NUTECH QUALITY MANAGEMENT SYSTEM (NQMS) POLICY

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CONTENTS

Chapter 1

<u>INTRODUCTION</u>

Urge to read, write and learn different skills has been the fundamental desire of every individual. With ever increasing number of colleges and universities, prime concern of students, parents and other stakeholders revolves around quality assurance of education, imparted by these institutes. Compliance and control mechanisms in the form of Quality Assurance (QA) and Quality Control (QC) have been adopted by various public and private entities to address quality concerns of the services and products.

Before getting into details of different Quality Systems and associated terminologies, brief historical background and emergence of Quality Assurance practices, explanation of various terminologies, international practices and brief details about the NUTECH Quality Management System concept paper have been covered in this chapter.

1.   **<u>Historical Perspective.</u>**   Quality Assurance emerged as a business methodology during 1950's period. In 1970s, QA methods were common in government services across North America, Europe and Asia, particularly in the areas of healthcare, procurements, education and public housing.

There was a different philosophy behind the approach towards QA in industry versus QA in public domain. Within industry, the philosophy over the past 50 years has focused on training of employees to prevent problems, strengthen organizational systems, and continuous performance improvement. While in public domain, particularly healthcare and education, emphasis has been upon compliance through government controls, internal and external audits etc.

Central concept behind development of QA systems in education and training originates from the basic desire of stakeholders that minimum quality standards are being followed and stakeholders are appropriately informed.

Following factors have contributed significantly towards development and implementation of QA systems in education and training: -

    a.   Pressure to demonstrate accountability.

    b.   Improved Learning Outcomes.

    c.   Better alignment of academic milestones with occupations.

    d.   Desire for Continuous Quality Improvement.

    e.   Increasing students' mobility.

    f.   Enhancing program capacity.

2.	**Explanation of Quality and Associated Terminologies.**	Andrea Wilger, from National Center for Postsecondary Improvement, School of Education, Stanford University, in a literature review, reports Quality as suitability for the intended Goal or **Fitness for the Purpose** [1]. American Society for Quality (ASQ) defines Quality as **pursuit of optimal solutions contributing to confirmed successes, fulfilling accountabilities** [2]. Quality of a product or service refers to the perception of the degree to which the product or service meet the customer's expectations [3].

3.	**Academic Quality Assurance.**	Many definitions of quality assurance in education domain have been reported in the literature. A more comprehensive one has been found in the literature review published by School of Education, Stanford University [1].

"Quality Assurance is a collective process by which the university, as an academic institution, ensures that the quality of educational process is maintained to the standards it has set itself. Through its Quality Assurance arrangements, the university is able to satisfy itself, its students and other stakeholders that: -

a.	Courses offered by the university meet the appropriate academic and professional standards.

b.	Objectives of the courses are appropriate.

c.	Means chosen and the resources available for delivering those objectives are appropriate and adequate."

Quality Assurance manual of Higher Education Commission (HEC) of Pakistan provides definition of Quality Assurance as "the means of ensuring that informed by its mission, academic standards are defined and achieved in line with equivalent standards nationally and internationally, and that the quality of learning opportunities, research and community involvement are appropriate and fulfill the expectations of the range of stakeholders" [4].

4.	**Accreditation and Quality.**	As described by Accreditation Board for Engineering and Technology (ABET), Accreditation is a review process to determine if educational programs meet defined standards of quality [5]. Pakistan Engineering Council (PEC) Manual of Accreditation explains Accreditation as a process of Quality Assurance by which a program is evaluated for conformance to prescribe standards and to obtain assurance that institution has adopted a desired quality assurance framework [6]. Accreditation has also been described as a process by which an institution qualifies for a certain status that may be a permit or a license to run a particular program in accordance with the pre-defined standards, set by the accreditation body. Generally, the outcome of the accreditation process is Yes or No [7].

According to ISO, "Quality is a form of management that relies upon following dual approach of driving an organization towards excellence, while conforming to established standards and laws" [3].

5. **Quality Control and Quality Assurance.** Quality Control is focused towards end product and aims at defect identification, instead of defect prevention that is the primary objective of Quality Assurance. Quality Assurance comprises administrative and procedural activities implemented in a quality system so that requirements for a product, service or activity are adequately addressed. In the discourse of higher education, Quality Assurance is the systematic monitoring of academic processes and an associated feedback loop to incorporate improvements in the form of Continuous Quality Improvement (CQI).

6. **Quality Audit and Accreditation.** International Organization for Standardization (ISO) defines Quality Audit as a three step process, aimed at (a) checking **suitability** of planned quality procedures in relation to stated organizational objectives (b) checking **conformity** of the actual activities with the plans and (c) checking **effectiveness** of the activities in achieving the stated objectives [3]. Literature published by European Association for Quality Assurance in Higher Education (ENQA) in the form of occasional papers defines Quality Audit as an evaluation of the strengths and weaknesses of the quality mechanisms established by an institution itself [8].

The main difference between Quality Audits and Accreditation is that audits focus on institution's own standards and goals and its success in meeting those standards while accreditation process is focused at standards external to the institution, usually national published standards and an assessment of the institution in terms of those standards.

7. **Quality Management.** A Quality Management System (QMS) is the organized structure of responsibilities, activities, resources and events that together provide procedures and methods of implementation to ensure the capability of an organization meets the quality requirement of the client [9].

8. **Salient Contents of Concept Paper.** A concept paper on NUTECH Quality Management System was presented and approved in 10th Syndicate meeting, held on 07 January, 2021. For reference purpose, salient contents of the paper have been included in this policy as per following details: -

    a.   An overview of QA related International Practices – **Appendix A**

    b.   Roles and responsibilities of national regulatory bodies – **Appendix B**

    c.   Quality Management Strategies – **Appendix C**

Chapter 2

<u>NUTECH QUALITY MANAGEMENT SYSTEM</u>

Technological advances in the form of Fourth Industrial Revolution (IR 4.0) are enabling significant changes in industry, where technology is not only improving efficiency but also changing the way people work. National University of Technology (NUTECH), established as *University for Industry* aims to adopt a leading role in transformation of national industry by addressing the emerging educational needs through educational offerings in collaboration with industry, regulatory bodies and other stakeholders.

1.   **<u>Origin of NUTECH Quality Management System</u>.**   NUTECH Quality Management System (NQMS) has been derived from the NUTECH Vision, Mission and Guiding Principles, as described below, with the help of underlined words: -

    a.   **<u>Vision</u>.** To be a <u>world-class</u> technology-driven research university <u>committed to best serve</u> society and industry through <u>purposeful</u> education, research and innovation.

    b.   **<u>Mission</u>.** To advance knowledge and educate students in science, engineering, technologies and other areas of scholarship so as to grow knowledge economy and <u>develop leaders, professionals and skilled workforce embodied with the spirit of discovery, innovation, entrepreneurship, social responsibilities and ethical practices to best serve the society and industry</u>.

    c.   **<u>Guiding Principles</u>.**   Following three guiding principles provide foundation for a comprehensive Quality Management System to be in place at NUTECH: -

        (1)   NUTECH will establish a <u>comprehensive system of regular academic audit, review, upgrade</u> and <u>improvement of learning, teaching and all tiers of knowledge eco-system</u> on the lines of best practices of leading international academic institutions.

        (2)   <u>All types of academic, skills and research programs</u> will be designed and developed to advance knowledge for the betterment of humanity, society and industry, and all such initiatives <u>be aligned with Sustainable Development Goals</u>.

        (3)   <u>NUTECH will advance its academic, skills and research pursuits</u> <u>aligned with the needs of national industry</u> in particular and regional and international industry in general.

2. **Objectives of NQMS.** NQMS concept revolves around establishing a comprehensive system of quality assurance at NUTECH with following objectives: -

    a.   To ensure conduct of regular review/audit of all academic and non-academic processes to assess desired conformity with the NUTECH Vision, Mission, Guiding Principles, policy guidelines of the regulatory bodies and best international practices

    b.   To recommend suitable remedial measures for achieving desired standards and organizational excellence

    c.   To ensure follow up of approved Implementation Plan in accordance with Continuous Quality Improvement (CQI) strategy of NQMS

3. **Scope of NQMS.** NQMS covers the entire spectrum of NUTECH activities related to infrastructure, finance, management, human resource, academics and all aspects of students' campus life, i.e. from admission to graduation, and interactions with the students even after their graduation, its main impetus is expected to revolve around ensuring the attainment of objectives and outcomes of academic programs (level 1 to 8). Moreover, NQMS applies to all types of educational initiatives undertaken by NUTECH, regardless of mode of study and place of delivery.

4. **Elements of NQMS.** NQMS comprises of the following three fundamental elements: -

    a.   **Academics.**

        (1)   It covers all academic initiatives (undertaken by various NUTECH offices) ranging from higher education (level 6-8) to Technical and Vocation Education and Training (level 1 to level 5) and associated processes. Prime focus of all academic activities including research remains aligned with the vision i.e. benefit to industry in particular and society in general.

        (2)   **NQMS ensures compliance to academic standards implemented by various NUTECH offices, departments, schools and institutes.**

b. **Industry.** It covers all forms of engagements with national, regional and international industry (undertaken by various NUTECH offices) aimed at achieving one or more of following objectives: -

(1) Study of industrial processes and reduction of issues being faced by the industry through effective R&D.

(2) Establishment of state of the art engineering and technology departments, technical and vocational education and training institutes, research centers and research labs for the growth of industry.

(3) Provisioning of solutions for the industry in the form of skilled workforce, policy documents, concept papers, research publications and conceptual designs/prototype products.

(4) **NQMS ensures compliance to industry standards implemented by the NUTECH researchers, professionals and projects teams.**

c. **Character.** It covers all forms of initiatives (undertaken by various NUTECH offices) aimed at personality development and character building of NUTECH family (includes students, faculty, support and management staff) executed in complete conformity with the divine principles of developing positive moral attributes. Following aspects constitute vital part of NQMS to achieve desired personality traits and character virtues among NUTECH students: -

(1) Ability to put in their best in all endeavors, remain motivated and positive with the help of unwavering trust, see a link between effort in the present and pay-off in the longer-term here and in the world hereafter, overcoming and persevering through, and learning from, setbacks when encountered.

(2) Learning and habituation of positive moral attributes, known as 'virtues', that include courage, honesty, generosity, integrity, humility and a sense of justice and various other similar traits.

(3) Acquisition of social confidence and the ability to present arguments clearly and constructively, listen attentively to the views of others, behave with courtesy and good manners.

(4) An absolutely clear understanding of long-term commitments which frame the successful and fulfilled life, for example to religion, faith, family, vocation and local community.

f.   **NQMS ensures compliance to standards related to personality development and character building implemented by various NUTECH offices, departments, schools and institutes.**

5.   **Principles of NQMS.** Quality Assurance principles are the globally accepted best practices aimed at improving the quality of education. Conformity with the best international practices and guidelines of the regulatory bodies is central to the NQMS design. NQMS is based on the following well known principles of TQM [9]: -

a.   **Leadership Commitment.** NQMS emphasizes upon leadership's commitment to quality as an integral part of the organizational strategy. Leadership is required to establish unity of purpose, direction, and create conditions in which people are engaged in achieving the quality objectives of the organization.

b.   **Focused Stakeholders' Satisfaction.** Understanding the current and future needs of all stakeholders contribute to the sustained success of an organization. Primary focus of NQMS is to address stakeholders' concerns on priority and strive to exceed their expectations.

c.   **Team Work.** Competent, empowered and engaged employees enhance organizational capability. In order to tap creative energies and improve motivation, NQMS stresses upon participation of all employees in work related decisions and improvements activities. Empowerment, recognition and knowledge enhancement is central to NQMS design to facilitate systematic engagement of employees in achieving the objectives of the organization.

d.   **Well Integrated Process Approach**. Managing a system of inter-related processes contributes to improved organizational efficiency. Desired results are achieved more efficiently when activities and related resources are managed as inter-related processes. Main advantages of the approach are effective resource utilization, predictable outcomes, continuous improvements etc. Performance optimization is best possible by understanding of the processes, resources, outcomes, controls and interactions.

e.   **Continuous Improvement.** Continuous improvement is essential for the survival of the organizations so that they can maintain current performance, adapt to changes/technological advancements and to create new opportunities. It enables enhanced focus on root cause investigation, followed by corrective actions. Continual improvement drives an organization to be both analytical and creative in finding ways to become more competitive and more effective at meeting stakeholders' expectations.

f. **Evidence Based Effective Decision Making.** Facts, evidence and data analysis lead to greater objectivity and confidence in decisions making. Decisions based on the analysis and evaluation of data are more likely to produce desired results. NQMS requires continuous collection and analysis of data in order to improve decision making accuracy, achieve consensus, and allow prediction based on past trends.

g. **Relationship Management.** Relationship management with the stakeholders is of prime importance in NQMS. Sustained success is more likely to be achieved when relationships with the stakeholders are well managed and utilized towards performance optimization.

Chapter 3

CONTINUOUS QUALITY IMPROVEMENT

(CQI)

Realization of desired quality standards is not a single stage process. Instead, it is linked to the implementation and integration of Continuous Quality Improvement (CQI) strategy with different processes of the university. CQI strategy for all academic and non-academic processes of NUTECH is based on well-known **Plan-Do-Check-Act (PDCA)** Cycle.

PDCA is a four step feedback control method to improve any process. This method has been successfully used at number of organizations / higher education institutes to steer and improve academic processes.

1.   **Feedback Surveys.**   Feedback surveys form an integral part of CQI Strategy. Analysis of the feedback, as explained below in Fig 3.1, is presented to the senior management of the university. Based on detailed deliberations and directives from the leadership, remedial actions are communicated to all stakeholders.

All surveys are required to be conducted online, if possible, and links of the surveys are to be mentioned in various monthly/annual reports, to be submitted to various regulatory bodies. Details pertaining to surveys' types, frequency and purpose are given below: -

Ser	Type of Survey	Frequency	Purpose
a.	Students Course Evaluation Survey	Once a semester	Students feedback about the course
b.	Students Teacher Evaluation Survey	Once a Semester	Students feedback about the teacher
c.	Faculty Course Review Report	Once a Semester	Faculty feedback about the course
d.	Faculty Survey	Annual/ as required	Faculty feedback about general aspects
e.	Graduating Students Survey	During last Semester	Feedback of graduating students about quality of education
f.	Internship Survey	As per requirement	Feedback about various aspects of internship
g.	Alumni Survey	As per requirement	Feedback of ex-students about quality of education
h.	Employer Survey	As per requirement	Employers feedback about NUTECH students
i.	Satisfaction Surveys	As per requirement	Feedback about general aspects

Fig 3.1: Feedback Mechanism

2.   **NUTECH CQI Strategy.**   NUTECH CQI strategy is based on PDCA cycle. **Plan** deals with definition / formulation of processes. **Do** part is the actual implementation of formulated plans and processes. **Check** is the evaluation / assessment of ongoing processes to ascertain whether set objectives or standards or Key Performance Indicators (KPIs) of various academic and non-academic processes are being achieved or not. Examinations (Quizzes, mid semester, end semester exams, lab exams), feedback surveys and interaction with the stakeholders are the basic tools available for said purpose. **Act** part deals with formulation of action plan to address highlighted weak areas.

Possible remedial measures are deliberated in detail by the senior management before being included in the action plan. NUQAD is responsible to ensure timely execution of the action plan and associated follow up actions. CQI Strategy has been explained with the help of following diagram.
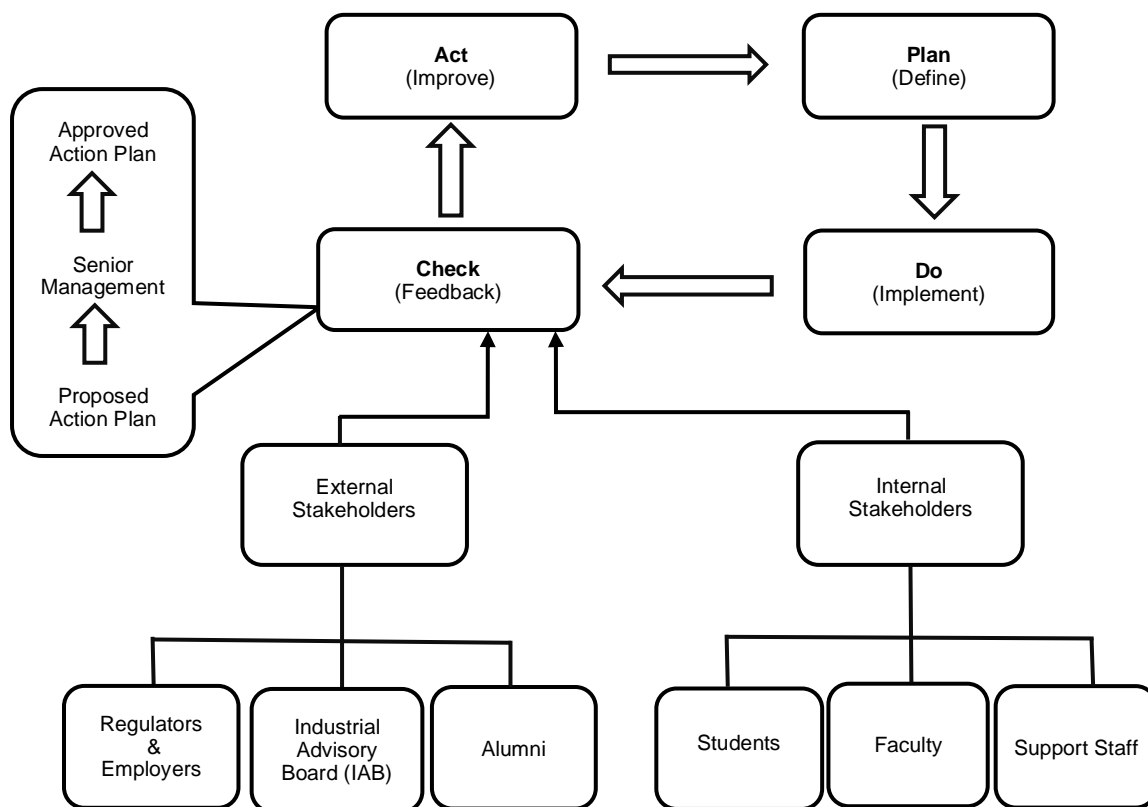
Fig 3.2: NUTECH CQI Strategy

3. **Assessments and Reports.** Periodic assessments of institutional health/capabilities and quality of programs being run play fundamental role towards enhancement of quality. These assessments can be undertaken by the university/institute itself, called Self-Assessment or can be sponsored and executed with the help of external bodies/experts. Necessary details pertaining to various assessments activities and reports are given below: -

   a. **University Portfolio Report (UPR)**. UPR is required to be prepared annually according to HEC IPE Manual.

   b. **Institutional Performance Evaluation (IPE)**. IPE is required to be conducted annually according to HEC IPE Manual.

   c. **Yearly Progress Report (YPR)**. YPR is required to be prepared annually according to HEC Quality Assurance Agency guidelines.

   d. **Self-Assessment Report (SAR)**. SAR is required to be prepared according to Accreditation Council Manual/guidelines.

   e. **Annual Internal Assessment**. Annual internal assessment of NUTECH processes is required to be conducted in accordance with guidelines given at **Appendix D**.

4. **Stakeholders.** Stakeholders for the purpose of activities related to NQMS are listed below: -

   a. **NUTECH Internal Stakeholders** include students, faculty and support staff.

   b. **NUTECH External Stakeholders** include industry specialists, graduates, employers, parents of the students, chambers of commerce and industry associations, professional organizations and regulatory bodies.

5.   **NUTECH Processes.**   Efficient management and improvement of various processes is vital for realization of quality culture at the university. Teaching and learning, being a leading core process, deserves special attention of the stakeholders. Summary of different processes is given below: -

a.   **Core Processes** at the universities/institutes are teaching and learning, assessments, examinations, internship, placement of graduates and engagements with external stakeholders in support of teaching and learning activities (Accreditation visits, Academic audits etc).

b.   **Support Processes** are the processes carried out to support the core processes. Enrolment of students, selection of required human resource that includes faculty, lab staff and support staff, procurements and provisioning of financial and ICT support are the few examples.

c.   **Management Processes** are those processes that are related to governance and organizational management. Strategic planning, resource allocation, setting objectives and targets and distribution of roles and responsibilities are few examples.

6.   **Internal Quality Assurance.**   Internal Quality Assurance system includes: -

a.   Description / formulation of Processes.

b.   Self IPE, Self-Assessments and internal audits.

c.   Change Management.

d.   Documentation.

7.   **External Quality Assurance.**   Both, External and Internal components of NQMS complement each other in execution of quality milestones related to educational activities. External Quality Assurance System includes: -

a.   Accreditation visits (including Zero and Interim visits).

b.   Institutional Performance Evaluation/External Audits.

c.   Program Reviews.

Chapter 4

NUTECH QUALITY ASSURANCE DEPARTMENT

NUTECH Quality Assurance Department (NUQAD) has been established with an aim to ensure that various academic and non-academic processes associated with all tiers of NUTECH knowledge eco-system remain aligned to university Vision, Mission and guidelines of the regulatory bodies. Details pertaining to organizational structure, Mission and Functions of NUQAD are given below: -

1. **Mission.** NUQAD Mission is to systematically implement and enhance quality standards of various processes associated with all tiers of knowledge eco-system of NUTECH while ensuring conformity with its vision, mission, objectives, best international practices and requirements of various regulatory bodies.

2. **Functions.** NUTECH Quality Assurance Department is responsible for the following: -

    a. Ensure implementation of NUTECH Quality Management Systems policy as per laid down quality standards and policy guidelines issued by HEC Quality Assurance Agency (QAA) and other regulatory bodies.

    b. Provide confidence to University management, students and rest of the public that overall quality standards of knowledge being imparted and processes being followed in NUTECH are safeguarded through compliance with the HEC and other Regulatory bodies' policies.

    c. Ensure compliance of quality standards related to academics, industry and character.

    d. Review of NUTECH academic affiliations with other institutions/entities and industry in terms of compatibility with the laid down quality policy guidelines.

    e. Ensure timely accomplishments of targets/tasks assigned by the regulatory bodies.

    f. Suggest measures for capacity building of faculty / staff involved in quality assurance procedures.

    g. Collect and provide university statistics / data for university ranking by national / international agencies.

    h. Ensure implementation of policies related to plagiarism according to guidelines issued by HEC and other regulatory bodies.

i. Ensure timely accomplishment of the following: -

(1) Self-Assessment of ongoing academic programs/ initiatives/ university services in accordance with laid down policies.

(2) Conduct of Institutional Performance Evaluation/self-audits as per given timelines.

(3) Conduct of feedback surveys and present its analysis to the senior management.

(4) Preparation and submission of Yearly Progress Report (YPR), University Portfolio Report (UPR), Self-Assessment Reports (SARs) and other similar reports in coordination with other stakeholders.

(5) Conduct of Departmental/ Program/ Subject reviews, as applicable.

3. **Organizational Structure.** Organizational Structure of NUQAD is shown below: -

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┌─────────────────────────┐
│ DG  / Dir        - 1     │
│ Jnr Officer      - 1     │
│ Supervisor       - 1     │
│ N/Qasid          - 1     │
│ Total            - 4     │
└─────────────────────────┘
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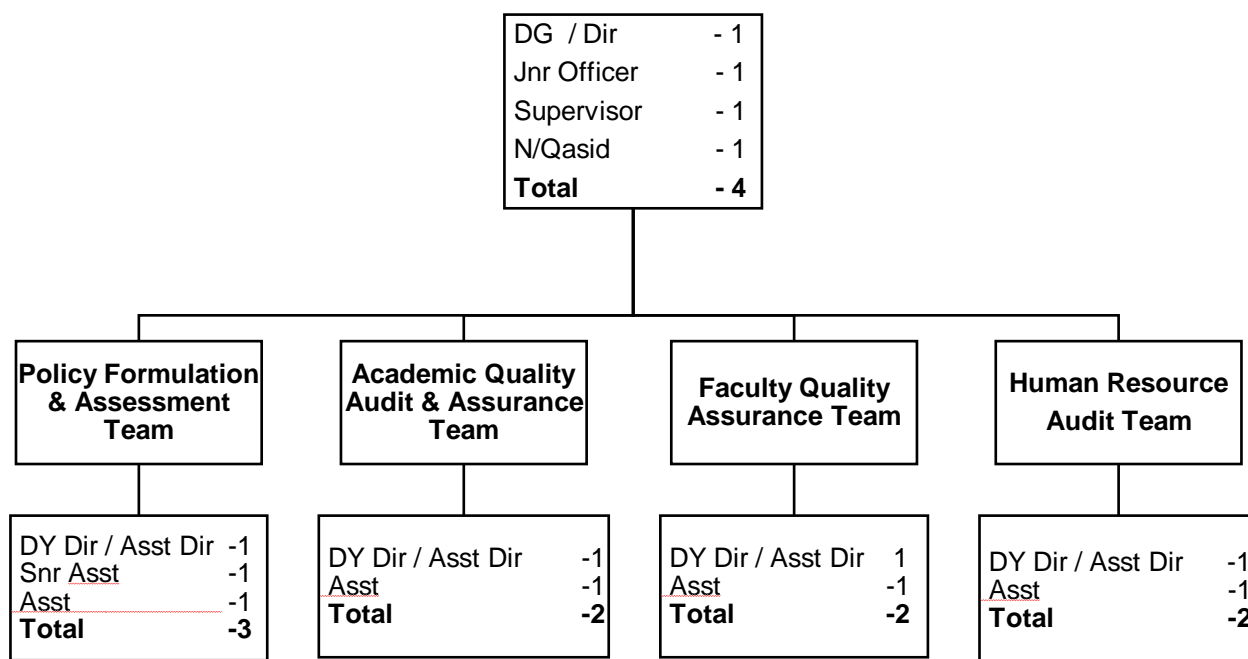| Policy Formulation & Assessment Team	Academic Quality Audit & Assurance Team	Faculty Quality Assurance Team	Human Resource Audit Team
DY Dir / Asst Dir -1 Snr Asst -1 Asst -1 **Total -3**	DY Dir / Asst Dir -1 Asst -1 **Total -2**	DY Dir / Asst Dir 1 Asst -1 **Total -2**	DY Dir / Asst Dir -1 Asst -1 **Total -2**

Fig 4.1: NUQAD Organogram

Chapter 5

<u>WORLD UNIVERSITY RANKINGS</u>

Most influential rankings of world universities are those published annually by Quacquarelli Symonds (QS), Times Higher Education (THE) and Shanghai Ranking Consultancy. Acceptability and reputation of a university largely depends upon its ranking by world renowned ranking bodies. Rankings play pivotal role towards improvement of the international outlook of a university and students' admission in various programs. Incorporating rankings news of the university into marketing strategy can have a positive effect on international student recruitment.

1. **<u>World University Rankings Indicators.</u>** QS six rankings indicators are academic reputation, employer reputation, citations per faculty, faculty/student ratio, international faculty ratio and international student ratio. THE five rankings indicators are teaching, research, citations, international outlook and industry income. Further details are available at QS and THE websites, https://www.qs.com/rankings/) and https://www.timeshighereducation.com/world-university-rankings.

2. **<u>Eligibility Criterion for World University Rankings.</u>** In order to be considered for QS rankings, a university must teach at undergraduate and postgraduate level and conduct work in at least two of five possible faculty areas namely Arts and Humanities, Engineering and Technology, Social Sciences and Management, Natural Sciences and Life Sciences and Medicine. Similarly, THE requires publishing of 1,000 or more scholarly articles over a period of five years, teaching at undergraduate and postgraduate level with focus on more than one discipline.

3. **<u>Impact Rankings Indicators.</u>** Sustainable Development Goals (SDGs) were adopted by the member states of United Nations Organization (UNO) in 2015 as a universal call for action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. Seventeen (17) SDGs are meant to achieve several challenging milestones, including no poverty, hunger and discrimination etc. Times Higher Education Impact Rankings are aimed at assessing universities efforts against these SDGs.

4. **<u>Impact Rankings Methodology.</u>** Impact Rankings have been designed to allow as many universities as possible to participate. The rankings are open to any university that teaches at either undergraduate or postgraduate level. Although research activities form part of the methodology, there is no minimum research requirement for participation.

Participation in the overall ranking requires universities to submit data to at least four SDGs one of which must be SDG 17 – Partnerships for the Goals. If a university submits data, but doesn't fulfil the requirement to be part of the overall ranking they will still be ranked in the SDGs for which they have provided data.

Strengths and weaknesses of a university can be identified through World University Rankings methodologies. Therefore, rankings ultimately help universities to evolve into world class providers of higher education. Further details are available at the websites of the mentioned rankings bodies. Further details are available at https://www.timeshighereducation.com/world-university-rankings/impact-rankings-2022-new-methodology-announced.

5. **<u>NUTECH Participation in Rankings.</u>** NUTECH, an evolving university, is well placed to formulate detailed roadmaps and comprehensive procedures to enable all offices of the university to align their activities with rankings indicators, as mentioned above. In coordination with all stakeholders, NUQAD is required to play a leading role for a meaningful outcome as regards participation in mentioned rankings.

6. **<u>Conclusion.</u>** NUTECH Quality Assurance Department (NUQAD), along with other stakeholders has been entrusted with the noble responsibility of ensuring compliance of quality standards related to complete spectrum of activities associated with the knowledge eco-system of the university. Proficient execution of quality assurance processes through synergetic involvement of internal and external stakeholders and conformance with the best international practices and guidelines of regulatory bodies would lay the foundation for achieving excellence in all endeavors.

List of Abbreviations

Ser	Abbreviation	Details
1	ABET	Accreditation Board for Engineering and Technology
2	ASQ	American Society for Quality
3	CQI	Continuous Quality Improvement
4	ENQA	European Association for Quality Assurance in Higher Education
5	HEC	Higher Education Commission
6	IPE	Institutional Performance Evaluation
7	ISO	International Organization for Standardization
8	IR 4.0	Fourth Industrial Revolution
9	KPIs	Key Performance Indicators
10	NQMS	NUTECH Quality Management System
11	NUQAD	NUTECH Quality Assurance Department
12	NUTECH	National University of Technology
13	PEC	Pakistan Engineering Council
14	PDCA	Plan-Do-Check-Act
15	QAA	Quality Assurance Agency
16	QA	Quality Assurance
17	QC	Quality Control
18	QMS	Quality Management System
19	QS	Quacquarelli Symonds
20	R&D	Research and Development
21	SA	Self-Assessment
22	SAR	Self-Assessment Report
23	SDGs	Sustainable Development Goals
24	TQM	Total Quality Management
25	THE	Times Higher Education
26	UPR	University Portfolio Report
27	YPR	Yearly Progress Report

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12. MIT Website https://audit.mit.edu/about-us/quality-assurance

AN OVERVIEW OF INTERNATIONAL BEST PRACTICES

In order to ensure conformity with the best international practices, brief roles of various international regulatory bodies have been presented in this Appendix. Moreover, Quality Assurance related practices at the world top ranking universities were studied and summary is presented in the following paragraphs.

1. **Focus of International Higher Education Regulatory Bodies:**

    a. **Quality Assurance Agency (QAA), UK,** established in 1997, is responsible for all kinds of regulatory processes. QAA principal concerns in relation to Quality Assurance are that (i) an institution has sound internal quality assurance systems and procedures for the assurance of quality and standards; (ii) procedures are applied effectively at subject level to ensure the quality of individual programs; (iii) effective means of reviewing the quality of programs exist at the institution and system facilitates continuous quality improvement; (iv) accurate, complete and reliable information about the quality of the university's programs and the standards of its awards is available to all stakeholders [10].

    b. **Accreditation Board for Engineering and Technology (ABET), USA,** A nonprofit, ISO 9001 certified organization, undertakes accreditation of colleges and universities programs in applied and natural science, computing, engineering and engineering technology. ABET Accreditation process aims at ensuring that a program offered by the university meets the quality standards of the profession for which that program prepares graduates. A program is accredited against defined criteria, intended to foster the systematic pursuit of improvement in the quality of engineering education [5].

    c. **European Quality Assurance Agency (EQAA),** is functioning in accordance with standards and guidelines, developed through Bologna Process. EQAA accords priority to development and improvement of quality culture within HEIs by stimulating and encouraging improvement of quality of teaching, learning, research and other activities at HEIs [9].

    d. **European Association for Quality Assurance in Higher Education (ENQA),** is an umbrella organization which represents quality assurance organizations from the European Higher Education Area (EHEA) member states. ENQA encourages co-operation in the field of quality assurance in higher education and distributes information and knowledge among its members / stakeholders in order to develop and share good practices [8].

2. **University level Practices related to Quality Assurance:**

      During literature review, Quality Assurance mechanisms of top ranking world universities were studied. Salient points of the existing practices are described below: -

    a.   **University of Oxford**

        (1)   Frame work for the governance of quality assurance at university of Oxford integrates activities at all levels that includes university, division and department.

        (2)   Departmental Reviews, conducted jointly by the divisions and Education Committee on six yearly basis, are a formal part of University's quality assurance system and help the university to meet wide range of its obligations under the UK Quality Code.

        (3)   Quality handbook of the university focuses on twelve major areas of quality assurance or quality enhancement, seen as being of major importance to any faculty/department. It includes admissions, induction, course design, approval, monitoring and review, student feedback, student complaints and appeals, statistical information, external input, quality enhancement in learning and teaching, monitoring of teaching, postgraduate research degrees, collaborative provision and placement learning.

        (4)   External Quality Assurance system at Oxford is based on High Education Reviews (HER) program. University has to submit Self-Evaluation Document and student written submission by student union to Quality Assurance Agency (QAA). [10]

    b.   **Cambridge**

        (1)   Cambridge University Quality Assurance procedures provide a framework within which its institutions can examine and enhance their teaching activities.

        (2)   The Education Quality and Policy Office is responsible for three key areas; namely Quality Assurance, Enhancement of teaching and learning, and Student health and wellbeing.

        (3)   Local Quality Assurance includes faculties and departments which are responsible for the quality assurance of the courses and curriculum.

(4)   Annual Program Reviews are conducted to monitor and review the programs by the Quality Managers through student survey data and external examiner reports. [11]

c.   **MIT**

(1)   Committee on Undergraduate Program (CUP) is overall responsible to supervise conduct of undergraduate education.

(2)   CUP encourages experimental innovation and ensures conformance of educational goals with educational standards of MIT.

(3)   CUP supports, encourages and monitors the development of new innovative subjects.

(4)   Committee on Academic Performance (CAP) is responsible for the academic performance of undergraduate students.

(5)   MIT Audit division undertakes audit of academics, research and related admin processes. Representatives of the audit division identify the areas which need any improvement during the evaluation process. [12]

d.   **Stanford University**

(1)   Committee on Undergraduate Standards and Policy (C-USP), answerable to Academic Council, is responsible to formulate policy governing the substance and processes of undergraduate education.

(2)   Stanford commitments to quality is reflected by its Criteria for Review (CFR). CFR consists of core standards, covering all aspects of institutional purpose, educational objectives, sustainability and quality assurance.

(3)   University employs a set of quality-assurance processes in both academic and non-academic areas, including periodic program review, assessment of student learning, and other forms of ongoing evaluation.

(4)   During review process, departments and programs are asked to complete self-studies that include curriculum assessment, feedback from current and former students, national rankings data (if available) and research grant volume etc.

(5)   C-USP, if required, may establish additional standing subcommittees to look after specific areas like Evaluation and Improvement of Teaching and Academic Standing of the degree programmes.

(6)   All stakeholders including alumni, employers, practitioners, students, and others designated by the institution, are regularly involved in the assessment and alignment of educational programs.

(7)   Internal Audit office also exists at Stanford to undertake financial, operational and information technology audits in accordance with approved policies.

e.   **Technology University of Munich**

(1)   Quality Management System at Technology University of Munich (TUM) is aimed at designing, implementing and enhancing degree programs, to make them not only attractive and challenging but also internationally competitive.

(2)   System covers the entire degree program life cycle and all related academic processes, from introduction of a program to its continuing operation, evaluation, and optimization.

(3)   Academic processes that are relevant to the quality of teaching and learning at TUM are steered by means of "Pan-Do-Check-Act" (PDCA) feedback control cycle.

(4)   One of the key components of quality management at TUM is its central evaluation system, which examines studies and teaching on three different levels; individual course, entire degree program and individual school / college level.

(5)   Evaluation involves orderly collection and analysis of data for the review and improvement of all aspects of study and teaching at TUM.

(6)   A Quality Management Circle in each of TUM's schools and colleges is responsible for analyzing evaluation results. This committee performs an analysis of the strengths and weaknesses of the evaluated unit on the basis of evaluation results and agrees upon improvement measures.

3.   **Washington Accord.** Washington Accord, initially signed in 1989 by ABET and engineering profession representative bodies of five countries (UK, Canada, Ireland, Australia and New Zealand), is an international agreement among bodies responsible for accrediting engineering degree programs in each of the signatory countries. It grants considerable equivalency to programs accredited by those bodies, and recommends that graduates of accredited programs in any of the signatory countries be recognized by the other countries as having met the academic requirements for entry to the practice of engineering.

4.   **Sydney Accord.** Sydney Accord, signed in 2001, is an international agreement among bodies of seven different countries responsible for accreditation of Engineering Technology academic programs. The signatories have exchanged information, and examined their respective processes, policies and procedures for granting accreditation to engineering technology academic programs. The signatories recognize the substantial equivalence of such programs in satisfying the academic requirements for the practice of engineering technology. Through the Sydney Accord, it was concluded that all such programs are comparable.

ROLES OF NATIONAL REGULATORY BODIES

Quality Assurance programs provide an opportunity to HEIs to showcase their achievements according to a well-defined strategy while at the same time rendering themselves accountable for the quality of their provisions. Role of regulatory bodies is fundamental in terms of definition of benchmarks/standards, processes, conduct of Program Reviews, Self-Assessment activities, Accreditation visits and compliance visits. Roles of different national regulatory bodies are briefly described in the following paragraphs.

1. **Higher Education Commission (HEC)** was established in 1974 as University Grants Commission (UGC). It came into its modern form in 2002. Main functions include funding, overseeing, regulating and accrediting the higher education institutions in the country. The commission is responsible for formulating higher education policy and quality assurance to meet the international standards as well as providing accrediting academic degrees, development of new institutions and uplift of existing institutions in Pakistan.

2. **Pakistan Engineering Council (PEC)**, established through an Act of the Parliament on January 10, 1976, is responsible for the regulation of engineering profession and education in Pakistan. PEC interacts with the Government, both at the Federal and Provincial level by participating in Commissions, Committees and Advisory Bodies. PEC is a fully representative body of the engineering community in the country to facilitate and regulate working of professional engineering bodies. Main functions include registration of engineers, consulting engineers, constructors/operators and accreditation of engineering programmes offered by universities/institutions, ensuring and managing of continuing professional development.

3. **National Computing Education Accreditation Council (NCEAC)** is a recognized accreditor of bachelor level computing degree programs in Pakistan. NCEAC has been established by HEC in 2005 to ensure the quality of computing degree programs and look after the intellectual development of students interested in pursuing the computing profession.

4. **Pakistan Medical Commission (PMC)**, established in Sep, 2020 through an act of Parliament, is responsible to regulate and control medical profession, establish a uniform minimum standard of basic and higher medical education and training and recognition of qualifications in medicine and dentistry.

5. **National Technology Council (NTC)**, established in September 2015, is responsible to carry out accreditation and certification of all 4 year programs at Bachelor level leading to technology degrees over a span of 16 years of academic learning. Engineering Technology

education curriculum has been aligned with the guidelines of HEC/ NTC to realize Continual Quality Improvement culture.

6.   **National Vocational and Technical Training Commission (NAVTTC)** established in 2005, is responsible to regulate and promote vocational and technical training in the country. By virtue of Act of 2011, NAVTTC has been empowered to set up an internationally acceptable accreditation system to oversee the growth and quality of TVET in Pakistan. Accreditation and Certification (A&C) Wing of NAVTTC is tasked to evolve procedures for quality assessment of TVET, specifically to lay down and articulate the criteria for assessment of quality.

QUALITY MANAGEMENT STRATEGIES

Based on the nature of services / products and associated processes, following well known quality management strategies have been reported in the literature and adopted by various organizations: -

1. **Plan-Do-Check-Act (PDCA)** is a four step feedback control method to improve any process. This management method has been successfully used at number of organizations / higher education institutes to steer and improve academic processes [3, 11, 6].
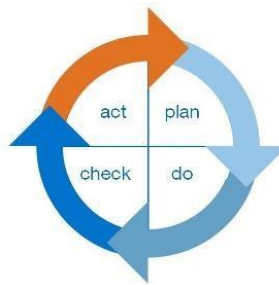
PDCA Control Cycle

(Figure taken from Technical University of Munich website)

2. **Define, Measure, Analyze, Improve, and Control (DMAIC)** is a quality strategy used to improve processes. It is an integral part of a Six Sigma initiative, but in general can be implemented as a standalone quality improvement procedure [11].
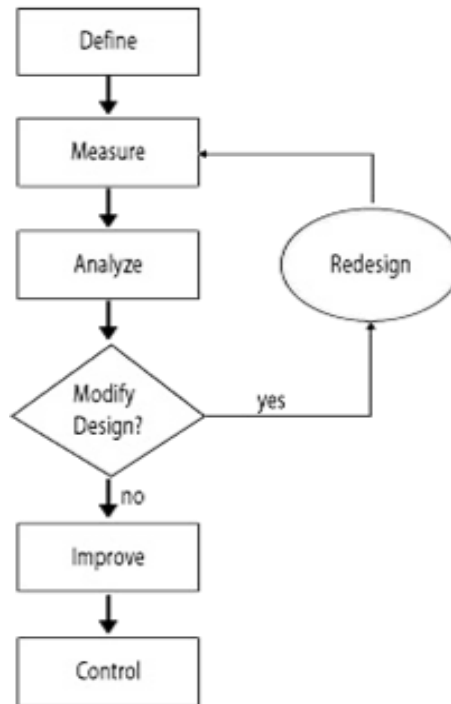
DMAIC Methodology

(Figure taken from American Society for Quality website)

3.   **Total Quality Management (TQM)** is a sophisticated management philosophy, not limited to one specified approach in doing the job. It is a continuous state of improvement that includes the participation of everyone in the organization, and represent continuous searching for the best ways to improve the organization and to reach the perfection. Some characteristics of TQM are considered to be fundamental, like customer preference, communication, consistent improvement, restorative measures, the organizational structure of network type, creativity, IT, organizational culture, team and future orientation [9].

4.   **Quality 4.0** is a term that relates to the future of quality and organizational excellence within the context of Industry 4.0. Quality professionals need to adapt to technological innovations, modern data analytics and entrepreneurships ecosystem. Process adjustment and optimization is achieved through digitization and adaptive learning. Quality 4.0 is a paradigm shift from production to system design and integration with the business world.

ANNUAL INTERNAL ASSESSMENT

1.   Annual internal assessment is aimed to ensure compliance of NUTECH processes with the laid down policies, formulated either by NUTECH herself or issued by various regulatory bodies and accreditation councils. Schedule of the activity (spread over 2/3 days) will be reflected in the university academic calendar issued by the Registrar office.

2.   Guidelines related to assessment of Academic processes include: -

    a.   Academic assessment covers all areas bench marked by respective accreditation councils and regulatory bodies in various policy documents.

    b.   NSDD is also included in this activity and compliance to accreditation related requirements of respective regulatory bodies will be assessed.

    c.   All academic departments, laboratories, library, DSL and Sports department will also be included in the assessment.

3.   Assessment of Support processes would be undertaken to assess compliance to various laid down policies. NUTECH offices included in this assessment are: -

    a.   Registrar Office

    b.   Dean of University Office

    c.   Examination Office

    d.   Admission Office

    e.   NUQAD.

    f.   NUTECH Office of Research Innovation and Commercialization (NORIC)

    g.   Treasurer Office

    h.   Administration Office

    i.   Planning & Development Office

    j.   Project Management Office

    k.   Supply Chain Management Office

    l.   Any other office/ entity deemed essential for inclusion in the assessment

4.   NUQAD is responsible for undertaking necessary coordination with relevant offices and ensure conduct of mentioned activity in a professional manner. Report of the activity is required to be shared with all stakeholders after approval of the senior management.