluated in this study, it must be pointed out that it was fully understandable and expected that we were able to find some shortcomings in respect of the programme's compliance with ABET criteria, as the programme was not designed with specific attempts to meet ABET's GC and PrCr.

There is very little research literature relating directly to the method of analysis and evaluation we followed. However, of some relevance is the work of Atchison et al. (1968), Austing et al. (1979), and Tucker (1991), who laid early groundwork for the curriculum of computing programmes. The curriculum evolution for computing continued in Cassel et al. (2008); The Joint Task Force on Computing Curricula (2001); and the ACM/IEEE-CS Joint Task Force on Computing Curricula (2013). One of the most recent computing curriculum models is presented by ACM and IEEE-CS (2020). In Besterfield-Sacre et al. (2000) and Engel et al. (2009), foundations for the accreditation standards of computing programmes are presented

2 Technically, it is possible for a programme to receive accreditation under just the GC, but this is not the typical case. Most programmes also satisfy PrCr.

and their history outlined. Raj et al. (2022) is recent work discussing how to interpret ABET's computer science PrCr using competencies is presented. The ABET computing curriculum and accreditation criteria continue to be refined, as new directions in the computing discipline emerge.

2. ABET accreditation criteria

For the purposes of this study, we focus on the Computing Accreditation Commission (CAC), although much of the discussion also applies to the other ABET commissions because ABET harmonised its GC in 2009 (ABET, n.d.-b). ABET's Computing GC consist of eight individual criteria that programmes must satisfy:

- Students;
- Program Educational Objectives (PEOs);
- Student Outcomes (SOs);
- Continuous Improvement (CI);
- Curriculum;
- Faculty;
- Facilities; and
- Institutional Support.

The Students criterion requires that performance is evaluated and progress monitored so that students can attain the SOs. This in turn allows graduates to attain the PEOs. Advising is required in curriculum and career matters. Policies must be established and followed regarding transfer students. Programmes must enforce graduation requirements. For the PEOs criterion, programmes must establish PEOs, publish them, involve constituents in their revision, and make sure that the PEOs are in line with the institution's mission, the needs of its constituents, and the ABET GC.

For the SOs criterion, ABET has five SOs: (1) analysing a problem and identifying its solution; (2) designing, implementing, and evaluating a solution to a problem; (3) communication skills; (4) professional responsibility; and (5) teamwork. The CI criterion requires that programmes have a robust system in place that is used regularly to determine the extent to which the SOs are being attained. The system must lend itself to programme improvements. The Curriculum criterion requires mathematics appropriate to the programme, and specifies the necessary breadth and depth of topics covered. Computing topics must include the following: "1. Techniques, skills, and tools necessary for the computing practice. 2. Principles and practices for secure computing. 3. Local and global impacts of computing solutions on individuals, organizations, and society" (ABET, n.d.-c, p. 6).

The Faculty criterion requires that the faculty members are competent and sufficient to develop and offer the programme in a manner that enables students to graduate on time. The Facilities criterion requires that the facilities and library are sufficient for students and faculty members to carry out their work. The Institutional Support criterion requires that the institution provide sufficient resources for the programme to operate in an appropriate and effective manner.

The ABET computer science PrCr, as is typical of ABET PrCr, focus on three GC areas: SOs, Curriculum, and Faculty. In the SOs for computer science, a sixth SO, in addition to the five listed above in respect of the GC, is added. It reads: "Apply computer science theory and software development fundamentals to produce computing-based solutions" (ABET, n.d.-c, p. 10). Clearly, the requirements in this statement apply only to computer science and not broadly to all fields involving computing, e.g., not information technology (IT) or information systems (IS). This is why the requirement is included in the PrCr, and not the GC. The Faculty criterion requires that some faculty members have PhDs in the field of computer science.

With respect to the Curriculum criterion in the PrCr for computer science, at least 40 hours of instruction are required, including:

- instruction on algorithms and complexity, computer science theory, concepts of programming languages, and software development;
- instruction on a general-purpose programming language;
- instruction on computer architecture and organisation, information management, networking and communication, operating systems, and parallel and distributed computing;
- instruction on computing-based systems at varying levels of abstraction;
- a project requiring integration and application of knowledge and skills acquired in earlier course work;
- at least 15 hours of rigorous mathematics, including discrete mathematics; and
- at least six hours in rigorous natural science courses, where the scientific method and laboratory work are included (ABET, n.d.-c).

It is our view that the UNAM BSc in Computer Science is representative of undergraduate computer science programmes in Sub-Saharan Africa, because we have found that many schools in the region follow similar models, e.g.,

- Bahir Dar University (n.d.), Ethiopia;
- Osun State University of Nigeria (n.d.);
- School of Advanced Level Studies (n.d.), Seychelles;
- Uganda Technology and Management University (n.d.);
- Unicaf University (n.d.), operating in several African countries;
- University of Dar es Salaam (n.d.);
- University of Ghana (n.d.);
- University of Nairobi (n.d.);
- University of Pretoria (n.d.); and
- University of Zimbabwe (n.d.).

3. Evaluation in terms of ABET GC Curriculum criterion and computer science PrCr

We now turn to the evaluation of UNAM's BSc in Computer Science programme against the curriculum requirements of ABET's GC Curriculum criterion and computer science PrCr. The course information presented in this section is available in the UNAM *School of Science Prospectus 2022* (UNAM, 2022a) and the UNAM *School of Engineering and the Built Environment Prospectus 2022* (UNAM, 2022b).

Mapping of UNAM programme in ABET format

A key part of ABET's Self-Study Report procedures is "Table 5-1", which is where programmes must describe their curricula (ABET, 2022d). Accordingly, Tables 1 to 4 below represent our mapping of UNAM's programme in the ABET Table 5-1 format, with each table corresponding to a year of study. We scaled UNAM's courses from 16 credits to four credits, which we regard as equivalents across the Namibian and US credit frameworks. And it should be noted that in the UNAM programme each full course has four contact hours per week and an associated practical session of three additional hours per week. Half-courses have four contact hours per week and practical sessions of 1.5 hours per week. The numbers in the columns represent the number of credits assigned to a given course, in the ABET accounting system. For example, Introduction to Digital Electronics (CIT 3511) has two credits of science and two credits of "other".

Table 1: First year of UNAM's programme (inserted into ABET's Table 5-1)

Course	Required (R), Elective (E), or Selected Elective (SE)	Math	Science	Computing Topics: Fundamental (F) or Advanced (A)	General Education (GE)	Other
English Communication & Study Skills (LCE 3419)	R				4	
Computer Literacy (CLC 3509)	R					2
Basic Mathematics (MAT 3511)	R					4
Programming Fundamentals I (CMP 3511)	R			4F		
Introduction to Digital Electronics (CIT 3511)	R		2			2
Fundamentals of Information Technology I (CIT 3512)	R					2
English for Academic Purposes (LEA 3519)	R				4	
Contemporary Social Issues (CSI 3580)	R				2	
Programming Fundamentals II (CMP 3512)	R			4F		
Precalculus (MAT 3512)	R					4
Fundamentals of Information Technology II (CIT 3521)	R					2
Introduction to Statistics (STS 3522)	R					4

Table 2: Second year of UNAM's programme (inserted into ABET's Table 5-1)

Course	Required (R), Elective (E), or Selected Elective (SE)	Math	Science	Computing Topics: Fundamental (F) or Advanced (A)	General Education (GE)	Other
Introduction to Database Systems (CMP 3611)	R			4F		
Object Oriented Programming I (COS 3611)	R			4F		
Mathematics for Computer Science (CMP 3651)	R	4				
Computer Networks I (CIT 3611)	R			4F		
Advanced Databases (COS 3632)	R			2F, 2A		
Object Oriented Programming II (COS 3612)	R			4F		
Computer Networks II (CIT 3612)	R			4F		
Computer Organisation & Architecture (CIT 3652)	R			2F, 2A		

Table 3: Third year of UNAM's programme (inserted into ABET's Table 5-1)

Course	Required (R), Elective (E), or Selected Elective (SE)	Math	Science	Computing Topics: Fundamental (F) or Advanced (A)	General Education (GE)	Other
Computer Theory (CMP 3711)	R			2F, 2A		
Software Engineering (CMP 3731)	R			2F, 2A		
Emerging Technologies (COS 3731)	R	4		4F		
Data Structures and Algorithms (COS 3711)	R			2F, 2A		
Operating Systems (COS 3732)	R			2F, 2A		
Human Computer Interaction (COS 3712)	R			2F, 2A		
Research Methodology (CMP 3752)	R			3F, 1A		
Web Design & Programming (CMP 3772)	R			2F, 2A		

Table 4: Fourth year of UNAM's programme (inserted into ABET's Table 5-1)

Course	Required (R), Elective (E), or Selected Elective (SE)	Math	Science	Computing Topics: Fundamental (F) or Advanced (A)	General Education (GE)	Other
Research Project (CMP 3810)	R			4F, 4A		
Network System Security (CMP 3821)	R			2F, 2A		
Wireless and Mobile Computing (CIT 3711)	R			2F, 2A		
Numerical Methods and Operations Research (CMP 3811)	SE			2F, 2A		
Distributed Systems (CMP 3851)	SE			2F, 2A		
Artificial Intelligence (COS 3871)	SE			2F, 2A		
Data Warehousing & Data Mining (COS 3812)	R			2F, 2A		
Entrepreneurship and Management of IT Systems (CMP 3832)	SE			2F, 2A		
Real Time Multimedia (CMP 3812)	SE			2F, 2A		
Database Programming (CMP 3872)	SE			2F, 2A		
Totals		4	2	53F, 31A 84	10	20
Total Credits: 120						

Identification of shortcomings

As can be observed in Table 1, UNAM's curriculum does combine technical and professional components to prepare students for a career, further study, and lifelong professional development in computer science. However, it is lacking in the General Education (GE) area (shortcoming 1, denoted s1). There are only 10 credits of general education, where eight of them are in English. The rest are coming from a half-semester course discussing social issues.

In Table 2 we see the programme's only required mathematics course beyond the precalculus level, Mathematics for Computer Science (CMP 3651), which is essentially a discrete mathematics course. Thus, the programme is lacking appropriate mathematics for computer science (s2). In Table 4, we see the programme has a total of 84 hours of up-to-date computing (53 fundamental and 31 advanced) topics, which provides both the breadth and depth required by ABET and far exceeds the 30 hours required in the GC for computing. This number also exceeds the 40 hours of required computer science topics as specified in the PrCr.

The programme includes techniques, skills, and tools necessary for computer science, and includes some discussion of the principles and practices for secure computing, but these security concepts could be stressed more throughout (s3). There is coverage of the local and global impacts of computing solutions on organisations, but more material could be added to focus on impacts on individuals (s4) and society (s5). Two other shortcomings identified are in respect of coverage of parallel computing (s6) and coverage of distributed computing (s7). Neither is included in a required course. Distributed Systems (CMP 3851), where students who choose this elective get exposure to distributing computing, is merely a selective elective, and parallel computing is entirely absent from the curriculum.

ABET requires at least 15 credit hours of mathematics that must include discrete mathematics and must have mathematical rigor at least equivalent to introductory calculus. Table 4 shows that the UNAM programme only has four credits of mathematics—i.e., the four-credit Mathematics for Computer Science (CMP 3651) course—with a rigor equivalent to introductory calculus (s8).

ABET also requires at least six credit hours in natural science course work, where students must develop an understanding of the scientific method and perform laboratory work. UNAM's curriculum does not meet this requirement (s9), as Table 1 shows that Introduction to Digital Electronics (CIT 3511) contains just two credits of science, and there are no other required science courses. The scientific method and appropriate laboratory work are missing, and the number of credits is deficient.

ABET's computer science PrCr include an additional student outcome (SO 6), which requires the application of computer science theory and software development fundamentals to produce computing-based solutions. UNAM's Computer Theory (CMP 3711) course is only a pre-requisite for a single course: Artificial Intelligence (COS 3871), which is a selective elective. Thus, UNAM's coverage of the first half of SO 6—application of computer science theory—is weak (s10). The second half of SO 6—software development to produce computing-based solutions—is satisfied by the programme's inclusion of Object Oriented Programming II (COS 3612), Software Engineering (CMP 3731), Human Computer Interaction (COS 3712), and Research Project (CMP 3810).

The only remaining item in the ABET computer science PrCr is in the Faculty criterion, which states: "In addition to the General Criteria Faculty requirements, some full-time faculty members must have a Ph.D. in computer science " ABET (n.d.-c, p. 11). In UNAM's BSc in Computer Science programme, three of the six faculty members have (at the time of writing this article) PhDs in computer science, thus satisfying the ABET computer science PrCr Faculty criterion.

In the next section, we examine the steps that would need to be taken to bring UNAM's BSc in Computer Science curriculum into compliance with ABET Curriculum criteria and with ABET computer science SO 6 (s10).

4. Required changes for compliance with ABET GC Curriculum criterion and computer science PrCr

In section 3, we identified 10 shortcomings (s1–s10) in UNAM's BSc in Computer Science in relation to ABET's GC Curriculum criterion and ABET's computer science PrCr (SO 6). Table 5 summarises the shortcomings and proposes solutions, assigning each solution a degree of difficulty ("easy" or "medium").

Table 5: Shortcomings and solutions

	Shortcoming	Solution	Degree of difficulty
s1	Lack of General Education (GE) courses.	Reduce computing requirements and introduce additional GE courses.	Easy
s2	Lack of appropriate mathematics for computer science in terms of the GC.	See s8.	Medium
s3	Insufficient coverage of principles and practices for secure computing.	Include some modules in existing courses.	Easy
s4	Lack of coverage of the local and global impacts of computing solutions on individuals.	Where the impact on organisations is discussed, include discussions on individuals.	Easy
s5	Lack of coverage of the local and global impacts of computing solutions on society.	Where the impact on organisations is discussed, include discussions on society.	Easy
s6	Lack of compulsory coverage of distributed computing.	Make Distributed Systems (CMP 3851) a required course rather than a selective elective.	Easy
s7	Lack of coverage of parallel computing.	In the Distributed Systems course, add fundamental coverage of parallel computing.	Easy
s8	Lacking 11 credit hours of mathematics that must, in terms of the computer science PrCr, have mathematical rigor at least equivalent to introductory calculus.	Reduce computing requirements and add three appropriate four-credit mathematics courses.	Medium
s9	Missing six credit hours of natural science course work intended for science and engineering majors, where students must develop an understanding of the scientific method and perform lab work.	Reduce computing requirements and add in two appropriate science courses.	Medium
s10	Lack of application of computer science theory to produce computing-based solutions.	Computer Theory (CMP 3711) can be made a pre-requisite for several other courses, and theory integrated more throughout the programme.	Medium

In Table 5, we have classified solutions to six of the 10 shortcomings detected in UNAM's programme as "easy" solutions. These are solutions that would require minimal effort—e.g., an administrative change, or a small addition of material to a course.

With respect to solutions to three of the shortcomings (s2, s8, and s9), computing requirements would need to be traded off for mathematics and science courses. We ranked these solutions as being of "medium" difficulty, requiring substantially more effort to execute than easy solutions. Although it is not too difficult to rearrange the curriculum, the students might struggle with the additional mathematics—and students might struggle financially if UNAM had to increase fees in order to cover the costs of additional mathematics courses. Shortcoming s10 is ranked as being of medium difficulty because it involves changes to the pre-requisite structure throughout the curriculum, and also to the content of a number of courses.

5. Evaluation in terms of remaining ABET GC (excluding Curriculum GC)

Now that we have addressed the ABET computer science PrCr and the Curriculum requirements of the ABET GC, we must now evaluate UNAM's BSc in Computer Science with respect to the remaining seven GC (excluding the Curriculum GC), which are:

- Students;
- Program Educational Objectives (PEOs);
- Student Outcomes (SOs);
- Continuous Improvement (CI);
- Faculty;
- Facilities; and
- Institutional Support.

Students

UNAM computer science faculty members evaluate student performance in their courses, and student progress is monitored by advisors, so that students are aware of programme requirements and can graduate in a timely manner. The programme has not established SOs or PEOs in an ABET style. The curriculum leads to students attaining SOs 1 and 2: analysing, designing, implementing, and evaluating a computing-based solution to a problem. SOs 3, 4, and 5 deal with communication, professional and ethical responsibilities, and teamwork. These are not a specific focus of the programme and material would need to be added to bring the curriculum into compliance with these SOs. Only the Research Project module (CMP 3810) partially addresses SO 3. Students are advised regarding curriculum and career matters. The programme has and enforces policies for transfers. The programme does not allow academic credit to be granted for work. There is a system of checks and balances to make sure that all students who graduate meet all graduation requirements. The programme needs to establish PEOs.

PEOs

As noted, the programme does not have ABET-style PEOs. However, the programme has clear goals for its graduates in the form of a set of its own nine SOs. The programme focuses on what students need to be able to attain by graduation rather than on what the students will be doing three to five years after graduation. These SOs are not publicly documented, as ABET requires of its SOs and PEOs. The programme would need to define PEOs and their constituents. A documented, systematically utilised, and effective process for the periodic review of the PEOs, involving programme constituencies, would need to be implemented to ensure they meet ABET's requirements.

SOs

The programme would need to adopt ABET's GC SOs (1–5) and the computer science PrCr's SO 6. Its internal nine SOs do in fact map to a number of ABET's SOs. Along with the PEOs, the programme would need to publish the SOs on its website, as well as enrolment data.

CI

Because the programme has not adopted ABET's SOs, there is no formal assessment process in place to assess these items. The programme would need to develop and regularly use an appropriate, documented processes for assessing and evaluating the extent to which the SOs are being attained. Those results would need to drive programme improvements. Many programmes struggle with the CI criterion. It can take a considerable length of time to develop and implement a good CI process. The programme's faculty members would need to develop additional expertise in assessment and evaluation.

Faculty

Each faculty member has the expertise and educational background necessary to contribute to the programme as expected. Faculty members have the education, professional credentials and certifications, and professional experience necessary. They are sufficient in number to maintain continuity, stability, oversight, student interaction, and advising. However, the faculty members need more professional development in order to remain current. The faculty has the responsibility and authority to improve the programme. When PEOs and SOs are defined and adopted, the faculty will need to modify the curriculum so that the SOs can be attained and, in turn, the PEOs reached.

Facilities

Faculty members have good offices, classrooms are sufficient, and there is sufficient work space for students. Internet connectivity is reasonable, as is the software provided to faculty members for teaching their courses. However, it is a challenge for UNAM to maintain high-quality and up-to-date laboratory and library services. Some of the machines in the labs are outdated, as are some of the materials in the library. Through additional online subscriptions, the library's collection can become sufficient without too much added cost. The institution and programme do, however, need to work with the Namibian government and industry to improve the programme's facilities. The main difficulty is securing an adequate budget for replacement of aging equipment, on a rotational basis.

Institutional Support

The programme is attracting and retaining faculty members. However, during a 2021 restructuring exercise at the institution, the School of Computing (where the BSc in Computer Science was housed) was merged with the Department of Mathematics and Statistics. This move seems to be contrary to the trend with computing departments elsewhere in world, which tend to be expanding rather than being absorbed into other departments. The programme has a technical support specialist, but, as stated above, the resources to maintain and upgrade faculty equipment are lacking. Additional resources are needed to provide the students and faculty members with up-to-date equipment. In addition, the budget for continued professional development may need to be augmented.

We now turn to consideration of ABET's fees. For programmes outside the US, ABET has an annual maintenance fee (at the time of writing in mid-2022) of USD1,530 per campus per commission, plus the same fee for each accredited programme at a campus. This means that were UNAM's BSc in Computer Science to become ABET-accredited, there would be an annual fee of USD3,060 (comprising the USD1,530 campus fee and the USD1,530 programme fee). Additionally, when a site visit occurs, which is normally every six years for a programme that meets ABET's requirements, there is a basic fee of USD8,235 and an additional fee of the same amount for each of the evaluators (usually there are two, thus costing USD16,470), in addition to the evaluators' travel expenses. Other fees may apply. For a complete listing of fees, see ABET (n.d.-e).

Table 6 summarises the non-Curriculum GC shortcomings and proposes solutions, with each solution given a difficulty ranking of "easy", "medium", or "difficult".

Table 6: Shortcomings and solutions with respect to remaining ABET GC (excluding Curriculum GC)

Shortcoming	Solution	Degree of difficulty
SOs are defined, but they are not ABET's SOs.	Adopt ABET's SOs. Modify the curriculum to make sure SOs 3, 4, and 5 can be attained by the students. SO 6 is addressed elsewhere.	Difficult
No ABET-style PEOs are defined.	Formalise the goals that the programme is trying to have its students attain three to five years after graduation. Formalise an ABET process for maintaining the PEOs and keeping the constituents involved.	Difficult
PEOs and SOs are not published.	Make the PEOs and SOs publicly known. Publish enrolment data.	Easy
Lack of CI process.	Develop and implement a complete assessment and evaluation process, and use it to improve the programme.	Difficult
Some faculty members not remaining professionally current.	Provide professional development opportunities and funds so that faculty members can remain current in computer science.	Medium
Lack of support to ensure SOs are attained and PEOs achieved.	Modify the curriculum to make sure the SOs can be attained and that they support the PEOs.	Medium
Out-of-date equipment in computing labs and library.	The library needs some additional funding in order to be able to subscribe to addutional electronic resources, and significant funds need to be budgeted for upgrading/replacing equipment.	Difficult
Insufficient institutional support.	The 2021 reorganisation merged the School of Computing into the Department of Mathematics and Statistics. This move has reduced the focus on, and some of the resources for, computer science. The administration must be encouraged to work with and support the programme. Computer science programmes sprang out of math programmes 40 years ago, and thus, moving such a programme back inside a mathematics department was a step in the wrong direction.	Difficult
Paying ABET's annual dues and visit fees.	Budget needs to be allocated to pay for ABET's annual dues and fees. These are significant costs for UNAM.	Difficult

6. Conclusions

In this article we have sought to chart the way forward for a typical African undergraduate computer science programme—UNAM's BSc in Computer Science—if it were to seek ABET accreditation. We have also sought to conduct our evaluation of the UNAM programme in such a manner that other institutions would be able to make use of the methodology if they wish to consider ABET accreditation. At the same time, however, our approach could not be applied blindly and directly to all programmes. Adjustments would need to be made to cater to the specifics of the existing programme. And there is little doubt that pursuit of ABET accreditation of a programme requires strong buy-in from both faculty members teaching the programme and decision-makers in the broader institutional administration.

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