

Technological Knowledge Systems Approach: From Little Insights to a Paradigm Shift in Structural Knowledge and Application

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ABSTRACT: Structural conservation is yet to emerge as a focused discipline within the overall area of architectural heritage as it does for modern day engineering and construction. A primary reason for this is the insufficiency of relevant information even though historic buildings are standing documents themselves, which further emanates from an indifferent attitude both in academics and professional domains of the concerned technical disciplines. This paper explores this fundamental aspect and poses questions. It puts forth a Traditional Knowledge Systems approach as an alternative to the conventional system of education and stresses upon the need for an inter-disciplinary approach, dialogue and partnership between Architecture and Engineering to answer these questions for the purposes of structural conservation.

1 INTRODUCTION

This international conference is very important for South Asia because it concerns with the responsible future of architectural heritage resources. This part of the world is very rich with such resources that possess immense values of universal significance making them as important for the rest of the world and the future generations. However, a large extent of these resources continue to be obscure and unacknowledged, which reflects in misdirected approach and actions towards their protection, maintenance and management. Therefore, our heritage is very vulnerable to destruction and a cause of great concern. It is hoped that this Conference can inspire the civil and structural engineers to adopt and adapt to the conservation approach and get involved in conservation measures.

One of the biggest challenges in heritage conservation lies with the continued colonial paradigm in our general perception of what constitutes heritage and the ensuing approach towards its protection and management (reference). Even though there has been a general increase in awareness about historical architecture in the last two decades in India and some attempts made to include it in mainstream architectural education, it still remains more in the impressionistic and romantic notions. The “Great Indian Heritage Pyramid” is not understood as a source of knowledge, as an irreplaceable resource and a standing repository of knowledge that we can draw lessons from to enhance our technical knowledge and education.

This situation of increase in public awareness not backed by proportionate upgradation in knowledge of built heritage has proved to be highly detrimental and exposed historic buildings to object commercial exploitation for purposes like tourism that make do only with maintaining appearances achievable through unauthentic measures, construction techniques and materials. That such actions are interventionist and affect the original fabric of historic buildings is not really understood; that they mutilate the Authenticity of Knowledge essential for quality conservation measures is an idea deemed unworthy of any consideration at all. This holds especially true for technical knowledge represented in historic buildings that is embedded much

deeper than the surface and requires serious concerted efforts to be realized. Thus, there is a great indifference and constant discrimination of our built heritage.

The high level of development in modern engineering and construction practices, and due relevance and prominence of Structures as a discipline in architectural studies is largely missing from the field of heritage education. This links back to the aforementioned non-recognition of built heritage as a source of knowledge. There are hardly any serious studies undertaken on historical buildings that result in little availability of structural information in the educational arena and affects the professional domain as well, which in any case prefers to base itself upon international systems in a bid to remain global. Therefore, the profession, the competence of professionals and the mode of practice are more relevant for new structures and not ideal for historic buildings.

Therefore, the premise of this paper is that built heritage is a source of technical and technological knowledge of immense potential that falls within the domain of engineering and structure but is yet to be realized; that upgradation of knowledge through competent education and technical training that brings respect and responsibility for built heritage to counter the exploitation emanating from an incomplete awareness is the only way to go. It is most urgent to bring historic buildings within scope of the disciplines of engineering, science and technology in a holistic and comprehensive way to achieve a technological competence critical for our heritage's survival, and a contribution to responsible management of built heritage.

This paper explores this primary issue of education for responsible structural conservation and raises questions that require an inter-disciplinary approach for answers. It also suggests an alternative way, the "Knowledge Systems Approach" to build information and knowledge on built cultural artifacts as part of mainstream education system and as a way of engaging different professionals, traditional masons and craftsmen and the people at large for collective and responsible heritage management.

2 THE CONTINUING COLONIAL PARADIGM IN TECHNICAL EDUCATION

As mentioned above, the two primary disciplines of Architecture and Engineering with its many sub-disciplines, which are requisite for structural conservation, continue to ignore historic buildings as source of knowledge.

The prevalent trend in architectural education and practice is an eclecticism drawing inspiration from foreign journals and places with an urge to go global. Even though it is generally acknowledged that the historical architecture is qualitatively far superior to modern practice, there are no efforts to realistically understand and draw from our architectural heritage attributes, including the technical facets displayed.

The ensuing result is a professional untrained to meet the challenges of the local context who continues to stay indifferent to requirements of built heritage, either by design or due to the inability to innovate and build upon the education imparted. Both situations reflect a stagnation of mind that does not have the capacity to evolve.

A similar state of ignorance and indifference applies to the discipline of Engineering that provides technical inputs to architecture. The 19th century revolution that arose with the introduction of steel and reinforced cement concrete for construction purposes introduced new principles of Structures and construction techniques that replaced the historic methods, and consequentially its knowledge base. Therefore, there is no training in historic engineering. The other aspect is the theory-based scholastic approach of modern engineering, where solutions are found through some generic applications like the Newtonian principles, the Equations of Equilibrium, the systems of mathematical calculations et al.

To build technical competence in Indian Heritage buildings another way is required. The unknown heritage has to be seen as a source of knowledge. As it is "unknown" the information has to be collected from the building itself and reorganized into knowledge systems. Ideas of stability, loads and other structural principles have been utilized but within a totally different situation and intellectual context. Therefore theories based on specific contextual hypotheses may not be directly applicable. The building becomes the source of knowledge requiring very exhaustive building documentation, studies and analyses to base the proposals upon. This may be understood in the West but is largely ignored in India. Almost all modern day engineers are in-

capable of assessing structural properties of buildings that have been standing for centuries. There is a tendency for direct application of modern theories without understanding the nature of building primarily that arises from the discriminatory attitude inculcated by modern education towards built heritage. The result is a cement based solution to all problems in historic buildings irrespective of original fabric.

The other facet centers upon the great compartmentalization of disciplines in education and professional domain that trains a person from one perspective. This does not necessarily imply bad education. But it becomes suicidal when one perspective is assumed to be the 'whole' information. This reflects the most in popular definition of heritage, heritage education and heritage management in India.

This inability to adapt to local needs results in a tendency to make generalizations and standards based upon international and modern guidelines for application in professional works - classic case of putting cart before the horse! Therefore, societal attitude, education and profession are in a constant state of equilibrium each trying to meet the demands of one another but nobody rising above the status quo to meet the demands of heritage itself. The primary challenge that emerges is the need to inculcate respect for the Great Indian Heritage and treat it accordingly.

3 WORKING TOWARDS A NEW PARADIGM IN HERITAGE EDUCATION IN INDIA

As they say necessity is the mother of invention, the richness, complexity and diversity of the Indian situation and context required development of new techniques to impart heritage education according to our realities. As the only institute in the country offering a Masters programme in Architectural Conservation, the responsibility was all the more grave.

The search for a suitable and appropriate way to conserve the diverse heritage of India inspired development of a new paradigm constituting holistic and knowledge systems approach to generate information and integrated management systems that spans over a period of two decades. It commenced with the author's Masters Dissertation at York and progressed to evolve through various academic and professional experiences, eventually linking this approach to "real" heritage management as evident in management plans prepared for various World Heritage Sites, inscribed and designate - Champaner, Khajuraho, Hampi and Mehrauli. And the lessons learnt have been applied back in teaching.

4 REDISCOVERY AND REDEFINITION OF HERITAGE

Indian architectural heritage shows a wide variety in their morphological character, being products of different geographical contexts, long period of time characteristics and functions. The quantity and quality of Indian heritage can be best represented in a simple way as the "Great Indian Heritage Pyramid" where like the tip of the iceberg, only a small part is realized but the richer bounty remains hidden and unacknowledged.

5 INDIAN BUILT HERITAGE

Built heritage is a cultural product and viewed within the larger framework of civilization studies. It is a product of the Context and "concerns itself with specific and unique characteristics of 'land,' 'community' and historic dimension of 'time.' The variety of combinations and interactions of great complexity culminate in an identifiable culture with specific norms, traditions, attitudes and perceptions. The built heritage, a product of the interaction of the three elements and the resulting cultures, is dynamic in character, is the physical expression of the ethos of an identifiable culture at a specific time and is the product of the community's perceptions and priorities... collective memory of a society... source of identity and inspiration...sustenance for our future survival. Hence, 'historicity' and historic built heritage has 'value.'"

Therefore, the surviving historic buildings are standing documents representing continuity of time, place and people and indicative of architectural evolution/ disruption by additions and al-

terations. They are products of many disciplines and represent historical, geographical and anthropological information besides technical, an aspect strengthened by the diversity visible in the character of these resources as architectural responses to the immediate local context.

Most of the information carried by a historic building remains embedded. It has to be extracted, understood and then applied for conservation works. This comprehension of buildings as repositories of knowledge becomes all the more crucial in the absence of written literature.

6 HOLISTIC UNDERSTANDING AND KNOWLEDGE SYSTEMS APPROACH

Holistic understanding of built heritage is crucial to inculcate the respect and responsibility due to it. It requires collective efforts of various disciplines to reintegrate the historical, cultural, scientific and technological information and intervene in a way that the authenticity, integrity and values of the historic structure are maintained. This way of working is referred to as the new paradigm.

The primary need to comprehend historic buildings as amalgamation of various disciplines towards a holistic understanding is achievable through a knowledge systems approach, which basically disintegrates the whole into parts to gain a comprehensive understanding inside out of each unit; and then putting the various parts together to realize the relationship between different parts and how the whole operates. Similarly, a building embodies numerous dynamic systems and sub-systems.

Further, the Knowledge Systems Approach centers upon the principle of decentralization and views every building within its immediate context, which varies from place to place.

Therefore, every building is deemed unique and requires special attention; the hierarchy of various system and sub-system within the building is identified and categorized based upon their importance in the larger scheme of things, which can be taken apart and then put back together. This exercise gives cognizance with the external world of historical architecture with our internal mind, a reintegrated view of the same old building. This helps to make the historical building as a source of knowledge. The relevant knowledge systems are architectural, design, planning, technical and technological knowledge systems are relevant.

The information so extracted forms the basis of education and technical training.

7 CASE STUDIES

This section demonstrates the issue of Technical Knowledge Systems as outlined earlier – as a challenge and leading to a new direction and paradigm.

Delhi is the location of the World Heritage Site – Qutub Complex with the landmark Qutub Minar, the tallest masonry structure that till some time back was the tallest of all types of constructions. The neighboring Alai Minar in the same complex is a mute testimony to the limits of structural knowledge, when the king of Delhi after the Slave Dynasty tried to construct a tower of double proportions. But it is an incomplete and failed endeavour in contrast to the original intentions. This exhibits all the issues of knowledge, technical capacity and management of works.

To make political statements through architecture that surpasses in physical dimensions has been a common strategy adopted in history that has achieved masterpieces. In the 16th century Temple of Govinda Deva, the Goswamis of Vrindavana designed a new temple type to accommodate new worship and rituals. The *raas lila* or the spiritual dance became part of ritual and required a large uninterrupted space hitherto unknown. The dome of Govinda Deva was an achievement which surpassed the achievement of the patron Emperor Akbar. (Refernce)

However, at Deeg in Rajasthan, the same strategy of surpassing the Mughals in building resulted in a structural disaster. The Nand Bhawan at Deeg was built similar to the Diwan-i-Khas of Red Fort, Delhi – the Hall of Private Audience of Emperor Shahjahan but larger in spans and dimensions. This has caused twisting of columns and collapse of the roof. The structural issue is yet to be resolved and awaits the help of appropriate technical expertise with high level of competence.

The way water has been handled in India is very significant. Traditional water network systems in India comprise a crucial area of traditional engineering and architecture. It is such a rich tradition with a variety of network systems based on few principles- gravity, hydrology and sustainability. A lot requires to be learnt. Because these systems are so closely linked to communities, livelihoods and social values; they have to be understood in a holistic and integrated way. This requires the knowledge systems approach.

The “Ghats” are the traditional way to respond to river banks; these are the steps that facilitate activity and ritual functions that is a true cultural response that developed a big way in 18th and 19th centuries which covered many major rivers. This kind of response is very unique and very distinct from the European way of building retaining structures that gives a straight edge.

The Ghats of Banares are iconic, very complex and layered.

Kesi Ghat in Agra is also articulate and complex design. Apart from responding to the river Yamuna, it cleverly relates to the structure and fabric of the town of Vrindavana. It also represents a successful partnership of public with the princes in the British times to provide a facility to the pilgrims. However, the condition of these ghats and the technical solutions require many disciplines working together to get total quality.

The Ghats at Maheshwar on the Narmada are threatened because they are slipping into the river. The challenge this presents is that the ecological issues have to be addressed and corrected before any conservation measure demonstrating the inter-disciplinary nature of the challenge.

8 CONCLUSION

As mentioned above, a building is a product of many disciplines. Therefore, there is a need to approach a historic building holistically even if the emphasis is on extracting a particular type of information, like in this case Structural information. The need is of a bi-disciplinary approach for study and analysis of historic buildings; this is essentially an anthropological view because of the importance given to the people and the building is only seen as a product of that culture. This is the new paradigm in the study of built heritage and the Traditional Knowledge Systems approach.

It is an attempt to articulate the intellectual and other processes required for removing “colonial filters” from minds eyes and rediscover the technological and engineering potential of our historical architecture, through examples of structural engineering; re-understanding simple but timeless structural principles; questioning some of our assumptions on the one side; on the other side questioning our own world view created by education / academics of the first globalization; then by redefining critical connections between society, knowledge, professional and engineering / structural analyses/techniques.

Once this information gap is fulfilled, it percolates into mainstream education and technical training, thus contributing our present with the lessons learnt from the past.

