An approach towards total quality in architectural education in India
track: higher education (architecture education)

Uma abordagem para a qualidade total no ensino de arquitetura na
Índia curso: educação superior (educação em arquitetura)

Un enfoque hacia la calidad total en la enseñanza de la arquitectura en
la India tema: enseñanza superior (enseñanza de la arquitectura)

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Rashmi Baluja Tandon
Pursuing Phd in Architecture
Institution: School of Planning and Architecture
Address: New Delhi, India
E-mail: rashmiphd226arc19@gmail.com

Amit Hajela
PhD In Architecture
Institution: School of Planning and Architecture
Address: New Delhi, India
E-mail: a.hajela@spa.ac.in

Anil Dewan
PhD In Architecture
Institution: Dean (Faculty Welfare), School of Planning and Architecture
Address: New Delhi, India
E-mail: a.dewan@spa.ac.in

ABSTRACT
Architecture Education is a service and product, which demands, quality delivery to meet
the expectations of stakeholders. Architecture Education in India is over 100 years old,
and the focus of higher education in India post-independence has been on addressing the
demand for skilled professionals required for a developing nation. Over the years the
emphasis on quantity has impacted the quality of graduates and there is a need for a
quality framework for better delivery to all the stakeholders and to produce more
employable graduates. Quality imperatives are critical to all contemporary societies
which demand a better quality of life through holistic built environments across the globe
delivered through professionals having the skill set to meet societal aspirations There is
an increasing demand for trained professionals given the tremendous growth in the
physical infrastructure in urban and rural areas particularly the current shortfall in the
housing sector besides other tertiary sectors of the economy. The paper addresses the
issues about architectural education as mandated through statutory processes prescribed
by the Council of Architecture, New India’s Minimum Standards of Architectural
Education in India, and the New Education Policy -2020 of the Government of India. The
research process adopted identifies the gaps in the current system of education through
content and perception analysis through interviews and expert opinions and suggests methodologies that can transform the current processes through an understanding of total quality principles and their application to the higher education sector. The paper evaluates various aspects of architectural education such as institutional mechanisms, the process of admission, curricula structure, pedagogy, teaching-learning processes, scheme of examinations, faculty selection process, and their growth through the perspective of total quality parameters for the service sector. The paper attempts to suggest an approach towards Total Quality in Architectural Education in India driven by quality and research, relevant to the socio-economic, cultural, and physical context of the developing economies in the 21st Century.

**Keywords:** architecture education, processes, curricula, pedagogy, quality.
nación en desarrollo. A lo largo de los años, el énfasis en la cantidad ha repercutido en la calidad de los graduados, por lo que es necesario un marco de calidad que mejore la prestación de servicios a todas las partes interesadas y produzca graduados más empleables. Los imperativos de la calidad son fundamentales para todas las sociedades contemporáneas, que exigen una mejor calidad de vida a través de entornos construidos holísticos en todo el mundo, proporcionados por profesionales con las habilidades necesarias para satisfacer las aspiraciones de la sociedad. Existe una creciente demanda de profesionales formados, dado el enorme crecimiento de la infraestructura física en las zonas urbanas y rurales, en particular el déficit actual en el sector de la vivienda, además de otros sectores terciarios de la economía. El documento aborda las cuestiones relativas a la enseñanza de la arquitectura, tal y como exigen los procesos estatutarios prescritos por el Consejo de Arquitectura, los Estándares Mínimos de la Nueva India para la Enseñanza de la Arquitectura en la India y la Nueva Política Educativa -2020 del Gobierno de la India. El proceso de investigación adoptado identifica las lagunas en el sistema actual de educación mediante el análisis del contenido y la percepción a través de entrevistas y opiniones de expertos y sugiere metodologías que pueden transformar los procesos actuales a través de la comprensión de los principios de calidad total y su aplicación al sector de la educación superior. El documento evalúa diversos aspectos de la enseñanza de la arquitectura, como los mecanismos institucionales, el proceso de admisión, la estructura de los planes de estudio, la pedagogía, los procesos de enseñanza-aprendizaje, el esquema de los exámenes, el proceso de selección del profesorado y su crecimiento a través de la perspectiva de los parámetros de calidad total para el sector servicios. El documento trata de sugerir un enfoque hacia la Calidad Total en la Educación Arquitectónica en la India impulsado por la calidad y la investigación, relevante para el contexto socioeconómico, cultural y físico de las economías en desarrollo en el siglo XXI.

**Palabras clave:** enseñanza de la arquitectura, procesos, planes de estudios, pedagogía, calidad.

1 BACKGROUND: DEFINING ARCHITECTURAL EDUCATION

Architecture education is a product, a service, and a lifelong objective, bought and paid for, as a pathway to opportunity committed towards the well-being of society through the creation of built environments. There can be various aspects, such as academic processes, curriculum, research temper, employability, global competitiveness, professionalism, etc., associated with holistic architectural education.

Architectural education has a vital role in addressing the ongoing crisis related to the built environment and sustainable development. In the coming years, we will encounter various social, political, and environmental challenges with increasing population, climate change, and which will demand prompt, sensitive, adaptive, and responsive approach towards the fast-changing scenario sensitively. While addressing the above concerns, it’s important to appreciate that design education addresses the stated
issues as it is an application driven by a continuous life-long learning process, a pathway for opportunity committed towards the well-being of society through the creation of harmonious built environments.

Higher education in particular is very critical to the future of education across the globe, particularly in India, where we have grown exponentially over the years. There has been an increase in the gross enrolment ratio in higher education from 7% to 25% in the last 13 years and the expected target is to enhance it to 50% by the year 2035. The building industry in India is the largest employer contributing to an 8% share of the country’s GDP and on account of emphasis on infrastructure, and housing the demand for trained professionals is bound to increase.

On one hand, we face the challenge of depleting natural resources which pose severe threats to the planet Earth and our ecosystem due to pressures of economic growth. On the other hand, we continue to face the challenges of unemployment and quality professional delivery. Nevertheless, the biggest challenge is to strike a balance and prepare the younger generation to be globally competitive by transforming their attitude with consciousness toward quality. Though India has been able to achieve self-sufficiency in the food and clothing sector still there is a huge shortfall in the housing sector, which is an essential need. As per the data, there is a shortfall of approx. 31 million housing units in both urban and rural areas. The demand concerning the demographics and shortfall in the housing and building sector will further increase and therefore, there will be an increasing demand for trained manpower and professionals in the building and infrastructure sector which the discipline of architecture has to recognize and fulfill. The architectural education in India has to transform in line with the National Education Policy, 2020 to ensure quality delivery to the society by producing employable graduates.

‘Ensuring Quality Higher Education is one of the most important things we can do for future Generations’. By Ron Lewis

2 HISTORICAL EVOLUTION OF ARCHITECTURAL EDUCATION IN INDIA

India is well known for its education system since the 5th century AD from the times of Nalanda and Taxila and ever since then it has evolved manifolds. The university system began in India in 1857 at Calcutta, Madras and Mumbai. (Development of Education during British Period in India, n.d.)The formal education in architecture started in 1912 at JJ school located in Mumbai, with the primary objective to prepare draftsmen
and assistants who could assist the then-British architects in India. The JJ art school later became an architecture college in 1929. There were other prominent schools also coexisting at that time like Kala Bhawan at Baroda and Kolkata.

These institutions are known for their varied approach and ideology since ever. The JJ school was based on art as its ideology whereas Delhi Polytechnic (1942) transformed to become the School of Planning and Architecture (deemed university in 1977) maintained a critical balance between classicism and technology. On the other hand, the Indian Institute of Technology, Kharagpur (1952) which came up soon after India’s independence as a response to nation-building was deeply rooted in a technological approach as it was conceived on the principles of Massachusetts Institute of Technology. It was devoid of humanities and liberal arts. Later Kala Bhawan converted into Maharaja Sayajirao Rao University (MSU Baroda 1954) AND IIT Roorkee (1956) also came up. The Centre for Environmental Planning and Technology at Ahmedabad (1962) came up with a unique approach and ideology driven by social concerns through research.

There has been a phenomenal change since the 1970s and 1980s when the arrival of Indian architects started experimenting with new styles in context to India on the one hand and the advent of HUDCO and building centers established by them. All this was successful in transforming and adopting new approaches. Education was also privatized and further, the scenario changed substantially after the LPG policy in 1991 which brought about economic transformation, new opportunities, and challenges. It is significant to note that there were only four architecture schools in India in 1947 at the time of India’s independence whereas there are over 378 architecture schools across the country in 2023. However, with the increasing population, the demand and supply equation still demands more trained professionals.

The phenomenal growth of Architecture schools is also because India is the world's second-largest democracy and the building industry is the second largest employer after agriculture it provides a significant contribution to the nation’s economy and accounting for 126 billion dollars which is 8% of the India’s GDP and is expected to go up to 15% by 2022. Thus, there is a constant need for growth in social infrastructure, educational institutions, hospitals, defense infrastructure, housing, etc. and thus the demand for trained professionals continues to increase. Post-independence many transformations took place in India, and various regulatory bodies were established. The significant step was the enactment of the Architects Act in 1972 under which the
regulatory body Council of Architecture was established with the primary objective to set up Minimum Standards of Architecture Education and to regulate the profession of architecture in India.

Currently, the educational landscape entails an annual intake of 25,000 students, necessitating a cadre of 2,500 well-qualified teachers to uphold quality standards with a student-teacher ratio of 1:10. The findings of the AISHE survey highlight a significant inclination towards master's and Ph.D. programs, signaling a growing demand for advanced education opportunities. (National Institute of Educational Planning and Administration, 2020) Concurrently, initiatives to enhance architectural services are underway, as evidenced by plans outlined by the Council of Architecture to reduce the architect-to-population ratio from 1:50,000 to 1:9,000 by 2030, reflecting a commitment to improving accessibility and maintaining excellence in architectural practices.

3 EDUCATION POLICIES AND THEIR IMPACT ON EDUCATION

Education and architecture have been evolving and growing in response to the education policy frameworks provided by the Government of India. (NATIONAL INSTITUTE OF EDUCATIONAL PLANNING AND ADMINISTRATION, 2020) The University Grants Commission UGC was established in 1948 and thereafter several commissions and the policies that were framed had something or the other to offer which was primarily based on the then-prevailing scenario and situation of the country. (Education in India - A Detailed Analysis.) UGC was established by the Government of India to provide University Education accessible to all sections of society through policies of enabling mechanisms.

In 1952 Mudaliar Commission (Educational Commission of India-"Mudaliar Commission 1952-53) proposed increased efficiency of production throughout India and recommended setting up of technical schools and a framework for women's education in India. Later Indian Education Commission IEC also known as Kothari Commission in 1964-66 formulated the National system of education with a long-term national aspiration to fulfil three aspects of internal transformation, qualitative improvement, and expansion of education facilities.

National Policy of Education 1986 provided education to all the sections of society and based on the Gandhian philosophy the focus was made on educating the rural population. (Patel, 1968) The 1986 policy focused on primary education and particularly
rural population, it also emphasized open universities, modernization, adoption of digital technologies, and development of a science and technology curriculum with a lifelong learning objective. The policy of 1968 came up after the Kothari Commission (1966). (NEP 2020_ A Comparison with the 1986 Education Policy - Education Times). The 1968 policy was aimed at harmony, national integration, and compulsory education for 6-14 years of age. It also recommended English as the medium of instruction and emphasized vocational education, and universalization with a focus on moral values.

Privatisation and opening of open universities were encouraged with the adoption of modernisation and incorporation of IT and digital technology in the teaching curriculum. Education was considered as lifelong learning with an emphasis on science and technology were developed strongly in the curriculum. The 12th Five Year Plan (India. Planning Commission., n.d.) mandated focus on the Quality of Higher Education. (The Evolution of India’s Education Policy, n.d.) The National Knowledge Commission 2005 and Yashpal Committee (Yashpal-Committee-Report) emphasized Rejuvenation of the Higher Education in India.

The evolution of educational policies in India began with the landmark 1986 Education Policy, which laid the groundwork for subsequent reforms. From 2005 onwards, various commissions were established to evaluate higher education, leading to a series of recommendations. These recommendations were translated into action through the 12th and 13th five-year plans. During this period, the ideas emphasized by Woods Hill in 1924, central to the philosophy of the Architectural Students Association and Bombay Arts Association, proposed a tiered structure of education under a Five-Year Program with an exit policy at three levels, considering the financial conditions and affordability of Indians to pursue higher education. Architectural Education, as per these ideas, was offered from High School, with two years of Elementary Education and one year of Intermediate education leading to a Diploma after five years, reflecting an early vision for inclusive education. The emphasis on integrating liberal Arts with Architectural Education, as laid out by Havells (1911), also emerged as a prerequisite. (A critical analysis of India’s education policy: determining objectives, outcomes, and flaws)

Fast forward to the present, the culmination of these efforts materializes in the New Education Policy 2020, recently implemented by the Government of India. (NEP 2020_ A Comparison with the 1986 Education Policy - Education Times). This policy envisions an education system that contributes to an equitable and vibrant knowledge society, by providing high-quality education to all, rooted in constitutional values and
responsive to global transformations of education. For the first time, the NEP 2020 (National Education Policy 2020) places a significant emphasis on quality, aiming to make professional education an integral part of higher education and transform the curriculum and pedagogy by 2022. Quality education, it emphasizes, is contingent upon the quality of teachers, marking a pivotal shift in educational priorities. (Gholap & Kushare, 2019)

4 QUALITY AND TQM (TOTAL QUALITY MANAGEMENT)

‘Quality .... Is everyone’s responsibility.’ by Deming W Edwards.

‘Without a standard, there is no logical basis for making a decision or taking action’

by Joseph M Juran

‘Quality is the result of a carefully constructed cultural environment. It has to be the fabric of the organisation, not part of the fabric’ by Phill Crosby

‘Quality comes not from inspection, but from the improvement of the production process’

by Deming W Edwards.

Quality control and inspection have been fruitless in the last few decades and they are replaced and augmented by the methods of quality assurance and quality improvement. This notion of quality improvement and quality assurance began to emerge after the Second World War. The ideas were developed by W Edwards Deming in the 1930’s and 1940’s. Various theorists and gurus formulated their ideas on quality in the 20th century. Deming, Juran, and Crosby share a consensus in their theories, asserting that inspection and policing are not effective approaches for improving quality. They stress the crucial role of leadership and top management in fostering a culture committed to quality. (Defining Quality in Education, 2000)Quality improvement programs require concerted efforts across the organization and long-term dedication, along with investments in training. Quality takes precedence over adhering strictly to schedules. Deming initially built upon Stewhart's methods, which led to the development of statistical techniques known as Statistical Process Control (SPC). Subsequently, the Japanese expanded upon the concepts of Juran and Deming, forming what they termed Total Quality Control (TQC). This approach was hailed by Japanese thinkers as a revolutionary shift in management philosophy.
‘Quality is about passion and pride.’
Tom Peters and Nancy Austin, A Passion of Excellence.

Achieving quality is the primary task for most institutions but the quality may have different meanings and it may imply differently to individuals. Service quality characteristics are even more difficult to define than physical quality because they include important subjective dimensions. The quality of services is attributable to an organization's culture, behaviour, and attitude. They may be driven by the vision, leadership, and approach of processes both academic and administrative.

Time is a crucial aspect of service quality, distinguished from product quality by its irreparability. Services revolve around processes rather than tangible products, emphasizing how outcomes are achieved rather than the outcomes themselves. Measuring successful output and productivity in services is challenging due to their intangible nature. The quality model as may apply to the manufacturing processes is different from service quality, wherein Human Capital is at the center of the process and is required to be factored in adequately. The most meaningful performance indicator is customer satisfaction.

In the case of education, the customers of education can be classified as under:

Table 1.: Classification of customer of education.

<table>
<thead>
<tr>
<th>Education (Value addition)</th>
<th>A service to stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Learner/ Parent</td>
<td>Primary Stakeholder</td>
</tr>
<tr>
<td>Faculty, Support staff and Institute</td>
<td>Secondary Stakeholder/ service provider</td>
</tr>
<tr>
<td>Government/ Society</td>
<td>Tertiary Stakeholder</td>
</tr>
</tbody>
</table>

Source: Authors

5 SIGNIFICANCE OF TOTAL QUALITY MANAGEMENT IN THE SERVICE SECTOR

"TQM is a management approach for an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organization and society."(Kuzmina et al., 2019)
Figure 1. TQM for Tertiary Education

Source: TQM for Tertiary Education, Govt. of Karnataka Initiative, NAAC, June 2003

TQM approach is a people-driven process that changes people’s attitudes primarily, dependent on a very strong process orientation that emphasizes continuous improvement to the process besides empowerment and autonomy and to pursue a particular process of the people involved and this has great relevance as far as the service sector of education in India is considered, which demands a continuous improvement (CI) plan, with an effort to bring out the best for the stakeholders as well as for the institution.

6 GAPS IN ARCHITECTURAL EDUCATION

On the evaluation of the education policies, and minimum standards of architecture education laid down by the Council of Architecture (Council of Architecture (Minimum Standards of Architectural Education) Regulations) several gaps in the system of education over the last seven decades post-independence based on exhaustive research of secondary studies have been identified. These include deficiencies in the admission process, curriculum stagnation, limited integration of multidisciplinary approaches, and inadequate emphasis on values and ethics. Pedagogical methods often lack depth in conceptual understanding and practical application, while teaching processes need to evolve to address contemporary challenges and integrate research more effectively. Standardization issues and a lack of internationalization further hinder the readiness of students for real-world demands and global competitiveness.

To address these gaps, reforms are imperative. Regular reviews of the curriculum, tailored pedagogies, and a stronger focus on ethics and values can enhance student development. Integration of multidisciplinary approaches, greater emphasis on research, and standardization efforts are necessary to improve educational quality and international
attractiveness. Collaboration with foreign institutions and investments in infrastructure can further bolster the stature of architectural education in India on the global stage.

7 QUALITY MODELS AND THEIR RELEVANCE TO ARCHITECTURAL EDUCATION AND SERVICE SECTOR.

Higher Education, being a service sector having a huge human resource needs to be appraised through scientific principles of education delivery through available management tools applicable to service quality delivery. This paper examines the Higher Education service sector through the lens of management tools that meet the aspirations and expectations of all the stakeholders involved which primarily include the student, the faculty, the parents and the management of the institution imparting education.

Six Sigma, originating in 1986 at Motorola, is a methodical approach to process improvement aiming for near-perfection in meeting customer needs. It necessitates a cultural transformation within organizations, striving for heightened customer satisfaction, profitability, and competitiveness. (Applying Six Sigma in Higher Education Quality Improvement) Embracing principles such as understanding customer requirements, data-driven decision-making, and continuous process refinement, Six Sigma operates through methodologies like DMAIC (Define, Measure, Analyze, Improve, Control) and DMADV (Define, Measure, Analyze, Design, Verify). In architectural education and the broader service sector, Six Sigma principles hold significant relevance, particularly in institutions needing to continually enhance services to meet evolving student needs. Adopting DMAIC methodologies (Ramanan & Ramanakumar, 2014) can aid in identifying areas for improvement, analyzing processes, implementing enhancements, and ensuring sustained control over service delivery, thereby elevating overall quality.

Ronald Barnett's conceptualizations of higher education further elucidate quality pursuits within academia, emphasizing education's role in fostering qualified human capital, preparing for research-oriented careers, managing teaching excellence, and expanding life opportunities. These conceptualizations underscore the multifaceted nature of quality in higher education, spanning from economic contributions through skilled graduates to the promotion of lifelong learning and societal advancement. Thus, the application of Six Sigma and DMAIC methodologies in architectural education aligns with broader educational goals of enhancing quality across various dimensions, from
academic rigor to lifelong learning opportunities, ultimately benefiting both students and society at large. The service quality model in higher education focuses on responsiveness, assurance, empathy, tangibles, and reliability, recognizing the dynamic, cyclical nature of achieving quality within resource constraints. Reliability is highlighted as crucial throughout the system. The SERVQUAL scale, adopting a performance-only approach, is widely used for measuring service quality, including in education. Owlia and Aspinwall outline key dimensions of quality in higher education, including responsiveness, reliability, understanding of customer needs, access, competence, courtesy, effective communication, credibility, security, tangibles, and performance. These dimensions collectively contribute to fostering an enriching learning environment and the holistic development of students. Henry Ford's quote underscores the importance of prioritizing quality over quantity in education.

Quality in architectural education in India requires a comprehensive approach spanning various dimensions. This involves ensuring faculty responsiveness, reliability, and competence, tailoring educational experiences to student needs, and providing accessible guidance. Effective communication, institutional credibility, and student work security are crucial. Tangible resources, performance assessment, and integration of supplementary skills like digital modeling and sustainability awareness are essential. (Defining Quality in Education, 2000). Additionally, fostering creativity, sustainability principles, and cultural sensitivity, while nurturing critical thinking and community engagement, prepares graduates for diverse professional challenges. Embracing technology, interdisciplinary learning, and professional development further enriches the educational experience and ensures graduates' relevance in the evolving architectural landscape. (A Good Quality Education Arises from Interaction between Three Enabling Environments: Policy, the School, and the Home and Community EdQual RPC and Education Quality A Framework for Education Quality Defining a Good Quality Education A Simple Context-Led Framework for Education Quality, 2010) In essence, holistic architectural education in India emphasizes faculty support, relevant curriculum, student-centered learning, and industry alignment, promoting a conducive learning environment and equipping graduates with essential skills, values, and global perspectives. (Lee, 2018) In the realm of architectural education in India, ensuring quality necessitates a comprehensive approach that considers various dimensions.
8 HESQUAL MODEL

The HESQUAL model introduces a comprehensive framework for ensuring quality in higher education, delineating five key dimensions: Administrative Quality, Physical Environment Quality, Core Educational Quality, Support Facilities Quality, and Transformative Quality. (Teeroovengadum et al., 2016) Administrative quality emphasizes efficient processes and transparent decision-making, while Physical Environment Quality focuses on adequate infrastructure. Core Educational Quality prioritizes academic rigor, and Support Facilities Quality attends to holistic student needs. Transformative Quality highlights the broader societal and personal impact of higher education. By addressing these dimensions, institutions can create a supportive environment conducive to rigorous academic programs and student success, ultimately preparing students for personal growth and societal contributions in an evolving world.

9 SERVQUAL MODEL

The SERVQUAL model is a foundational framework for evaluating service quality across industries, including higher education. It comprises five dimensions: reliability, responsiveness, assurance, empathy, and tangibles. In academia, these dimensions are crucial for assessing the effectiveness of service delivery, from the consistency and timeliness of academic processes to the competence and credibility of faculty and staff. Assurance reflects the institution's expertise and reputation, while empathy emphasizes a supportive environment. Tangibles encompass physical evidence like campus infrastructure. (Adam.) Additional dimensions like corporate collaboration and course offerings contribute to a holistic assessment, ensuring relevance across disciplines. By identifying strengths and areas for improvement, institutions can enhance service delivery and student satisfaction, enriching the educational experience.

10 TQM IN HIGHER EDUCATION

Total Quality Management (TQM) in higher education requires systematic performance measurement aligned with institutional missions, despite challenges in adopting quality control due to academic freedom. (Sindwani et al., 2011) Quality remains essential for competitiveness, customer satisfaction, and institutional credibility,
emphasizing lifelong learning and research-driven pedagogy. In architectural education in India, quality entails institutional commitment, skilled faculty, and student-centered learning, preparing students for evolving job markets. Continuous faculty development and research investment bolster educational quality. *(TQM-Principles and Concepts, n.d.)*

Dimensions in TQM for higher education include tangibles, competence, attitude, content, delivery, and reliability, collectively aiming to enhance educational services and meet stakeholder expectations.

### 11 OBJECTIVES FOR ACHIEVING QUALITY IN ARCHITECTURAL EDUCATION

The aim is to address various barriers in higher education in India by establishing dedicated institutional mechanisms that motivate both students and faculty, ensuring leadership commitment to transparency, decentralization, and continuous facility upgrades. Curriculum planning occurs periodically with a focus on holistic growth, supported by feedback mechanisms from stakeholders at different levels and flexibility in grading systems. Pedagogy in the 21st century must align with student behavior, with a consistent philosophy towards producing employable graduates to foster stakeholder trust. Architecture education should integrate diverse disciplines with architecture design at its core, offering flexible curriculum structures that support credit transfer and ample elective options. *(Charalambous & Christou, 2016)* Emphasis on sustainable design and emerging technologies is essential, alongside promoting research, development, and documentation. Continuous appraisals and feedback ensure accountability, with quality assessment at every stage maintaining institutional integrity.

### 12 VARIOUS QUALITY DIMENSIONS FOR ARCHITECTURAL EDUCATION

After reviewing multiple quality models and their associated principles and dimensions, the quality dimensions most pertinent to Architectural Education have been identified. These dimensions have been categorized into Prerequisites, drivers, and instruments, as outlined in the table below.
Table 2: Quality Dimensions for Architectural Education

<table>
<thead>
<tr>
<th>Pre-Requisites</th>
<th>Drivers</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsiveness</td>
<td>Access to Guidance</td>
<td>Courtesy</td>
</tr>
<tr>
<td>Reliability</td>
<td>Security</td>
<td>Effective Communication</td>
</tr>
<tr>
<td>Understanding Student Needs</td>
<td>Tangible Resources</td>
<td>Credibility</td>
</tr>
<tr>
<td>Faculty Competence</td>
<td>Cultural Sensitivity</td>
<td>Assessment of Performance</td>
</tr>
<tr>
<td>Creativity and Innovation</td>
<td>Ethics and Professionalism</td>
<td>Completeness</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Technology Integration</td>
<td>Adaptability and Resilience</td>
</tr>
<tr>
<td>Critical and Lateral Thinking</td>
<td>Interdisciplinary Learning</td>
<td>Community Engagement</td>
</tr>
<tr>
<td>Global Perspectives</td>
<td>Sustainability &amp; Environmental Awareness</td>
<td>Continuing Professional Development</td>
</tr>
</tbody>
</table>

Source: Authors

13 COMPARATIVE TABLE OF QUALITY MODELS AND THEIR DIMENSIONS FOR THE ARCHITECTURAL EDUCATION

After reviewing different quality tools, we have mapped various dimensions to identify their relevance to Architectural Education from the perspective of the human resource-based service sector. These dimensions have been structured as essential prerequisites for achieving quality. The key drivers will act as enablers to achieve the defined prerequisites, along with the instruments that will enable us to achieve the outcomes that will translate into the enhancement of the Quality of Architectural Education, as referred to in Table No.3
Table 3: Comparative Table of Quality Models and their dimensions for the Architectural Education.

<table>
<thead>
<tr>
<th>SIX SIGMA</th>
<th>DMAIC</th>
<th>KAIZEN</th>
<th>HESQUAL (Higher Education Service Quality)</th>
<th>SERVQUAL (Service Quality)</th>
<th>TOTAL QUALITY MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defects Reduction: Minimizing errors or defects in architectural processes, design, and outputs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMAIC in architectural education in India entails systematically defining project objectives, measuring processes and stakeholder needs, analyzing root causes of issues, implementing improvements, and establishing controls to sustain progress, fostering continuous enhancement in teaching, learning, and assessment practices.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Employee Involvement: Engaging in continuous improvement initiatives, fostering a culture of continuous improvement.
| | Implementing Six Sigma principles in architectural education in India aims to enhance quality, efficiency, and stakeholder satisfaction through defect reduction, variation reduction, data-driven decision making, process improvement, and employee involvement. |
| Variation Reduction: Reducing variability in design and construction processes to ensure consistency and reliability. |
| Measurement: Collecting and analyzing data on processes, performance metrics, and stakeholder needs. |
| Continuous Improvement: Promoting a culture of incremental improvement in architectural processes, design methodologies, and project delivery. |
| Administrative Quality: Ensuring efficiency and effectiveness in administrative processes related to architectural education, such as admissions, scheduling, and resource allocation. |
| Tangibles: Ensuring the adequacy and modernity of architectural facilities, equipment, and materials to support effective teaching and learning. |
| Customer Focus: Focusing on the needs and expectations of architectural students, stakeholders, and end-users. |
| Analyze: Identifying root causes of issues or inefficiencies in architectural education, service delivery, teaching and assessment. |
| Core Educational Quality: Delivering high-quality architectural education through rigorous curriculum design, innovative teaching methods, and assessment practices. |
| Assurance: Demonstrating the competence, credibility, and trustworthiness of architectural faculty, staff, and educational resources. |
| Data-Driven Decision Making: Using data and statistical analysis to inform design decisions, project management, and quality improvement efforts. |
| Improve: Implementing solutions and process enhancements to address identified issues and improve educational outcomes. |
| Support Facilities Quality: Offering comprehensive support services, counseling, and academic advising to meet the diverse needs of architectural students. |
| Empathy: Understanding and addressing the diverse needs and backgrounds of architectural students, fostering a supportive and inclusive learning environment. |
| Process Improvement: Identifying and eliminating waste, inefficiencies, and bottlenecks in architectural workflows and project delivery. |
| Control: Establishing measures and protocols to sustain improvements, monitor performance, and prevent regression in architectural education processes. |
| Transformative Quality: Fostering personal and professional growth among architectural students, preparing them for successful careers and societal impact. |
| Responsiveness: Promptly addressing student inquiries, concerns, and needs in architectural education, enhancing satisfaction and support. |
| Employee Involvement: Engaging architectural staff and stakeholders in quality improvement initiatives, fostering a culture of continuous improvement. |
| Waste Reduction: Eliminating waste and inefficiencies in architectural workflows, design iterations, and project management practices. |
| Employee Empowerment: Encouraging architectural staff to identify and implement small, incremental changes to improve efficiency and quality. |
| Support for Facilities Quality: Offering comprehensive support services, counseling, and academic advising to meet the diverse needs of architectural students. |
| Process Management: Optimizing architectural workflows, design processes, and project management practices to enhance efficiency and effectiveness. |
| Inference drawn for all the Quality Models for their application to Architectural Education |

| Implementing Six Sigma principles in architectural education in India aims to enhance quality, efficiency, and stakeholder satisfaction through defect reduction, variation reduction, data-driven decision making, process improvement, and employee involvement. |
| Kaizen principles applied in architectural education in India foster a culture of continuous improvement, empowering faculty to make incremental changes, and emphasizing waste reduction in workflows, ultimately enhancing educational quality and preparing students more effectively for the profession. |
| HESQUAL principles in architectural education in India prioritize administrative efficiency, modern facilities, high-quality education, comprehensive support services, and personal/professional growth. This integrated approach aims to enhance the overall educational experience and prepare students for impactful careers in architecture. |
| SERVQUAL principles in architectural education in India emphasize the adequacy of facilities, reliability of services, assurance of faculty competence, empathy towards student needs, and responsiveness to inquiries. This framework aims to create a supportive and inclusive learning environment, ensuring student satisfaction and success in their architectural education journey. |

Source: Authors
TOTAL QUALITY GOALS AND ARCHITECTURE EDUCATION

Total Quality Goals encompass a range of objectives aimed at optimizing production processes and ensuring continuous improvement in various aspects of operations. These goals include Cost Control, focusing on modifying production to reduce costs while maintaining quality standards; Quality Control, striving for excellence in product or service delivery; Performance Control, seeking continuous efficiency enhancements throughout production activities; Adaptability Control, ensuring ongoing professional training to keep pace with evolving industry needs; Sustainability Control, emphasizing continuous development for long-term viability and success; Informative Flow Control, promoting clarity and simplicity in cooperative processes; and Security Control, fostering confidence and trust in production partnerships. Collectively, these goals drive organizational success by prioritizing efficiency, quality, adaptability, sustainability, transparency, and security in all aspects of operations.

RELATIONSHIP BETWEEN TQM GOALS AND GOALS OF ARCHITECTURAL EDUCATION PLANNING

In India, over 350 architecture schools are catering to more than 25,000 students, yet only a handful offer world-class education. This disparity highlights a significant gap between the education provided and industry demand, resulting in a shortage of employable graduates with the necessary skills. The rigid curriculum and teaching methods limit students' creativity and hinder their ability to apply knowledge effectively. Many institutions struggle for recognition and fail to establish their brands due to entrenched adherence to traditional approaches, impeding sustainable development. Bridging the gap between dreaming, conceptualizing, and design implementation is challenging, compounded by a lack of emphasis on soft skills essential for employability. Achieving quality in architectural education requires institutional commitment to motivation, leadership, equality, transparency, and decentralization. Continuous investment in facility planning and curriculum alignment with industry needs is vital, along with fostering a culture of lifelong learning and providing equal growth opportunities. Implementing robust feedback mechanisms and balanced assessment approaches focusing on the learning process further contribute to maintaining educational
quality. These foundational elements collectively establish a strong framework for quality architectural education.

The Total Quality goals intrinsic to the Total Quality Management (Sudha T) approach have been mapped against the critical goals of Architectural Education and the key derivatives have been defined as enablers to achieve Total Quality in Architectural Education. The understanding of Total Quality is primarily oriented towards the manufacturing and production processes. However the critical aspects find significant relevance to the Service sector wherein the TQM approach can be applied which will contribute towards Continuous Improvement as part of education delivery.

The Total Quality Management (TQM) goals and the goals of architectural education planning share significant overlaps, reflecting a mutual commitment to efficiency, excellence, adaptability, sustainability, communication, and security. Both frameworks prioritize cost control and time-cost efficiency, seeking to optimize resources and reduce wastage while maintaining high standards. Additionally, they emphasize quality control and achievement, striving for excellence in outcomes and project success. Performance control and development are central to both TQM and architectural education, focusing on continuous improvement and refinement to enhance efficiency and effectiveness. Furthermore, adaptability control and adaptive flexibility are essential aspects, highlighting the importance of responsiveness to changing circumstances and needs, whether in production processes or student-instructor communication. The critical Quality drivers have been mapped in the table below enumerating the interrelationship between the specified goals to the Higher Education.
Table 4: Mapping of Quality Drivers and the Goals of the Architectural Education Planning

<table>
<thead>
<tr>
<th>TOTAL QUALITY GOALS</th>
<th>GOALS OF ARCHITECTURAL EDUCATION PLANNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Control: Modifying Production for Cost Reduction</td>
<td>Time- Cost Efficiency: Outcome efficiency on completion of program</td>
</tr>
<tr>
<td>Quality Control: Quality reach in production</td>
<td>Quality Achievement: Establishing Quality culture and mechanisms for Continuous improvement</td>
</tr>
<tr>
<td>Performance Control: Continuous Modification for efficiency through production activity process</td>
<td>Performance Evaluation: Accelerating systematic design and success in educational delivery</td>
</tr>
<tr>
<td>Adaptability Control: Education continuity of Professional Training for changing life</td>
<td>Adaptive Flexibility: Flexible learning pathways and trajectories for career progression</td>
</tr>
<tr>
<td>Sustainability Control: Continuous development for existence and confidential medium</td>
<td>Sustainable Durability: Continuous improvement through effective monitoring of processes(Internal &amp; External)</td>
</tr>
<tr>
<td>Informative flow Control: Making clear in the process of Cooperation and simplification</td>
<td>Communicative Effectiveness: Effective dialogue between all stakeholders.</td>
</tr>
<tr>
<td>Security Control: Cooperation in production with confidence</td>
<td>Confidence Building: Confidence Building measures towards professional security</td>
</tr>
</tbody>
</table>

Source: Authors

Moreover, sustainability control and sustainable durability are shared objectives, emphasizing long-term viability and success. Both TQM and architectural education prioritize continuous development and the establishment of common terminology and a confidential medium for communication. Finally, security control and confidentiality are paramount, fostering trust and confidence in partnerships and educational environments alike. In essence, these frameworks underscore a holistic approach to achieving excellence, emphasizing efficiency, quality, adaptability, sustainability, communication, and security across all operational and educational endeavors.

A distinguished academic program embodies several essential attributes that collectively enhance its effectiveness. It is anchored by a clearly defined vision and philosophy, guiding its objectives and policies. The strategic framework and implementation align closely with these principles, targeting specific learning outcomes at each stage. Lifelong learning skills are emphasized to ensure graduates remain competitive on a global scale. The program’s design education approach is both comprehensive and integrated, distinguishing between definitive and interpretive fields. Curriculum progression is systematic, prioritizing complexity and favoring a process-oriented approach over final products. Flexibility allows for adaptation to changes, including compliance with regulations and tailored career paths. The curriculum is
designed to be relevant, reflecting the school's philosophy and emphasizing learning outcomes through specific course objectives. Learning is actively promoted through exploration, experimentation, and experiential learning—the 3Es. Research-driven learning and practical knowledge application are central, fostering creativity, innovation, and multidisciplinary collaboration. The program emphasizes multifaceted student development, connecting design issues with real-world practice. Overall, this academic program is characterized by its holistic and forward-thinking educational approach.

16 PRE-REQUISITES FOR TOTAL QUALITY IN ARCHITECTURAL EDUCATION

a) Institutional Commitment: Total Quality in Architecture Education requires unwavering commitment from institutions. This commitment serves as the foundation for implementing quality measures and ensuring continuous improvement.

b) Student Engagement and Professional Growth: Students must be actively engaged in their learning process, stimulated by innovative instruction methods, and equipped with the skills for continuing professional growth. This involves staying updated on advancements in technology, science, and instructional techniques, facilitated by a strong focus on research and development.

c) Paradigm Shift in Instruction: Achieving Total Quality necessitates a paradigm shift in teaching methodologies. This includes transitioning from a focus on information dissemination to knowledge-centered approaches, from time-served to results-driven strategies, and from routine exercises to creative problem-solving methods. Additionally, structured instructions should give way to unstructured, exploratory learning experiences.

d) Academic Excellence of Faculty: The faculty plays a crucial role in realizing Total Quality in Architecture Education. Faculty members should be committed to continuously acquiring knowledge and possessing the ability and attitude to disseminate, apply, and create knowledge. Their academic aspirations and dedication to excellence are essential for fostering a culture of quality within the educational institution.
16.1 APART FROM THE PREREQUISITES FOR APPLYING TQM, THE OTHER AREAS OF CONCERN ARE LISTED BELOW

The process also includes careful consideration of faculty selection and development, maintaining a ratio of 1:2:4 for progression. This allows flexibility for faculty growth, driven not by vacancies but by individual achievements and meeting minimum standards for advancement. Additionally, there should be a shift in student selection criteria, with greater emphasis placed on aptitude tests (50%) and subject-based evaluation (35%), with a smaller portion allocated to school-level examinations (15%).

Student attributes should be aligned with professional positioning, encouraging innovation, out-of-the-box thinking, and a research-oriented mindset over their five-year tenure. Infrastructure plays a crucial role in facilitating comprehensive learning, encompassing well-equipped laboratories, smart classrooms, media labs, digital libraries, and comfortable living amenities such as recreation rooms, sports facilities, and gyms. The campus should feature additional amenities like an in-house departmental store, stationery shop, documentation center, and model-making workshop. Comprehensive security measures and Wi-Fi connectivity are essential. Emphasizing sustainability principles, the physical infrastructure should contribute to a high quality of life for the academic community, incorporating both active and passive systems for air quality and maintenance. Effective campus management should ensure upkeep and integration of interior environments, focusing on ergonomics.

17 DESIGN CENTERED CURRICULUM

Our developed process places a strong emphasis on a design-centered curriculum, where design serves as the core subject and connects naturally with all related fields in a progressive manner. The content is carefully crafted to provide students with varying levels of complexity as they progress through the course, motivating them to pursue architecture with explorative values. Fundamental principles of architecture and design software are imparted through a series of exercises, focusing on design thinking structured around critical thinking. Additionally, there is a focus on creating comprehensive infrastructure to facilitate learning, including well-equipped laboratories, media labs, digital libraries, and amenities for comfortable living and recreation. The
physical infrastructure prioritizes safety and sustainability principles, contributing to a high quality of life for the academic community.

Figure 2: Project Evaluation Process

18 IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT

a). At Curriculum Level: Each stage of our architecture education curriculum is meticulously crafted to inspire students to pursue the profession with explorative values rooted in a deep understanding of design principles. Through a series of carefully articulated exercises, students are encouraged to develop their skills in design thinking, alongside fostering critical thinking abilities. This structured system spans all 10 semesters of architecture education, providing flexibility in teaching and learning processes facilitated by studio teams. It allows for cyclical growth and seamless integration between different semesters, ensuring a progressive extension of learning from one stage to the next. Central to this process is the incorporation of design thinking and sustainable design principles, as well as the integration of key subjects such as structures and construction. The culmination of this journey is the Architectural Thesis, where students present their learnings from nine semesters in the form of a comprehensive design project, showcasing the integration of both definitive and interpretive fields.
b). Scheme of Examinations and Evaluation: The scheme of evaluation involves a continuous review of the progression of students. Higher weightage on progressive stages and reduction of final stages of marking thereby focusing on the process rather than the product. The question papers need to be equipped with more applied and analytical questions to emphasise on power to think analyse and generate opinions.

c). Faculty: Faculty members should possess a minimum of three years of professional experience before entering into any academic roles. The criteria for faculty recruitment should undergo regular review, considering qualifications, research contributions, publications, and professional experience. Peer review processes, similar to those in the Indian Institute of Technology, should be implemented periodically. Equal opportunities for professional growth and development should be provided to all faculty members. There must be an effective integration of research and development activities with the academic curriculum. Faculty members should be equipped to impart lifelong learning skills and should maintain a positive and progressive attitude toward achieving academic excellence. They should be competent and forward-looking, capable of generating resources through research and development initiatives, institutional projects, and practice.

d). Institution: Each institution must implement a systematic approach to assess the performance of both students and faculty members. The faculty performance index serves as a critical quality driver and is instrumental in evaluating faculty performance, ensuring accountability across the academic discipline. Consistent teaching loads should be maintained, with an expectation for faculty members to engage in research and professional growth. The institution should have academic aspirations for faculty members, encouraging the development of teaching materials in architecture. Moreover, adherence to a relevant curriculum and the adoption of appropriate assessment and evaluation criteria are essential. Establishing minimum quality parameters and conducting periodic quality audits contribute to a systematic mechanism for evaluating quality. Emphasis should be placed on teamwork and documentation, and institutions are encouraged to adopt a multidisciplinary approach and foster exchange programs and collaborations with other institutes and universities.

TQM in architectural education requires a strategic roadmap tailored to the unique needs and challenges of the field. This begins with a thorough SWOT analysis, systematically evaluating the strengths, weaknesses, opportunities, and threats specific to
architectural education. From this analysis, key values and principles are discerned, laying the foundation for a quality-centric approach within architectural institutions. The application of the 5 S's—sorting, systematizing, sanitizing, standardizing, and self-discipline—becomes integral to streamlining processes and fostering an environment conducive to continuous improvement, particularly in design studios and academic settings. Top management's commitment to TQM is crucial, driving the establishment of a visionary statement that encapsulates the institution's dedication to excellence in architectural education. This vision statement guides decision-making and problem-solving processes, facilitating the development of long-term action plans that align with the institution's goals and aspirations. Values and principles are established to guide both students and faculty, promoting a culture of quality and innovation within architectural programs.
19 BENCHMARKING IN TOTAL QUALITY MANAGEMENT

Benchmarking is a critical component of Total Quality Management (TQM) in architectural education, enabling institutions to assess their processes and outcomes against global standards. By comparing themselves to leading architectural programs worldwide, institutions can identify areas for improvement, particularly in design pedagogy, research output, and industry collaboration. A team-based approach is essential for TQM implementation, fostering collaboration among faculty, students, and industry partners. Continuous learning is emphasized, highlighting the importance of ongoing professional development in a rapidly evolving field. Critical success factors are identified to evaluate TQM initiatives, ensuring a commitment to delivering quality education across all aspects of the curriculum. Ultimately, benchmarking within the TQM framework creates a flexible foundation for enhancing architectural education and preparing graduates for success.

In education, benchmarking aids in assessing and improving academic programs by evaluating practices against global standards and best practices.
CONCLUSIONS

The model outlined incorporates various types of benchmarking, such as internal, competitive, functional/industry, and generic process benchmarking, each serving specific purposes in process evaluation and improvement. Despite its significance, benchmarking in education often focuses more on process analysis than strategic integration. A comprehensive approach could lead to continuous enhancement of educational quality, starting with establishing a strong institutional philosophy and vision, supported by a comprehensive framework to ensure quality education delivery and stakeholder satisfaction. The model remains dynamic, adapting to changes in the educational landscape and emphasizing lifelong learning for enhanced employability.

This model stands out for its emphasis on design thinking, advocating for fostering creativity and innovation in problem-solving. It also promotes a structured curriculum, pedagogy, and continuous outcome evaluation through collaborations with research institutions. This holistic approach spans from overarching philosophy to the specifics of educational processes across different years, ensuring a comprehensive and cohesive learning experience. In essence, it serves as a guiding framework for educational institutions, promoting adaptability, quality, and forward-thinking to meet the evolving needs of students and society.

The educational approach outlined places significant importance on developing effective communication skills, both verbal and graphical, utilizing various mediums. It begins with a solid application of basic design knowledge, encouraging hands-on experiences like workshops, site visits, and presentations. The curriculum aims to cultivate perception and appreciation for architectural elements, guiding students in understanding space and form. A key focus lies on ideation and concept development, guided by design thinking principles. Acquiring a diverse skill set, including manual and automated techniques, is essential. Extracurricular activities are integrated to enhance learning, providing practical application and skill refinement opportunities. Furthermore, the model emphasizes the creation and application of knowledge rooted in socio-cultural values. It aims to develop various skills, including graphical, computational, and verbal expression, while also emphasizing technical vocabulary. Sensitivity to architectural design issues is fostered through a holistic understanding of the discipline, integrating both definitive and interpretive fields.
The curriculum encourages contextual appreciation and equips students with the tools to engage actively with the physical environment. Overall, this comprehensive approach prepares students as skilled professionals and conscientious contributors to the architectural field.

In the context of Total Quality Management (TQM), the educational framework emphasizes the continuous application of previously acquired knowledge to current design challenges, fostering a continuous learning process. Students develop a comprehensive understanding of various aspects related to building development within regulatory frameworks, ensuring adherence to quality standards. The curriculum prioritizes the assimilation of Codes of Practice and the application of both traditional and innovative technologies, aligning with TQM principles that emphasize excellence in all aspects of education.

Integrated learning is facilitated through the use of software applications and simulation techniques, experiential learning, and enriching the educational experience. The model promotes the development of conceptual frameworks and their translation into appropriate design solutions, emphasizing the process over the final product—a fundamental aspect of TQM. The appreciation of design issues and the cyclic integration
of different disciplines further reinforce the commitment to continuous improvement. Extramural activities complement this approach, fostering holistic growth and providing practical application opportunities. Additionally, the curriculum empowers students to address challenges in sustainable development, emphasizing research methods and evidence-based decision-making. A strategic framework for technology selection and application, along with practical training with architectural firms, provides understanding and appreciation of the practical application of the critical concepts that contribute meaningfully to the profession with a focus on quality and sustainability.

The curriculum places a strong emphasis on integrating building services and construction technologies into the design process, emphasizing practical skills essential for the modern architectural ecosystem. Urban design projects provide insights into people-centric design engagement and integrate various aspects of architecture, construction, and sustainable design, ensuring students are prepared for real-world scenarios, thus further providing opportunities to work on large-scale projects. The curriculum also prioritizes contextual responses, considering site characteristics, climatic conditions, and socio-cultural influences. The selection and application of appropriate technology reflect a commitment to staying updated with industry advancements. Overall, the suggested curricula framework ensures that students have both theoretical knowledge and practical skills, preparing them for the complexities of architectural design and implementation. In conclusion, this research underscores the imperative for a transformative approach to architectural education in India, driven by the principles of Total Quality. By recognizing the paramount importance of quality in meeting societal aspirations and addressing contemporary challenges, our study highlights the pressing need to bridge the gap between quantity and quality in the education sector. Through an exhaustive analysis of various facets of architectural education and their alignment with statutory processes and national policies, this paper identifies critical shortcomings and proposed methodologies for improvement.

Central to our approach is the integration of Total Quality principles, which provides a holistic perspective that considers not only academic standards but also socio-economic, cultural, and physical contexts. By emphasizing research, innovation, and alignment with stakeholder expectations, our proposed framework seeks to ensure better delivery of education and produce more employable graduates. In essence, a paradigm shift is required towards Total Quality Principles in Architectural Education in India. By fostering a culture of excellence and continuous improvement, the objective is to nurture
a new generation of professionals equipped with the skills and knowledge to address the evolving needs of society and contribute to the creation of holistic built environments that enhance the quality of life. This approach, relevant to the socio-economic realities of developing economies in the 21st century, holds the promise of not only meeting the current shortfall in skilled professionals but also paving the way for a more sustainable and prosperous future."
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