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Why BIM not standardized by LDA, for Submission documentation? *A review*

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Abstract

Though the technology of Building Information Modeling has, through the holistic method of generating and handling all the information required for any project to be built, transformed the building codes and practices worldwide, such has not been the case of Pakistan. This paper focuses specifically on the reasons why the Lahore Development Authority (LDA) has despite the various advantages and accuracy to be had with BIM, not yet standardized it to be used for the documentation of submissions and other processes. This research highlights the main reasons behind the delay in the implementation of BIM technology by LDA, which includes the limited training and teaching, high costs in implementing the BIM technology as well as the lack of digital infrastructure to aid the professionals and the government staff. Furthermore, the lack of legislative ruling and the necessity of updating the building regulations and codes also make the BIM standardization procedure challenging. Another important issue that impedes the adoption of this technology is unprofessionalism and immaturity of the local market which in turn makes the streamlining of the processes of drawing submission and data management.

The present research emphasizes the importance of developing benchmarks for institutional support, pilot projects, and policy changes that may lead to a sustainable environment for architecture and regulation in Lahore. In order to gain a deeper insight, this study will draw a comparative analysis of the Lahore Development Authority and the Singapore Construction Authority in the context of administrative structure, performance and methodologies of both bodies to achieve sustainability in the build infrastructure while also looking at the minimum amount of red tape-ism.

Keywords Digital Infrastructure, Submission, BIM Standardization, Regulatory Challenges, Legislative Frameworks, Sustainability

Introduction

Globally the adoption of BIM is changing the past paradigms of architecture and construction industry. BIM technology integrates the physical and functional aspects of a built asset throughout its life cycle in the form of a digital model (ICEHRM, 2021). Despite its benefits globally, BIM is yet to be integrated by the Lahore Development Authority (LDA); which is the principal urban regulatory body in Lahore, Pakistan, in the processes of standardization of submission documentation and management of assets.

The aim of this research is to look at the principle reasons of this delay in adoption of BIM by LDA, examine the main hindrances and finally to propose recommendations to expedite the ensuing standardization(Pakistan, 2023). This paper will help in identifying the gaps in the digital infrastructure, the lack of professional experts and training and the legal framework that hinders the application of BIM by LDA. Although there are numerous advantages associated with BIM, its

application to the submission documentation process by the Lahore Development Authorities (LDAs) has its own set of challenges as well as constraints. The challenges with integrating BIM data into the legal system of LDAs accompanied by the difficulties of data exchange and standardization have prevented smooth implementation of BIM within this field. Therefore, there is a lack of utilizing full BIM potential in regards to electronic submissions under the LDA framework (Al Sehrawy et al., 2021). This paper undertakes to investigate the possibility of utilizing BIM for electronic submission documentations in LDAs; the strengths, limitations, and enablers of the approach; and key implementation issues and recommendations. By analyzing comprehensively the present scenario and a progressive approach, this research explores methods which will make it easier to adopt this transparent, efficient, standardized and digitally- driven submission process in the legal policy framework of LDA (Farooq et al., 2020).

Background:

According to LDA act 1975 that has been established by Punjab Provincial Assembly Lahore Development Authority.. Earlier, it was known as the "Lahore Improvement Trust". It was established when the Punjab assembly legislate the LDA Act in March the act was named as Lahore Development Authority Act 1975 when, Governor of Punjab approved it on 3 rd May 1975. LDA is a financially independently organization affiliated with Punjab's Secretary of Housing and Physical Planning. The rationale of this Act was that "it was considered desirable in the public interest that there should be a continuing, systematic, metropolitan and regional plan for the development and that there should be a systematic plan for the development of the Lahore metropolitan area." It has three main wings of Lahore development authority:

- Urban Development Wing
- Water and Sanitation Agency (WASA)
- Traffic Engineering Planning Agency (TEPA)

The board of governors is elected by the Zila Nazim of the Lahore City District through the minister of Punjab. Its members include the following:

- Director General LDA
- Town Nazims of all the Towns of Lahore City District
- District Coordination Officer of Lahore City District
- Representative of the Planning and Development Board Punjab not below the rank of Additional Secretary/Deputy Secretary
- Representative of the Finance Department not below the rank of Additional Secretary/Deputy Secretary
- Representative of the Housing Urban Development and Public Health Engineering Department not below the rank of Additional Secretary/Deputy Secretary
- Representative of the Local Government and Rural Development Department not below the rank of Additional Secretary/Deputy Secretary.
- All the Heads of the Agencies established by the Authority (M.D. WASA & M.D. TEPA)

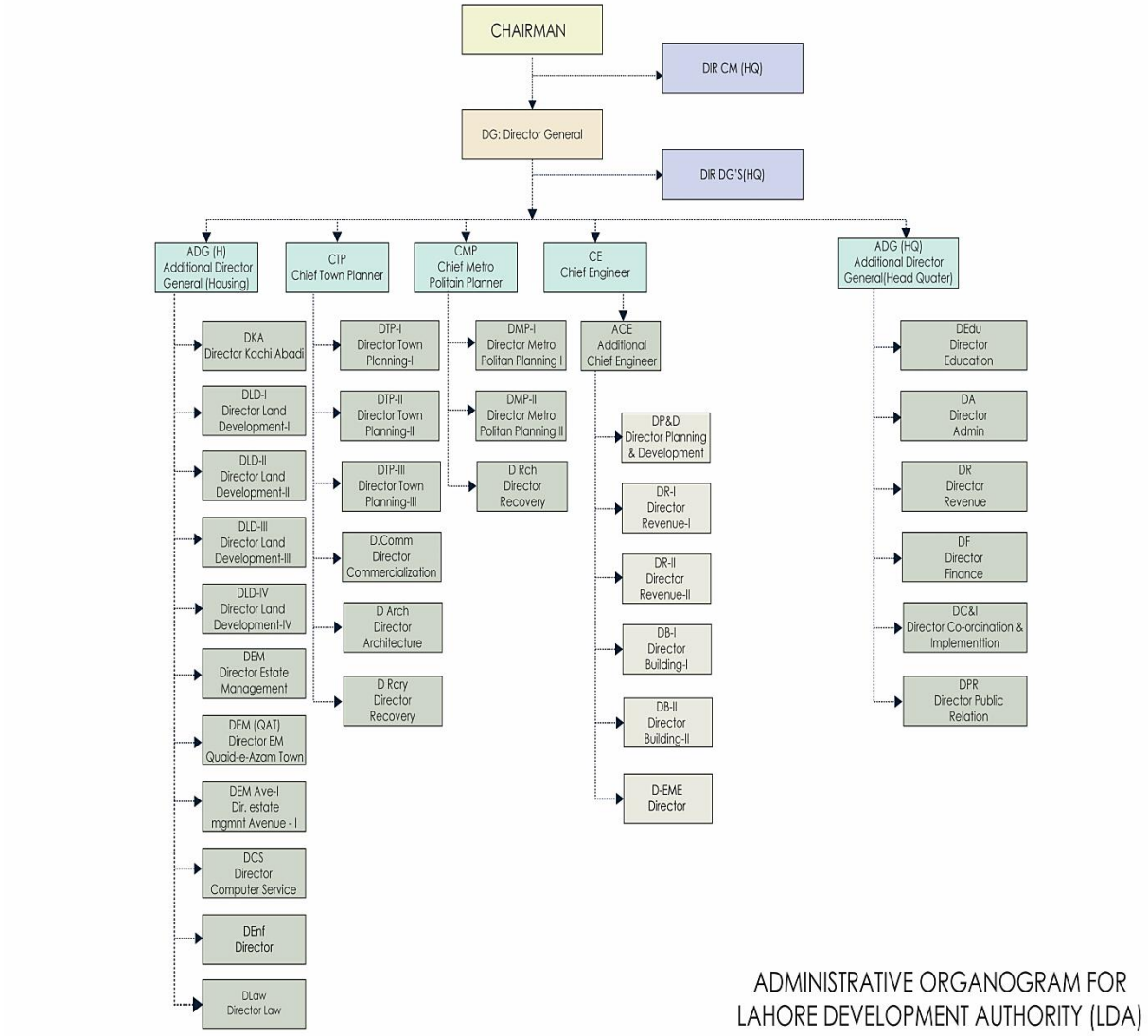

Figure 1- LDA's Administrative Organogram (Auther's Own work)

As for the organizational structure, the Commissioner Lahore was the first to chair the Authority. The Director General/Chief Executive was a senior civil official; the Authority was constituted of chairs of independent board reporting agencies which LDA had the authority to create, including the Water and Sewerage Authority (WASA), the Managing Directors and chairs of Municipal Committees. Some of the broad areas of work that LDA concentration include Katchi Abadis, Hidden Properties, Estate Management and Development, Commercialization and Housing and many more. These are all headed by directors and come under the Ministry's Urban Development Wing. Most attention should be paid to the Lahore Development Authority Government of Punjab's section on coordination and implementation.(Shoaib, 2019)

Category of Housing Schemes:

- A housing scheme must be at least one hundred kanal in area and must comprise a cooperative housing scheme.
- Farm housing schemes that have plot divisions in acres.
- Land sub - division of less than a hundred kanal and land sub-division having an area less than fourty kanals.
- Farm housing schemes have plot division in acres.
- Apartment housing schemes.
- Low cost apartment housing schemes private or initiated by the government. (LDA 1975 Act, 2016)

Literature Review:

PLRA (Punjab record development authority), was developed in collaboration with the World Bank, they initiated PULSE (Punjab Urban Land subdomain), to facilitate LDA (PLRA, 2024). Due to which E-khidmat markaz was launched at LDA with help of PITB (Punjab Information technology board) just after COVID-19 with a unified system ready to be used with the help of a mobile app(PITB, 2023). With the help if this LDA has recently rolled out paperless document submission system. With this, documents can be easily submitted in vector form, i-e scanned in PDF format. Along with this a several documents which are a must for a building of commercial or public scale can be initiated, those documents are:

- Soil investigation report.
- Fire department (1122) compliance report.
- Building height approval report from Civil Aviation Authority.
- Housing transaction, one for all file.
- Building Plans.
- Addition, alteration, extension, amalgamation or commercialization scheme upon owner's requirement.

In the LDA there are old and new system that work in a mixed way:

Old System:

- Physical system in which 1 file had three copies created for a Land, Building and Construction paper work (having a room for future commercial supermarket conversion approval by law).

New System:

The old data was digitalized in three steps:

a) **Archives:** The old date was digitally archived starting from 2015 upto now, in which the old date was digitally scanned and recorded.

b) **Digitalization:** After the date was scanned, it was then tagged, numbered and later cleaned with authentication for internal use.

c) **Workflow:** Data now can be used for new transaction, fines and surcharges without construction on empty plots.

The new system was mostly transaction based, it had a problem of security and sharing issue with different decision makers, within the LDA, specialized in different areas. Traditionally, the submission documentation process has relied heavily on manual processes, which are inherently time-consuming, prone to errors, and lack transparency. The manual review of documents, often involving physical copies or scanned documents, can lead to delays, miscommunication, and misunderstandings among stakeholders. Furthermore, the lack of digital integration and collaboration tools can hinder the effective exchange of information, resulting in inefficiencies and potential project delays. (Author's Own work)

BCA Submission Process:

The submission of building plans in Singapore to be approved by the Building and Construction Authority (BCA) also guarantees compliance to the safety and design before the construction had even took place thus enhancing urban planning. Here's a detailed breakdown:

a) *Appointment of a Qualified Person (QP):* However, to meet the requirements provided by the QP, an Architect or a Professional Engineer must supervise the design and compliance of the project.

b) *Pre-Consultation & Clearances*: The QP assembles requisite preliminary approvals with authorities, for instances, the URA or required particular technical divisions (fire security, environment clearance, etc.). Both these consultations are helpful to determine regulatory compliance requirements right at the start.

c) *Submission via CORENET e-Submission System*: All the documents in the completion of any building plans and any regulatory documentation is done through CORENET. These consist of, architectural, structural, mechanical and electrical plans and forms along with the applications fee.

d) *Plan Review by BCA and Other Agencies*: BCA examines the submission in terms of structure stability, access and the Building Control Act. Clearances from other agencies (e.g Fire Safety and Shelter Department, PUB for drainage) is incorporated in the process.

e) *Timeline for Approval*: If the plans respond to all correspondents, BCA aims for approval in not more than seven working days. If this does not happen, the QP will have to make changes to the plans that have been presented.

f) *Permit to Commence Work*: After obtaining the building plan, the QP, the builder and the project applicant jointly make an application for a permit to commence construction. This makes it possible for actual site activities to match the approved designs on the drawing table.

g) *Monitoring and Compliance*: BCA may undertake inspections during construction phase in an effort to test compliance to approved drawings and code. When this happens, any deviation must be reporting a new plan(SCA, 2022).

Thus, all new developments are safe and sustainable reflecting the general vision of Singapore's urban planning. Full details on this can be obtained by visiting the official site of BCA. Incase of LDA submission the licensed architect and town planners takes palace of the QP remaining process is similar but in case for approval of housing schemes process at LDA completes in following way:

LDA Submission Process:

- Owner will apply all application at once. Approval time starts after 7 days, standardization of the approval will be based on categories above.
- NOCs are issued, as per plan submitted, upon inspection.
- After operation starts LDA takes control of the enforcement.

Automation and Research:

LDA's metropolitan section in the town-planning department takes care of the enforcement, research and automation. Working is primarily file based, all new electronic interventions and automation are backed by the file system. LDA started digitalization in 2014, superseded by E-Khidmat system in 2019. Initiative like GIS, survey drone, amendment, drone survey and rain water harvesting are initiated. Trees are plant on world forest days and on 14th august.

Moreover, the integration of BIM into the submission documentation process can also enhance transparency by providing a clear and auditable record of the review and approval process. This can help to build trust among stakeholders and improve the overall quality of the projects approved by the LDA. Additionally, the use of BIM can facilitate the integration of other digital tools and technologies, such as data analytics and artificial intelligence, to further enhance the efficiency and effectiveness of the submission documentation process. (Auther's own work)

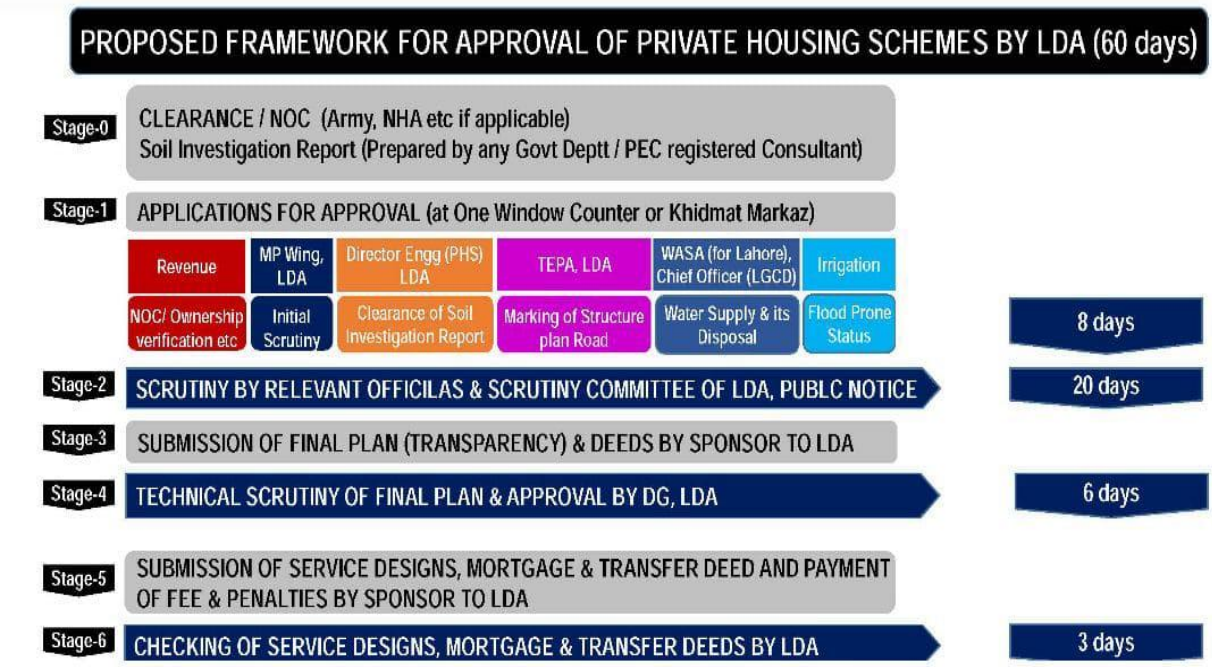

Figure 2 - Framework for private schemes approval by LDA, partially digitalized (Auther's own work)

Research Methodology:

A comparative case study analysis has been done in this paper to analyze the submission documentation process between the Lahore Development Authority (LDA) and Singapore's Building

and Construction Authority (BCA)(Editor et al., 2020). Both primary and secondary sources have been used to validate this study. The primary data was obtained through structured questionnaires and interviews with government officers, architects, construction specialists, and IT employees working on the submission in both cities (Foxe, 2010). These interviews shed light on internal processes, difficulties, and the digital integration of submittal paperwork (Farooq et al., 2020). The sources of secondary data included government reports, literature on BIM and digital transformation, and documentation of submission requirements, guidelines, regulations, and rules of building authorities. In the comparison part, the focus is made on several major factors including the stakeholder experience, digital integration, approval, and the process complexity (Ali et al., 2018). Whereas content analysis and statistical analysis were employed to compare the survey response and legislative documents, interview data was analyzed thematically (Ummah, 2019).

Comparative analysis of both drawing submission system in the form of a table shown on the next page:

Feature	BCA CoreNet-X (Singapore)	Operational Status	LDA One Window Cell (Pakistan)	Operational Status
Purpose	Integrated solution in Singapore offers control, compliance, construction services.	**Full**	An e-governance module for application related to water connection under Local Development Authority in Pakistan.	**Partial**
Primary Services	- Building permits and approvals - Compliance checks - Inspection scheduling - e-Services for construction. - Data management tools	**Full**	- Online water connection applications - Application status tracking - Billing and payment processing - Customer support services	**Partial**
UI Design	- Intuitive and user friendly design - Adaptive to different devices - Easy to navigate with clear categories and subcategories.	**Full**	- Functional design may differ in terms modernity. - Accessibility on multiple devices a probability - Navigation structure based on the need of the user.	**Partial**
Accessibility	- Accessible to the community as well as different industry specialists - Multi-language support (primarily English)	**Full**	– Mainly aimed at the local populace and the local commercial establishments - Support language may involve some regional languages in addition to English.	**Partial**
Security Features	- Strong data encryption - Secure user verification - Regular security audits and compliance with global standards	**Full**	- Standard government security procedures - User authentication is a prerequisite	**None**
Support & Help Resources	- Wide-ranging FAQs and user guides - Customer support via email and hotline - Online chat support	**Full**	- Support through helpdesk or customer service centers - FAQs and instructional resources available online	**None**
Integration Capabilities	- Assimilates with other BCA services and national databases - API access for third-party	**Full**	- Integration with local utilities and government systems - Probable API or data	**Partial**

	incorporations (if applicable)		sharing with other local services	
Registration	- User registration required for accessing certain services - Secure login with verification steps	**Full**	- Compulsory registration for application processing - Secure login mechanisms	**None**
Mobile Compatibility	- Fully compatible design with mobile and tablets - Upgradable mobile application	**Full**	- Mobile-friendly website design with access to key services	**None**
Payment Options	- Online payment gateways for permits and fees - Multiple payment methods (credit/debit cards, e-wallets)	**Full**	- Online payment processing for water connection fees - Support for various payment methods	**None**
Additional Features	- News flashes or alerts - Project management dashboard - Decision support tools such as data analysis and reporting tools	**Full**	- Notifications regarding application status - User dashboards for tracking applications and payments - Customer feedback options	**Partial**

This approach provides a clear direction for considering the differences and similarities between BCA and LDA and a starting point for considering how the changing uses of digital technology and the implementation of new legislation are impacting the submission of architectural digital designs (Clausen et al., 2020).

Analysis:

a) **BCA CoreNet-X (Singapore):**
- **Regulatory Compliance:** Strict adherence to Singapore's building codes and regulations, ensuring high standards in construction and safety.
- **Technology Integration:** Likely leverages advanced technologies for data management, real-time updates, and seamless service delivery.
- **User Experience:** Emphasis on providing a streamlined and efficient user experience to support Singapore's robust construction industry.(Nova Group, 2020)

b) **LDA One Window cell (Lahore, Pakistan):**
- **Local Focus:** Customized to needs of local communities and infrastructure development, everything partially digitalized.
- **Service Efficiency:** Aims to simplify the process of obtaining water connections, which is crucial for urban and rural development, in form of challans (Forms).
- **Scalability:** Potential to expand services as per the growing demands of the population and infrastructure projects, sustainability not being the prime focus(LDA, 2020).

Benefits of Paperless submission: Through the use of BIM the efficacy and productivity of LDA's building department's submission process can by significantly enhanced by ensuring a digital workflow. Below are the key ways BIM can ensure this:

Key Benefits of Paperless Submission	Description
Improved Workflow Efficiency	Streamlines the submission and review process, reducing errors and speeding up approvals.
Enhanced Collaboration and Communication	Provides a collaborative platform for real-time access and updates by all stakeholders.
Automated Code Compliance Checking	Automates the review process for compliance with building codes and regulations.(Velosimo, 2021)

Secure and Authentic Document Handling	Ensures the authenticity and integrity of electronic documents with encrypted signatures and seals.
Cost Savings	Reduces costs associated with printing, archiving, and physical document handling.
Centralized Data Management	Promotes the use of a Common Data Environment (CDE) for the sharing of project information (ICEHRM, 2021).
Real-Time Updates and Notifications	Provides real-time updates and notifications on submission status and required actions.
Visualization and Analysis	Offers advanced visualization tools for better understanding and evaluation of designs.
Sustainability goals	Sustainability is a framework of procedures tied together, with a paperless data integrated system, can fill the communication gaps to achieve goals.

The missing X factor:

As a result of the mentioned benefits, this research seeks to survey the possibilities of BIM to support electronic submission and to reveal the problems that can prevent its use within the LDA framework. By exploring the feasibility, benefits, and barriers of utilizing BIM in this specific context, this research seeks to contribute to the development of more efficient, transparent, and digitally-driven submission processes within the regulatory framework of LDAs.(Teo et al., 2016)

BIM can do a lot to facilitate paperless submissions where clients such as LDA are involved, and this can be seen from the discussion above. This would afford with global practices where cities employ the use of digital construction permits to enhance efficiency and clarity. Here's how BIM can play a key role:

a) **Digital Plan Submission & Compliance Checks:** Centralized Submission Platforms: Submissions can be made on LDA's online portal in formats such as IFC or Revit BIM models.

b) **Automated Code Compliance:** They also mentioned that since BIM can correlate with local building codes, LDA can use rule-based checking tools (e.g., Building heights or FAR or required safety measures) automatically. Example: BCA of Singapore employs BIM in compliance checking &rule checking algorithms to determine compliance of buildings(PHA, 2024).

c) **Coordination and Error Reduction:** 3D Visualization: 3D views of structures are more understandable than routine 2D paper drawings and thus are helpful for LDA reviewers to review the designs.

d) **Clash Detection:** Application of BIM means architects can detect and eliminate design clashes (for instance overlapping services) to reduce chances of design revisions and rejection.

e) **Paperless Documentation and Integrated Submission Portals:** BIM implemented design tools such as Autodesk Construction Cloud have document management within which all design drawings, reports, and forms can be linked.

f) **Electronic Signatures & Stamps:** BIM platforms can facilitate digital stamps/ checking and approval logs which is almost going paperless on approvals.

g) **Tracking and Notifications:** Both LDA and design teams can monitor the status of submissions as well as feedback in real time.

h) **GIS-enabled BIM:** Lahore Development Authority could relate BIM with GIS data for zoning, flood zone, or PHA regulation(Chauhan, 2024b), so the development constructed following BIM would be both environmentally sound and legal. Integration with other systems such as GIS and Facilities Management (BIM & AI,Pakistan, 2023).

i) **Lifecycle Management:** Once approved, much of the BIM data is already ready to feed into facilities management for future upgrade and assessment purposes. Shorter investigation-scoping phases, namely, faster first-stage site investigations and the integration of environmental approval processes.

Discussion:

The findings of this study underscore the imperative for the Lahore Development Authority (LDA) to address the multifaceted challenges and limitations that impede the adoption of Building Information Modeling (BIM) for submission documentation (Chase, 2018). The study's results emphasize the critical need for the LDA to develop standardized processes and protocols that are tailored to the unique characteristics of BIM models. This is essential to ensure the effective implementation of BIM within the LDA framework, thereby enhancing the efficiency, transparency, and quality of the submission documentation process.

As a part of the Human Resources, twenty-three (23) Employees died during fire tragedy in LDA Plaza on 9th May 2013. According to LDA officials, it has increased the amount of compensation to twice that of earlier and the families of the 23 people who died in a fire at LDA Plaza are to be given Rs. one million each. For offering reasonable jobs for the qualified children of those employees who died during the service time, the Lahore Development Authority will approach the Punjab Government for such special permission. As a result, a lot of data, stored in form on paper files was burned with along the human resource lost (LDA, 2014).

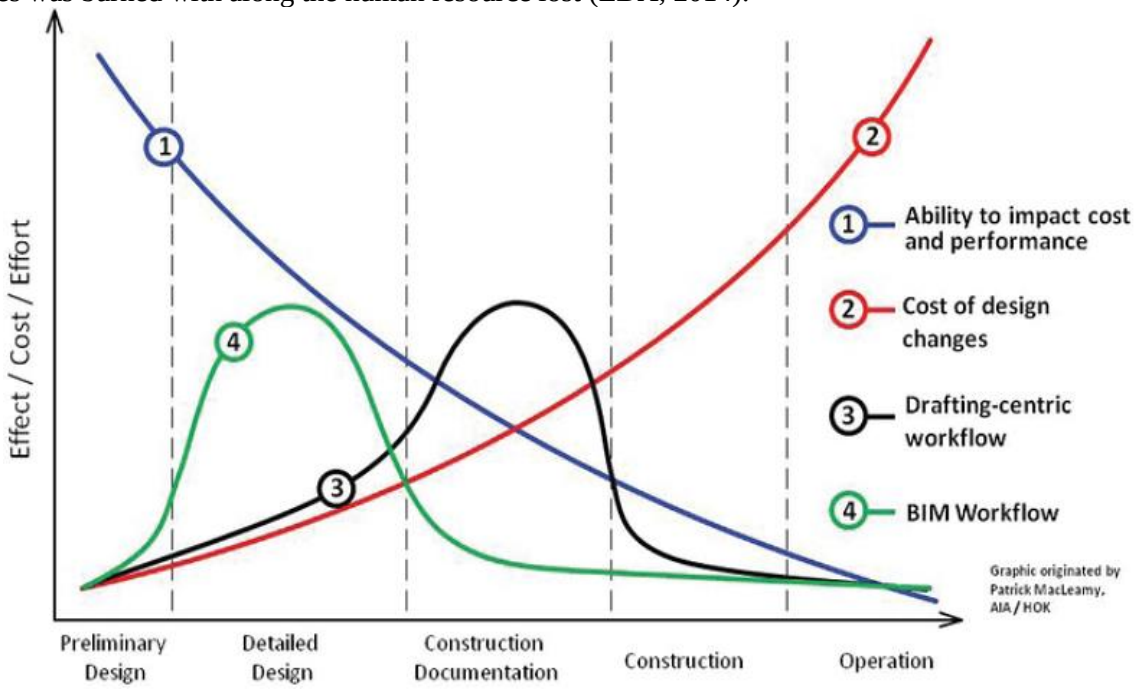

Figure 3: Opportunity vs time, Source: MacLeamy, P. HOK, 2009

Furthermore, the LDA should consider investing in the development of new systems and software that are compatible with BIM models, to incorporate hybrid, onsite and remote work models. This would enable the seamless integration of BIM into the submission documentation workflow, thereby reducing the complexity and potential errors associated with data exchange and integration. The development of such systems would also facilitate the efficient sharing and analysis of BIM data among stakeholders, ultimately leading to improved collaboration and decision-making.

Conclusion:

The application of Building Information Modeling (BIM) by the Lahore Development Authority (LDA) shows great potential to increase effectiveness, openness and coordination in the construction approval process. Notwithstanding, these are the difficulties that interfere with implementation; that is, insufficient communications infrastructure, pricey technology, unleaded training, poor policies. It is also delayed when there are no clear guidelines on how to implement BIM, and the effort necessary to connect the new technology with preexisting schemes. A comparison with practice in Singapore's Building and Construction Authority (BCA) shows how BIM can be used in automated compliance checks, real time updates, and centralized submission. Its CORENET system shows how BCA gets

improved approvals, easier collaboration, and better governance in fully digital work processes (Solutions, 2020). Despite these challenges, LDA can learn from these best practices with the help of introducing pilot projects, training programs and other digital change initiatives step by step. The transition to BIM-based paperless submissions has lots of advantages, including enhanced processes, automating coding compliance, saving documents, and improved communication with stakeholders. The use of BIM with GIS tools and environmental data means that LDA's work will be more closely linked to the sustainable development of urban areas (Di Gaetano , 2023). But this transformation will need policy changes, clear standing rules, and adherence from both public and private sectors. If standardized as the only mode of submission, BIM can not only help the LDA to easily digitalize the information, but I will also flower the longtime struggle of Pakistan Green building council to help the government and the end user to achieve sustainable goals, making more LEED certified buildings (PAKGBC, 2021).

In conclusion, the literature validates that implementing A BIM technology presents the direction needed on how LDA can update its practices and minimize undue wastes thereby improving the delivery of services. The biggest challenge will be the barriers and therefore a gradual implementation approach that seeks to build the capacity to implement will be crucial. Based on institutionalization and compatible practices against the international standards, LDA can effectively contribute to the transformation of Pakistani urban landscape.

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