Establishing an Internationally Benchmarked Accreditation System for Engineering Education in Bangladesh

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Outline of Presentation

- Inception and evolution of Engineering Education in Bangladesh
- Current status of HEIs offering degree programs in Bangladesh and the accreditation progress
- Some infrastructure megaprojects and the involvement of Bangladeshi engineers
- Background of BAETE, IEB
- Recent progress toward achieving Signatory Status in WA
- Future plans



Accords to Benchmark the Accreditation Worldwide

Establishing a global engineering education standard that drives sustainability

Ref: Em Prof. Dr. Elizabeth Taylor in the International Symposium on Quality Assurance in Engineering Education through Accreditation, 13-14 March 2019, Dhaka, Bangladesh

UN Sustainable Development Goals



International Accords

- IEA: International Engineering Alliance [1989]
- FEIAP: Federation of Engineering Institutions of Asia and the Pacific [1978]
- **ENAEE**: European Network for Accreditation of Engineering Education [2006]
- NABEEA: Network of Accreditation Bodies for Engineering Education in Asia [2003]

Engineering Education Accords are contributing to promote quality education in engineering, extending the outreach of the standards and process, and evolving to global standards that are of common interest to engineering communities worldwide.

The global standards need to reflect the requirements of the 2030 SDGs in the graduate attributes and competencies for guiding, engineering and transforming societies with sustainable developments.



International Engineering Alliance

- Working together to advance educational quality and enhance global mobility within the engineering profession
 - Educational Accords—establish and enforce internationally benchmarked standards for engineering education
 - Washington Accord—for the engineers
 - Sydney Accord—for the engineering technologists
 - Dublin Accord—for the engineering technicians
 - Competence Agreements—establish and enforce internationally benchmarked expected competences for engineering practice.
 - IPEA—International Professional Engineers Agreement
 - APEC—for countries of Asia-Pacific Economic Cooperation
 - IETA—International Engineering Technologists Agreement
 - AIET—Agreement for International Engineering Technicians

Washington Accord (WA)

- **The global leader of accreditation in engineering programs**
- **Serves the students and the world by contributing to UN SDGs**
- □The WA educational standard, such as graduate attributes (GAs) [exemplar], is outcome-based.
 - We need to be careful and use an input parameter, such as a number, as a conscientious or sub-conscientious requirement for a program.
 - Quantitative assessments are easy; qualitative assessments are the hardest.

IEB-BAETE and **IEA**

- The Institution of Engineers, Bangladesh (IEB), is the only professional organization for engineers in Bangladesh recognized by the government.
- In 2003, IEB founded the Board of Accreditation for Engineering and Technical Education (BAETE) as an autonomous body.
- BAETE was the provisional signatory of WA since 2011, which was transferred to IEB in 2017.



Total IEB Members: 41,000Total number of programs: 271

Inception and Evolution of Engineering Education in Bangladesh

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1876	Dacca Survey School	Offered two-year course in land surveying			
1903	Dacca Engineering School (renamed Ahsanullah Engineering School in 1905)	Offered three-year diploma courses in civil engineering (electrical and mechanical engineering added later			
1947	Ahsanullah Engineering College	Offered four-year bachelor's course in civil, electrical mechanical engineering			
1950	Ahsanullah Engineering College	Chemical and metallurgical engineering introduced.			
1962	East Pakistan University of Engineering and Technology, EPUET	Upgraded to a full-fledged university to create facilities for postgraduate studies and research.			
1971	Bangladesh University of Engineering and Technology, BUET	Renamed BUET after the independence of Bangladesh			

Expansion of Engineering Education

To create opportunities in peripheral areas, three engineering colleges offering four-year bachelor degree programs in civil, mechanical and electrical and electronic engineering were established.

- 1964 Rajshahi Engineering College
- **1967** Chittagong Engineering College
- **1974** Khulna Engineering College

programs

- **1980** Dhaka University of Engineering & Technology (offered degree programs for holders of three-year diplomas from polytechnics)
- **1986** Conversion to degree awarding institutions named as Bangladesh Institute of Technology
- **2003** Conversion of BITs into autonomous public universities (RUET, CUET, KUET, and DUET)

2004–date Government constituted 32 public universities offering engineering

Dinajpur Rangpur Mymensingh 1964 Sylhet Rajshahi Tangail Gazipur Savar Dhaka Pabna Comilla/ Jessor Noakhali 974 Patuakhali Rangamati Khulna Chittagong Barisa 1967 11

International Universities

- **1978** Islamic University of Technology, IUT was initially established as the Islamic Centre for Technical and Vocational Training and Research, ICTVTR, following the decision of the Foreign Ministers of Islamic Countries.
- 1994 Upgraded to IIT
- **2000** Upgraded to IUT (a subsidiary organ of OIC and funded by 57 member countries of OIC)

Expansion to Private Sector

1992 Government decided to permit the establishment of private universities for the first time in 1992, for which the private University Act of 1992 was passed in the National Parliament. (**Private University Act, 1992**).

The number of approved private universities has increased rapidly during the last few years to 103.



Institutions of Higher Learning in Bangladesh Offering Engineering Degree Programs

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Parameters	Number
Number of public universities in Bangladesh with engineering programs	32
Number of private universities in Bangladesh with engineering programs	85
Number of international universities in Bangladesh with engineering programs	1
Number of engineering programs offered	271
Number of engineering programs accredited by BAETE	63
Number of self-assessment reports being reviewed*	39

* Under Manual Version 1 and Version 2



Fast Track Projects to Initiate the Development Process

Bangladesh aspires to achieve a developed country status by 2041. To overcome some of the weaknesses in physical infrastructure, the government has initiated a number of megaprojects. Engineers are playing an important role in planning, designing, and implementing these megaprojects.

PROJECT NAME	TOTAL COST (est.) (BILLION USD)				
Padma Bridge	3.43				
Padma Rail Link	4.16				
Dohazari-Gundum Rail	2.18				
Metro Rail (MRT-6)	2.62				
Payra Sea Port	Not yet set				
Rooppur Nuclear Power Plant (2x1,200 MW)	12.55				
Matarbari Power Project	4.28				
Rampal Power Project	1.78				

A Few Infrastructure Projects at a Glance

Padma Multipurpose Bridge

- Direct connection between central and southwestern part of the country.
- One of the longest bridges in the Padma-Brahmaputra-Meghna river basins, with a length of 6.15 km and a width of 18.1 m.
- A two-level composite (steel truss and concrete deck) bridge with a four-lane highway on the upper level and a single-track railway on the lower level.

Karnaphuli Tunnel

- An underwater river tunnel in the port city of Chittagong.
- The first of its kind in Bangladesh and is expected to connect the Asian highway to Dhaka-Chittagong-Cox's Bazar highway network.
- The tunnel is 3.4 kilometers in length and 10 meters wide. Completion is expected in 2022.





A Few Infrastructure Projects at a Glance

Dhaka Metro Rail

- Includes a separate bus rapid transit system.
- Part of the 20-year Strategic Transport Plan developed by the government's Transport Coordination Authority.
- Consists of seven lines. MRT-6 (elevated) to be completed by 2021; projected to carry 65,000 passengers per hour per direction.

Rooppur Nuclear Power Plant

- The first nuclear power plant is now under construction in Rooppur, Pabna .
- The Bangladesh Atomic Energy Commission is implementing the project, under the guidance of the Science and Technology Ministry of Bangladesh.

In these projects, Bangladeshi engineers are working hand in hand with foreign engineers.





Toward Outcome-Based Education

Quality and ability for outcomes to meet societal demands

Efficiency and sustainability in national development

Future engineers think big and think far

Engineering programs that tie theory to application in the industry Empowering the individual with such capacities can bring innovation to the economy.

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Deeper internships to learn and appreciate the work environment and its complexities

Opportunities to learn from crossdisciplinary areas and cross-border experiences

Continual updating to address the product, processes, and systems for a fruitful integration

Toward Outcome-Based Education

Proper assessment procedure of outcome-based education

Safety is a mandatory requirement.

Business owners can have confidence in their potential employees. Our engineers should have skills and attitudes for lifelong learning, and our industries will need to have transformation maps to scale the ladder of progress.

Lack of health and safety culture in educational institutions may mean that graduates will not be conscious about health and safety measures. They may become engineers who are not sensitive to health and safety risks in their future work environments.

A considerable opportunity to convert the country's additional human resources into world-class engineers for the global market to greatly increase national earnings in the international market

UN Sustainable Development Goals



BAETE of IEB

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- Institution of Engineers, Bangladesh (IEB) is the only professional institution of graduate engineers in the country.
- □ IEB has 11,546 fellows, 26,417 members, and 8,344 associate members. All are at least graduate engineers.
- □ BAETE is an independent organization of IEB.
- □ To become a member, the applicant must be a graduate of a program accredited by BAETE.
- □ BAETE became a provisional signatory of WA in 2011 with EC, UK and BEM, Malaysia as nominators.

Vision and Mission of IEB-BAETE

Vision

• To be a nationally and internationally recognized accreditation body in ensuring quality engineering education.

Mission

- To set a standard for the accreditation of engineering programs.
- To accredit and recognize local and foreign programs.



The Process Flow of BAETE Accreditation



Outcome-Based Accreditation Manuals



Sets the policy, criteria, and procedure for evaluating the programs to reach the accreditation decisions.

Main changes in 2017 and 2019:

2017

- OBA adopted in 2017, along with 12 WA GAs.
- Further clarification on knowledge profile, complex engineering problems, and complex engineering activities in 2019.

2019

SAR Template was updated accordingly in 2017 and 2019.





Addressing Conflict of Interest (Col)



IEB-BAETE Criteria

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- Ten criteria considered for accreditation
 - Organization and Governance
 - Financial and Physical Resources
 - Faculty
 - Students
 - Academic Facilities and Technical Support
 - Curriculum and Teaching–Learning Processes
 - Program Educational Objectives (PEO)
 - Program Outcomes (PO) and Assessment [12 WA GA]
 - Continuous Quality Improvement
 - Interactions with Industry

A Few Facts and Figures

Sector-wise details of the BAETE pool of evaluators

			Sector	(discipline)		
Affiliation	Civil Eng	Computer Science & Eng	Electrical & Electronic Eng	Mechanical Eng	Chemical Eng	Total
Academia	34	27	50	18	22	151
Industry	10	6	13	6	8	43

Sector-wise details of accreditation applications received by BAETE during the last 3 years

		Sector (discipline)						
Year	Civil Eng	Computer Science & Eng	Electrical & Electronic Eng	Mechanical Eng	Chemical Eng	Total		
2019	6	6	6	0	0	18		
2018	5	9	7	4	1	26		
2017	6	13	12	7	4	42		

National Level Workshops, Experience Sharing Sessions, and Intensive Training of Program Evaluators (October 30–31, 2016)





Capacity Building: Visit to Malaysia on invitation from BEM (May 16–17, 2017)



Visit to BEM to Observe Accreditation Visit (May 16–17, 2017) and Decision-Making Meeting (July 26, 2017)



2017

2018

Visit to IES to Observe Accreditation Visit (March 19–21, 2018)





IES and BEM Joint Mentoring Visit (April 27 to May 4, 2018)



55th BAETE MEETING (July 12, 2018)



Meetings and Trainings (January 24 and October 8, 2019)







International Symposium on Quality Assurance in Engineering Education through Accreditation



300 participants; 176 from academia, 105 from industry and 24 from national policy makers

Four keynote speakers from Bangladesh and significant deliberations of 11 foreign delegates from Australia, Japan, China, Hong Kong, Malaysia, Singapore, Turkey, and Nepal in the symposium as invited speakers were major attractions and motivations for the distinguished participants of Bangladesh.

International Symposium on Quality Assurance in Engineering Education through Accreditation



Participants from different programs at 51 higher learning institutions attended the symposium, including eight public, 42 private, and one international institutions.

Vice chancellors, program leaders, and senior faculty members from IHL offering engineering programs in Bangladesh and BAETE program evaluators and members of different BAETE committees were present.

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International Symposium on Quality Assurance in Engineering Education through Accreditation



The Honorable Minister for Science and Technology graced the opening ceremony of the symposium.

International Symposium on Quality Assurance in Engineering Education through Accreditation



The Honorable Minister for Industry made his concluding remarks at the concluding ceremony.

International Symposium on Quality Assurance in Engineering Education through Accreditation







International Symposium on Quality Assurance in Engineering Education through Accreditation



The Honorable Minister for Education presented her speech at the special plenary session.

Capacity Building: Training Workshop 4 (June 18–19, 2019, and August 5, 2019)



Training Workshops (June 18–19, 2019)





Training Workshops (June 18–19, 2019)







2019



Training Workshops (June–October 2019)









IEAM 2019 in Hong Kong (June 2019)







Visit to ABET as observer in November 2019



Meetings with mentors in December 2019







Our Current Focuses

- To enhance BAETE's reputation, image, and ability to attract more public and private higher institutions of learning to apply for accreditation under BAETE;
- To highlight the importance of reinforcing the Conflict of Interest (Col) policy;
- To ensure strong governance, so that decisions and policies are not influenced;
- To enhance the quality of the accreditation system with the implementation of the outcome-based new accreditation manual—improvement for a more systematic, transparent, and fair system;
- To ensure the adoption of WA graduate attributes as a standard outcome;
- To elevate the quality and competency of the program evaluators—professional, collegial, avoiding Col, good time keeping, facts and not-fault finders, always keeping the big picture of accreditation in mind, no bean counting, and so forth; and
- To improve the procedure of accreditation visit (timeliness, professionalism, avoid Col, etc.).

A Few Benchmark Achievements

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Benchmarks	Status
Establishment of BAETE	2003
Provisional signatory of Washington Accord	2011
Finalization of manual for outcome-based accreditation	April 2017
Consideration of stakeholder's opinions on the manual before finalization	Completed by June 2017—stakeholders actively involved
Implementation of the manual for all new applications	In effect since July 1, 2017
Improvement in program evaluation quality [interactions with BEM as observer in accreditation visits]	BAETE delegates participated as observers in BEM and IES accreditation visits in May 2017 and March 2018, respectively.
Improvement in decision-making quality [interactions with BEM as observer in accreditation decision meeting]	BAETE delegates participated as observers in a BEM/EAC decision meeting in July 2017
Holding two–three evaluator training programs with close participation/advice from the mentors [August 2017– December 2017]	Mentors from BEM and IES conducted several workshops for PEVs during each mentoring visit. Additional training programs were conducted by others.
Finalization of 2nd Edition of Manual	March 2019 (Effective since January 1, 2020)

Streamlined Actions

- > Deeper interaction with IEA and full signatory countries
- Build capacities for program evaluation
- > Develop standards and procedures for accreditation procedures and decision-making
- Familiarize the institutions for higher learning for outcome-based education
- > Outcome assessment procedures at IEB headquarters and onsite trainings throughout



Basic Data

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Number of accreditation decisions made by BAETE (as of December 2019)

	Validity period	# of programs			# o †	f institu		
Manual version		Total	From private institutions	From public institutions	Total	Private	Public	Decisions
		61	51	10	23	19	4	Accredited
v 0	1/2003	10	8	2	8	6	2	Not accredited
(input based)	_ 6/2017	1	1	-	1	1	-	Deferred (revisit decision pending)
	7/2017	6	3	3	5	2	3	Accredited
v_1		9	9	-	8	8	-	Not accredited
(outcome based)	_ 12/2019	1	1	-	1	1	-	Deferred (revisit decision pending)
v_2 (outcome based)	1/2020 _ ~	NA	NA	NA	NA	NA	NA	NA



Growth of interest among programs in BAETE accreditation



Basic Data

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Current status of accreditation renewal (as of December 2019)

		Programs		Institutions			
Applicable Manual	Total	From private institutions	From public institution s	Total	Private	Public	Status
Manual_v0	20	12	8	10	8	2	Renewed
Manual_v1	2	2	-	2	2	-	Renewed
Manual_v1	21	16	5	13	12	1	Applied for renewal

Flowchart of the Proposed CQI Method for the Accreditation Process and System



BAETE Presented SAR for Full Signatory Status

June 2020

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- IEB-BAETE demonstrates the readiness to become a WA signatory.
- SAR shows compliance with the IEA requirements, as stipulated in the Accord Rules and Procedure:
 - Criteria 1–3 of Schedule B1
 - Criteria 4–6 of Schedule B2



A Few Basic Data

Activity	Number
Programs Accredited	63
Programs with Renewed Accreditation	32
Qualified Program Evaluators	270
Workshops Held at Headquarters	12
Onsite Trainings	28
Manuals Published	2 editions
Program Evaluator Trainings	10
Guidelines for Aplomb and Decorum During Onsite Visit	2

COVID-19 Situation

COVID-19 Situation

- Completed four visits during January–March 2020
- Postponed 17 visits after March 2020
- BAETE is working from home, with SARs being received online
- All meetings are being held online
- PEV training sessions and the International Symposium in August 2020 are getting organized online



IEB-BAETE at Present

- IEB-BAETE has fully adopted the WA Graduate Attributes of 2013 with knowledge profile, complex engineering problem solution, and activities prescribed by POs.
- IEB-BAETE continues to meet the requirements of IEA Criteria 1–3, as specified in Accord Rules and Procedure Schedule B1 (for provisional signatories).
- IEB-BAETE meets the requirements of IEA Criteria 4–6, as specified in Accord Rules and Procedure Schedule B2 (for signatories).

 There is no gap between the WA requirements and criterion, policy, procedure, and practice of IEB-BAETE.

Action plan of BAETE

Description of the Task	Expected Date of Completion			
Attended IEAM 2019 and reported on progress achieved	June 2019			
Demonstrated maturity and sustainability of OBA system by completing the accreditation of programs at three public universities and five private universities	December 2019			
Applied for WA review visit for full signatory status	December 2019			
Attended IEAM 2020 and reported on progress achieved	June 2020			
Receive MA review teem	November 2020 [postponed due to			
	pandemic]			
Achieve MA signatory status	June 2022 [after WA Review Visit in			
	2021]			



