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Analysing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Metropolitan City

by

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A THESIS

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DECLARATION

I hereby declare that the thesis entitled "**Analysing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Metropolitan City**", submitted to the Department of Civil Engineering in partial fulfillment of the requirement for the degree of Master of Science in Engineering in Construction Management, is a record of an original work done under the guidance of Asst. Prof. Mahendra Raj Dhital and Assoc. Prof. Nagendra Bahadur Amatya. This thesis contains only work completed by me except for the consulted material, which has been duly referenced and acknowledged.

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The undersigned certify that we have read and recommended to the Institute of Engineering for acceptance, a thesis entitled "**Analysing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Metropolitan City**" submitted by Nishee Shrestha in partial fulfillment of the requirements for the degree of Master of Science in Construction Management.

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ABSTRACT

Building by-law implementation continues to face challenges in Kathmandu Metropolitan City (KMC) despite having revised and updated by-laws and regulatory frameworks. This study investigates the challenges to building by-law implementation through a dual-perspective analysis of implementation challenges and behavioral intentions. Assessment of challenges to building by-law implementation shows that stakeholder attitudes/awareness, communication gap and lack of construction monitoring mechanisms constitute the most significant challenges as compared to institutional and technical challenges. Behavioral analysis using the Technology Acceptance Model 2 demonstrates that in this mandatory compliance environment, professionals' intentions to comply are primarily driven by perceived usefulness rather than process ease. The research identifies that social influence factors particularly subjective norms, professional image and job relevance significantly predict perceived usefulness of by-law system and compliance. These findings indicate that Kathmandu's implementation gap are not only from inadequacy in regulatory aspect but from insufficient demonstration of usefulness of compliance and weak social enforcement mechanisms. The study concludes that effective by-law implementation requires measures that enhance perceived benefits, strengthen awareness and social norms, and address the communication and trust gap between stakeholders and regulatory bodies.

Keywords*:* *Building by-laws, Implementation Challenges, Behavioral Intentions, TAM 2, Regulatory Compliance, Permit System*

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079/MSCoM/017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
BI	Behavioral Intention
CDRMP	Comprehensive Disaster Risk Management Programme
EBPS	Electronic Building Permit System
FAR	Floor Area Ratio
GCR	Ground Coverage Ratio
GLD	Guided land Development
IM	Image
JR	Job Relevance
KII	Key Informant Interview
KMC	Kathmandu Metropolitan City
OLS	Ordinary Least Squares
OQ	Output Quality
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
RD	Result demonstrability
RII	Relative Importance Index
RMSE	Root Mean Square Error
ROW	Right Of Way
SD	Standard Deviation
SN	Subjective Norm
TAM2	Technology Acceptance Model 2
UNCRD	United Nations Centre for Regional Development
UNDP	United Nations Development Programme
VIF	Variance Inflation Factor

CHAPTER ONE: INTRODUCTION

1.1 Background

Building by-laws are essential for ensuring safe, organized, and sustainable urban development. In Kathmandu Metropolitan City (KMC), these bylaws are in place to guide construction. Building bylaws, often referred to as building regulations or standards, are a set of rules established to ensure the safety, health, and welfare of occupants and the public in a built environment (S. Bhattarai et al., 2024). Building bylaws are the set of legal tools adopted by local government or regulatory authority to regulate the design, construction and alteration of building. The primary purpose of building bylaws is to regulate land zoning, ground coverage, height, building bulk and setbacks of buildings to ensure regulated development of an area. In Kathmandu Metropolitan City (KMC), these by-laws are in place not only to guide construction, but also in maintaining safety, order, and planned development of the city.

In recent years, Kathmandu Metropolitan City has experienced massive economic and urban growth. In response to changing urban needs and development, the Kathmandu Metropolitan City has formulated and updated various building by-laws and regulations to regulate organized and safe development of the city. Unfortunately, in urban cities like KMC, there is a significant gap between these rules on paper & how building construction actually happens on the ground (S. Bhattarai et al., 2024). The violations of these regulations which include unauthorized floor expansions, mandatory open space encroachment, height violation, and changes in approved drawings are a constant challenge to sustainable urban growth (S. Bhattarai et al., 2024, Rijal et al., 2025). To ensure safe, organized & sustainable urban development, proper implementation and practice of building bylaws and regulation is vital. For this purpose, the role and attitude of governing and regulatory bodies, designers/engineers & house owners plays a vital role.

1.2 Statement of Problem

Kathmandu Metropolitan City (KMC) utilizes National Building Codes, building by-laws and regulatory frameworks to manage the building permit and construction process within various wards. The major problem, however, lies in the implementation of the building by-laws. Through currently operational by-laws, ‘Building Construction

Standards, 2080' and 'Building Construction Working Procedure, 2080', KMC has mandated building permit through the current bylaws, to ensure regulated and systematic building construction and overall urban development throughout the city.. However, there exists a significant gap between regulatory intent and on-ground implementation. With majority of building construction in urban areas like Kathmandu Metropolitan City being owner driven under the supervision of local contractors, mostly untrained, the implementation of building by-laws without engineered and regulatory supervision has been found challenging (S. Bhattarai et al., 2024) (S. K. Bhattarai & Mishra, 2017). From design phase to permit approval to construction, bylaw implementation is met with institutional, awareness and co-ordination gaps. (Thapa et al., 2023). This has led to numerous minor and major violation of by-laws in residential buildings within the urban city (S. Bhattarai et al., 2024) (Sharma, 2022).

1.3 Research Rationale

Numerous existing literatures have successfully identified challenges to the building by-law implementation in contexts of urban cities like Kathmandu (S. Bhattarai et al., 2024) (Sharma, 2022) (Dahal & Shrestha, 2017). These studies, primarily qualitative in nature, have provided valuable insights into the complex socio-political and economic factors affecting compliance. While existing literature has successfully identified a range of challenges to the building by-law implementation in contexts of municipalities like Kathmandu, a significant gap remains in translating these findings into actionable intervention strategies. The prevailing literature with abstract grouping (economic, social, functional) (Sharma, 2022), while intuitively logical, does not point to a specific agency, process, or actionable plan for change. Eventually, it remains unclear which challenges are most critical and where resources should be concentrated first. This study aims to address this gap by introducing a structured, action-oriented grouping that categorizes challenges according to specific domains of the by-law implementation system. This paper also aims to understand the social and psychological mechanisms that drive compliance behavior. This study employs a mixed-methods approach that quantitatively ranks challenges but also explains the behavioral factors that influence compliance.

1.4 Research Questions

- What are the biggest challenges that prevent the building bylaws from being effectively enforced?
- What motivates or discourages professionals involved (designers, regulatory officials) from complying with the by-laws?
- What are the major changes that can be made to enhance existing building permit system?

By answering these questions, this research will provide a clearer picture of the issues and help find practical ways to improve bylaw implementation within KMC.

1.5 Objectives

The primary objective of this research is to understand the challenges of building bylaw implementation within Kathmandu municipality and how regulators and practitioners experience the bylaw system.

- To identify and categorise the major challenges of building bylaws implementation in Kathmandu Metropolitan City
- To analyse the factors influencing the intention of regulators and registered designers to comply with building by-laws, using adapted TAM2 framework
- To identify possible themes to enhance existing building permit system

1.6 Scope and Limitation

This research focuses specifically on the implementation of building by-laws within Kathmandu Metropolitan City (KMC) through two main aspects: 'challenges hindering the effective implementation of building by-laws' and 'behavioral intentions of regulators and registered designers toward compliance with building by-laws'. The study focuses primarily on building permit processes for residential building projects within KMC with a height of less than 17 meters and the bylaws governing it. The study does not address the unique challenges associated with large-scale commercial, industrial, or high-rise construction projects. The key stakeholders are KMC registered designers, ward technical engineers and municipal officials in Planning/Permit section. While this provides a crucial professional view, it may not fully capture the perspectives of other important groups, such as house owners, who also play a significant role in compliance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Historical Evolution of Building bylaw

The historical evolution of building bylaws governing Kathmandu Metropolitan City shows us a gradual evolution from broad, valley wide directives to specific municipal bylaws. A significant event being the introduction of **'Basic Construction Standards for Settlement Development, Urban Planning and Building Construction'** (unofficial translation) published in 2072 B.S. after a major earthquake that established a national level standard for safe building construction. Following this, KMC developed its own tailored municipal bylaws in 2075B.S. The second amendment to Basic Construction standard in 2078 B.S. once again guided the latest **'Kathmandu Metropolitan City Building Construction Standard, 2080 B.S' and 'Kathmandu Metropolitan City Building Construction Working Procedure, 2080 B.S** (unofficial translation). addressing newer urban challenges, building use and improvised parking space provisions.

List of documents relating to building bylaws within Kathmandu Municipality (Source: eBPS - Kathmandu Metropolitan City, n.d.)

1. **Directive on Activities within the Urban Areas of the Kathmandu Valley Town Development Plan, 2033 BS**

   (Unofficial translation of: काठमाडौँ उपत्यका नगर विकास योजना भित्र पर्ने सहरी क्षेत्रहरुमा हुने क्रियाकलाप सम्बन्धी निर्देशिका, २०३३)

2. **Construction Standards for the Kathmandu and Lalitpur Municipality Areas and the City Expansion Zone of Kathmandu Valley, 2050 BS**

   (Unofficial translation of: काठमाडौँ र ललितपुर नगर पालिका क्षेत्र तथा काठमाडौँ उपत्यकाको शहर विस्तार क्षेत्र भित्र गरिने निर्माण सम्बन्धि मापदण्ड, २०५०)

3. **Construction Standards for Municipalities and Urbanizing Village Development Committees within Kathmandu Valley, 2064 BS**

   (Unofficial translation of: काठमाडौँ उपत्यका भित्रका नगरपालिका र नगरोन्मुख गा. वि. स. हरुमा गरिने निर्माण सम्बन्धि मापदण्ड, २०६४)

4. **Construction Standards for Municipalities and Urbanizing Village Development Committees within Kathmandu Valley, 2064 BS (First Amendment)**

   (Unofficial translation of: काठमाडौँ उपत्यका भित्रका नगरपालिका र नगरोन्मुख गा.वि.स.हरूमा गरिने निर्माण सम्बन्धी मापदण्ड, २०६४ (संसोधन))

5. **Basic Construction Standards for Settlement Development, Urban Planning and Building Construction, 2072 BS**

   (Unofficial translation of: बस्ती विकास, सहरी योजना तथा भवन निर्माण सम्बन्धी आधारभूत निर्माण मापदण्ड, २०७२)

6. **Basic Construction Standards for Settlement Development, Urban Planning and Building Construction (First Amendment), 2073 BS**

   (Unofficial translation of: बस्ती विकास, सहरी योजना तथा भवन निर्माण संम्बन्धी आधारभूत निर्माण (पहिलो संशोधन) मापदण्ड, २०७३)

7. **Kathmandu Metropolitan City Building Construction Standards, 2075 BS**

   (Unofficial translation of: काठमाडौँ महानगरपालिका भवन निर्माण मापदण्ड, २०७५)

8. **Basic Construction Standards for Settlement Development, Urban Planning and Building Construction, 2078 BS (Second Amendment)**

   (Unofficial translation of: बस्ती विकास, सहरी योजना तथा भवन निर्माण संम्बन्धी आधारभूत निर्माण (दोश्रो संशोधन) मापदण्ड, २०७८)

9. **Kathmandu Metropolitan City Building Construction Standards, 2080 BS**

   (Unofficial translation of: काठमाडौँ महानगरपालिका भवन निर्माण मापदण्ड, २०८०)

10. **'Kathmandu Metropolitan City Building Construction Working Procedure, 2080 B.S**
    (Unofficial translation of: काठमाडौँ महानगरपालिका भवन निर्माण सम्बन्धी कार्यविधि, २०८०)

Table 1: Historical Evolution of Building By-laws in KMC

Building Bylaws	**Type**	**Context**
Directive on Activities within the Urban Areas of the Kathmandu Valley Town Development Plan, 2033 BS	Directive	One of the earliest documents that guided land use and development control within Kathmandu Valley
Construction Standards for the Kathmandu and Lalitpur Municipality Areas and the City Expansion Zone of Kathmandu Valley, 2050 BS	Bylaw	A combined municipal level regulation for Kathmandu and Lalitpur
Construction Standards for Municipalities and Urbanizing Village Development Committees within Kathmandu Valley, 2064 BS	Bylaw	Specific to municipalities within Kathmandu Valley and addresses growing peripheral VDCs
Construction Standards for Municipalities and Urbanizing Village Development Committees within Kathmandu Valley, 2064 BS (First Amendment)	Bylaw (Amendment)	Addresses ambiguities and adjustments to Far and setbacks
Basic Construction Standards for Settlement Development, Urban Planning and Building Construction, 2072 BS	National Standard	A significant national document post - earthquake to create uniformity on national level
Basic Construction Standards for Settlement Development, Urban Planning and Building Construction (First Amendment), 2073 BS	National Standard (Amendment)	Addresses unclear terminologies and recalibration of standards to practicality

Kathmandu Metropolitan City Building Construction Standards, 2075 BS	Bylaw	First independent bylaw for Kathmandu municipality with specific context to city needs
Basic Construction Standards for Settlement Development, Urban Planning and Building Construction, 2078 BS (Second Amendment)	National Standard (Amendment)	Refined to address growing urbanization and present context
Kathmandu Metropolitan City Building Construction Standards, 2080 BS	Bylaw	Currently operational, addresses building use, parking requirements, setback, zoning, etc.
Kathmandu Metropolitan City Building Construction Working Procedure, 2080 BS	Working Procedure	Currently operational, establishes administrative and technical processes for implementing the Building Construction Standards

The chronological evolution of building bylaws in Kathmandu, shows how standards were developed gradually to address specific contexts within Kathmandu Municipality. However, despite refinement of parameters like zoning, Floor Area Ratio (FAR), Ground Coverage Ratio (GCR) setbacks etc., a gap lies in addressing the external factors for their effective execution. The need to address disconnect between regulatory rigor and practical implementation is essential for the bylaws to function as intended.

2.1.1 Kathmandu Metropolitan City Building Construction Standards, 2080 BS

The *Kathmandu Metropolitan City Building Construction Standards, 2080 BS*, is the current by-law document that serves as the primary technical and administrative guideline for all construction activities, replacing earlier versions to address contemporary urban challenges. It guides building construction, addition/renovation and building use within Kathmandu Municipality

Key provisions

- Technical regulations including Floor Area Ratio (FAR), building height limits based on road width, minimum setbacks, and Ground Coverage Ratio (GCR)
- Zoning and special regulations that apply to heritage zones, core city areas, and new development corridors
- Building Components like requirements for basements, parking spaces, ventilation, and utility provisions.

- Brief Processes outlining permit application procedures, completion certification requirements, and designer qualification criteria

2.1.2 Kathmandu Metropolitan City Building Construction Working Procedure, 2080 BS

The *Kathmandu Metropolitan City Building Construction Working Procedure, 2080* BS establishes a detailed administrative and technical processes for implementing the Building Construction Standards. It governs how permits are obtained, reviewed, and approved. It translates formal rules into actionable workflow.

Key provisions

- Mandates building permit approval prior to the start of any construction, renovation, floor extension or alteration.
- Permit process and documentation requirements specifying the stages of permit application and list of documents required
- Procedures for building modifications, including plinth extension and storey addition, as well as for obtaining a completion certificate after construction
- Road and access provisions related to road width, access, and setbacks
- Regularization of Past Constructions with a special provision for issuing completion certificates for buildings built before 2074 BS, in cases of minor violations
- Provisions for change of building use and ownership outlining the process for legalizing a change in building use (e.g., residential to commercial) and for updating records in cases of building ownership transfer

2.2 Electronic Building Permit System (EBPS)

The **Electronic Building Permit System** (EBPS) is the official digital website of Kathmandu Metropolitan City (KMC) for the purpose of building permit application. It is a centralised system to apply for building permit, upload required documents, and track the application status from anywhere. EBPS was initiated by CDRMP/UNDP in 2012 under the project Automated Building Permit Process (*Home | EBPS*, n.d.)

Figure 1: EBPS homepage

Source: (Home | EBPS, n.d.)

2.2.1 Key Features of EBPS

- **Online Application Submission:** Applicants can apply for permit, extension and completion and upload all necessary documents like drawings, administrative and legal documents directly through the portal.
- **Real-Time Application Tracking:** The portal allows live tracking of documents showing the progress of permit process. Both applicant that is designer in this case and house owners can track the file and check which desk the file is being reviewed at.
- **Document Management System**: The portal allows to upload documents in categorical groups allowing for smoother document management and record keeping for future.
- **Digital Signature**: The EBPS has introduced a digital signature system for designers and regulators assuring the validity of uploaded documents and drawing.
- **Integrated Fee Payment:** The portal facilitates online payment of permit fees. It also displays the revenues/fee to be paid promoting transparency.
- **Public Access to Information:** While protecting sensitive data, the portal lists, required document checklists, and bylaws more accessible to the public. It also provides information about ward officials, registered designers and statistics of no. of permit application in the given fiscal year.

2.2.2 Official Building Permit Approval Timeline

The official EBPS portal lists approval timeline and required documents for building permit approval. According to the official portal, the building permit approval is designed to be completed within a stipulated timeframe of 25 to 30 days from application submission to the issuance of the Building Permit approval to allow construction.

Table 2: Building Permit Approval Timeline

Day	Action
Day 1	Applicant submits drawings and documents to the Metropolitan City.
Day 2	The municipality forwards the application file to the relevant ward office.
Day 4	The ward office conducts a field check and issues a notice to the project site's neighbours.
Day 8	Start of the mandatory notice period for neighbours.
Day 23	The ward office conducts a local inquiry.
Day 27	The ward office returns the file to the municipality.
Day 29	The municipality begins the final process of issuing the permit and drawing approval

However, the actual steps of building permit approval contain lots of nuances and file transfers through various desks

2.2.3 Steps to Obtain Building Permit Approval

Step 1: Submission of application and building drawings online on portal through registered designer or consultancy along with required legal documents. Land tax clearance of current fiscal year is required to proceed.

Step 2: Checking of required documents such as Land Ownership Certificate, citizenship certificate, cadastral map etc. is done at Registration Desk. The file is then forwarded to GLD desk

Step 3: Checking for plot information, Chaarkilla, land area etc. is checked and forwarded to technical desk

Step 4: The technical engineer checks the architectural requirements, bylaw compliance. and forwards it to structural desk

Step 5: The structural desk reviews structural drawings, analysis and report and forwards it to ward technical desk

Step 6: The ward technical engineer reviews the drawing, Then a notice sent to adjacent neighbors for a chance at objection within 15 days

Step 7: If no objection in those 15 days, a field visit by a technical staff within 3 days thereafter. Technical staff to draft a checklist about existing site conditions, Guided Land Development (GLD), river and high voltage consideration and viability to proceed with the proposed drawings

Step 7: File forwarded back to executive desk in municipality. Drawings and documents are rechecked if required.

Step 8: Municipality proceeds for issuance of Permit Approval certificate. Building Permit Tax and Designer Fee to be deposited by the owner or their representative

Step 9: Municipality to provide construction permit certificate within 7 days of file receival

Step 10: Building construction process up to plinth level to start under technical supervision.

Step 11: Request for site inspection up to plinth level and approval certificate for so

Step 12: Request for construction permit for permanent construction (superstructure level)

Step 13: After completion of construction, owner applies for building completion certificate

Step 14: Field inspection by technical staff to assess adherence of built structure with approved drawings

Step 15: Issuance of Building Completion Certificate in case of compliance

Step 16: In case of minor alterations within by-law, revised drawing of 'As built drawing' to be presented. In case of major alterations with violation of FAR, ground coverage and setbacks, revised drawings with fine payment for the violation to be submitted.

2.3 Challenges to the Building By-law Implementation

Continuously growing literature discusses on various challenges that act as a barrier to the effective implementation of building by-laws. Substantial number of factors were identified through existing literature on building bylaw implementation and its

challenges. The challenges identified were diverse yet interconnected, ranging from issues in the formulation and clarity of regulations, lack of awareness and ethics to capacity constraints within the municipal institutions and coordination/communication gaps. To systematically analyse the challenges to the building by-law implementation and connect them to the phases of implementation cycle and the permit system in Kathmandu Municipality, this study adopts a framework combining action plan framework and permit system taxonomy.

2.3.1 The Action Plan Framework by UNCRD

Understanding the major challenges of building by-law implementation can come from the deeper understanding of elements of implementation itself. The primary structure for categories of challenges in this research is derived from the action plan for effective building regulation implementation proposed by UNCRD (Subedi & Mishima, 2008)

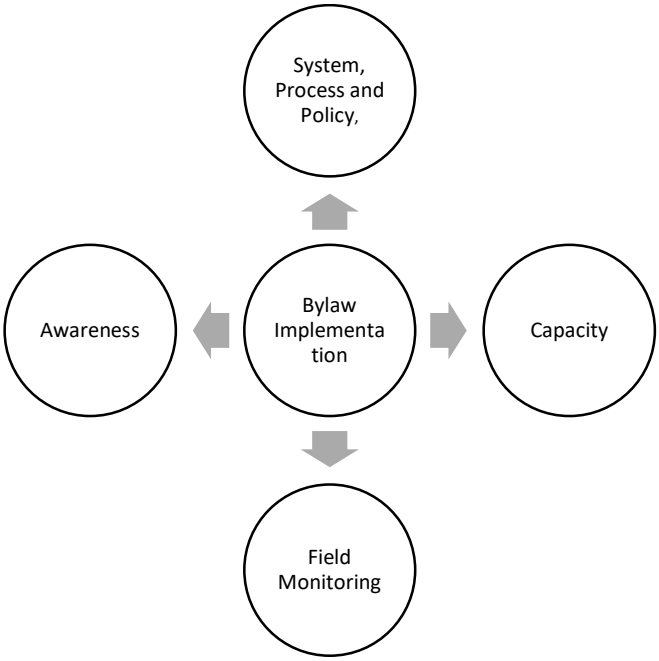

Figure 2: Action Plan Framework

Derived from: (Subedi & Mishima, 2008)

- **System, Process and Policy**: This category concerns the regulatory framework itself the laws, rules, and procedures that constitute the formal system.
- **Capacity Building:** This category addresses the human and institutional resources required to operate the system.

- **Field Monitoring:** This involves the post-approval phase, ensuring that construction on the ground adheres to the approved plans.
- **Awareness:** This category focuses on the end users of the system: homeowners, designers, and contractors.

This framework addressees beyond a static list of problems and explains implementation as a dynamic process. A failure at any one stage be it in policy design, institutional capacity, on-site monitoring, or public awareness can derail the entire regulatory effort. It provides a logical flow from "what the rules are" to "who enforces them" to "how they are enforced on the ground" and finally, "whether people understand and accept them."

2.3.2 The Permit System Taxonomy

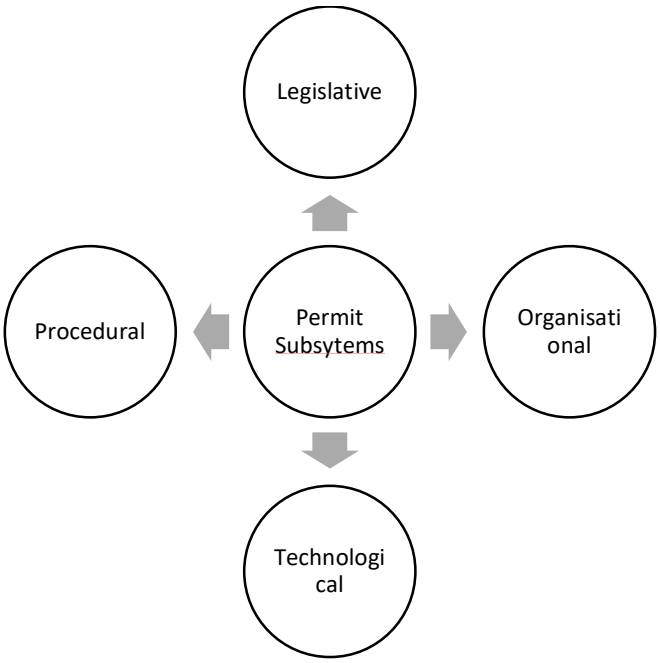

Figure 3: Permit System Taxonomy

Derived from: (Fauth et al., 2023)

To complement and further organize the action plan grouping, this study also draws upon the taxonomy for Building Permit Systems (Fauth et al., 2023) organizing the challenges through view point of permit system and its subsystems. This taxonomy dissects a permit system into four critical subsystems:

- Legislative Subsystem: The body of building codes, bylaws, and regulations. This maps directly to the System, Process and Policy category in the action plan.
- Organisational Subsystem: The institutions and human resources involved, including their structure, competencies, and workflows. This is the core of the Capacity Building category.
- Technological Subsystem: The tools and platforms (such as the EBPS) used for processing applications, managing data, and conducting reviews. Challenges here cut across categories, causing inefficiencies in process and hindering field Monitoring.
- Procedural Subsystem: The step-by-step processes for application, review, approval, and inspection. This subsystem is integral to the Process within the action plan and is deeply linked to Field Monitoring.

This categorization helps understand the challenges through the aspect of permit system, detailing the components involved at each subsystem. This ensures that challenges are analyzed both from the point of view of implementation lifecycle and component of the regulatory system they affect.

2.3.3 Identification of Implementation Challenges

A comprehensive review of existing literatures on building by-law, challenges and implementation was done to identify various challenges to building bylaw implementation in context of urban cities like Kathmandu. The theme for identification of the challenges were guided by context translational to bylaws and working procedures of KMC. Expert review was also done to refine and/or add challenges contextual to KMC. Challenges identified were diverse yet interconnected, ranging from issues in the formulation and clarity of regulations, lack of awareness and ethics to capacity constraints within the municipal institutions and coordination/communication gaps. The table below lists the identified challenges and respective sources that they were adapted from.

Table 3: List of identified challenges to building by-law implementation

Challenges	**Adapted from**
Inconsistent/Inadequate building regulations	(Omollo, 2019)
Lack of clarity in building by-law clauses	(Sharma, 2022)
Overlapping jurisdiction	(Amer et al., 2025)
Poor coordination between municipal policies, national policies and urban development plans	(Bikdeli, 2025)
Cost of compliance due to rigid policy	(Shrestha et al., 2017)
Inaccurate cadastral maps and irregular sub-division of plots	(Dahal & Shrestha, 2017) (Bikdeli, 2025)
Inconsistent Guided Land Development (GLD), river setback and high voltage setback designations	(Dahal & Shrestha, 2017)
Lack of public engagement in policy-making	(Bikdeli, 2025)
Lack of technical expertise among staff	(Omollo, 2019) (Sharma, 2022)
Lack of internal accountability and ethics	(Sharma, 2022) (Bikdeli, 2025)
Corruption, malpractice and political interference	(Omollo, 2019)
Inadequate staffing and financial resources	(Shrestha et al., 2017)
Conflict of interest due to regulating staffs being involved in building design	(Shrestha et al., 2017)
Lack of data & records	(Agyeman et al., 2016)
Inefficiencies and delays in the approval process	(Dahal & Shrestha, 2017)
Frequent transfers of key officials	Expert View
Lack of technical assistance and helpdesk	(Omollo, 2019) (Bikdeli, 2025)
Limited integration of by-laws during the design phase	(Bikdeli, 2025) Expert view
Insufficient knowledge, training and lack of local context among designers	(Shrestha et al., 2017) (Sharma, 2022)
Frequent resubmissions due to digital file formats or incomplete data	(Sharma, 2022)
Weak review mechanisms for drawings prior to submission	(Amer et al., 2025)
Digitized drawings not aligning with physical site conditions	Expert view
Lack of standardization in digital drawing formats	(Amer et al., 2025)
Inconsistent evaluation of drawings	(Amer et al., 2025)
Lack of qualified designers	(Shrestha et al., 2017)
Lack of standardized inspection protocols and reporting mechanisms for non-compliance	(Omollo, 2019) (Bikdeli, 2025)
Poor inter-department coordination	(Amer et al., 2025)

Poor communication channels between houseowners, regulators and practitioners	(Omollo, 2019)
Lack of regulatory construction inspection	(Omollo, 2019)
Weak penalties and weak legal backing for field officers to act on non-compliance	(Bikdeli, 2025)
Unregulated contracting and subcontracting practices	(Omollo, 2019)
Lack of construction supervision by engineers	(Omollo, 2019) (Sharma, 2022)
Limited collaboration with utility providers (Road, electricity, water, drainage)	(Bikdeli, 2025)
Low awareness of building by-laws among house owners	(Sharma, 2022)
Willful defiance towards by-law compliance	(Shrestha et al., 2017) (Sharma, 2022)
Lack of public trust in regulatory bodies	(Dahal & Shrestha, 2017)
Inflation/unaffordability	(Bikdeli, 2025)
Perceived high cost and time consumption for compliance	(Sharma, 2022)
Bribery and informal negotiations	(Dahal & Shrestha, 2017)
No formal integration of building bylaws in academic curricula	Expert View
Prioritizing profit over compliance	(Bikdeli, 2025)
Lack of trained contractors and masons	(Omollo, 2019) (Sharma,2022)

2.4 Technology Acceptance Model 2 (TAM2)

Drawing from the original Technology Acceptance Model (TAM), that recognizes two primary constructs for technology or system acceptance, recognizing the need for greater explanatory power, Venkatesh and Davis (2000) extended TAM into TAM2, incorporating social influence and cognitive instrumental processes. Adapting TAM2 constructs to various E-government services like Building Permit System (Amer et al., 2025) helps understand how users interacting with the system perceive the system in terms of usefulness, ease of use and future intention to use the system. (Thapaliya & Esichaikul, 2025). It encompasses the following constructs:

Perceived Usefulness (PU): "The degree to which a person believes that using a particular system would enhance his or her job performance"

Perceived Ease of Use (PEOU): "The degree to which a person believes that using a particular system would be free from effort"

Social Influence Processes:

- **Subjective Norm (SN):** Person's perception that most people who are important to him think he should or should not perform the behavior in question"
- **Image (IM):** The degree to which use of an innovation is perceived to enhance one's status in one's social system"
- **Voluntariness:** The extent to which technology use is perceived as voluntary

Cognitive Instrumental Processes:

- **Job Relevance (JR):** The individual's perception regarding the degree to which the target system is applicable to his or her job
- **Output Quality (OQ):** The degree to which an individual believes that the system performs his or her job tasks well
- **Result Demonstrability (RD):** The tangibility of the results of using the innovation"

Behavioral Intention to Use (BI): The degree to which a person intends to use the system.

CHAPTER THREE: METHODOLOGY

3.1 Research Methodology

This study uses a mixed research approach to investigate the challenges and behavioral intentions surrounding building by-law implementation in Kathmandu Metropolitan City through questionnaire survey. The process begins with a comprehensive literature review to establish the research gap and theoretical foundation, followed by the comprehensive research design to create a structured questionnaire and eventually, collection of data through questionnaire. Then the next step involves statistical analysis, result and discussion of the collected data to assess the challenges and to test the hypothesized relationships, followed by conclusions and recommendations.

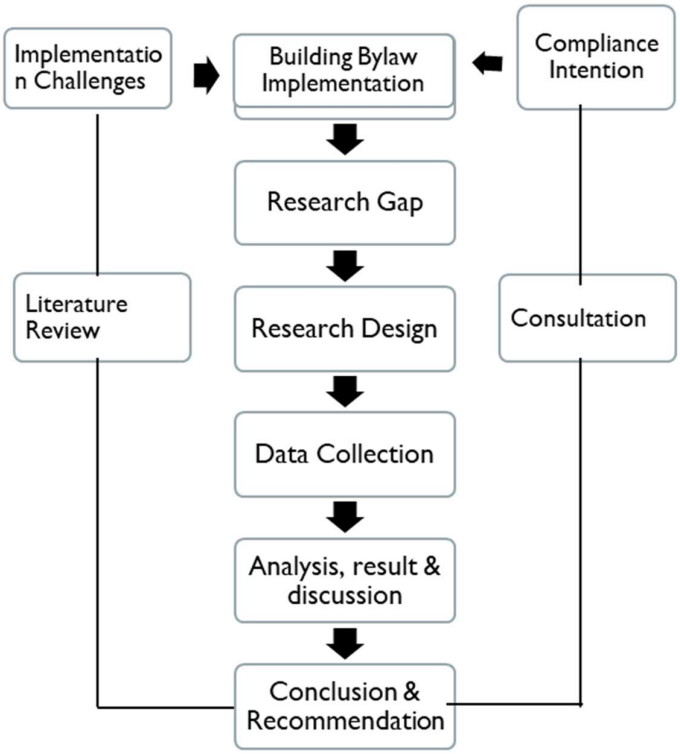

Figure 4: Research Methodology

3.2 Conceptual Framework

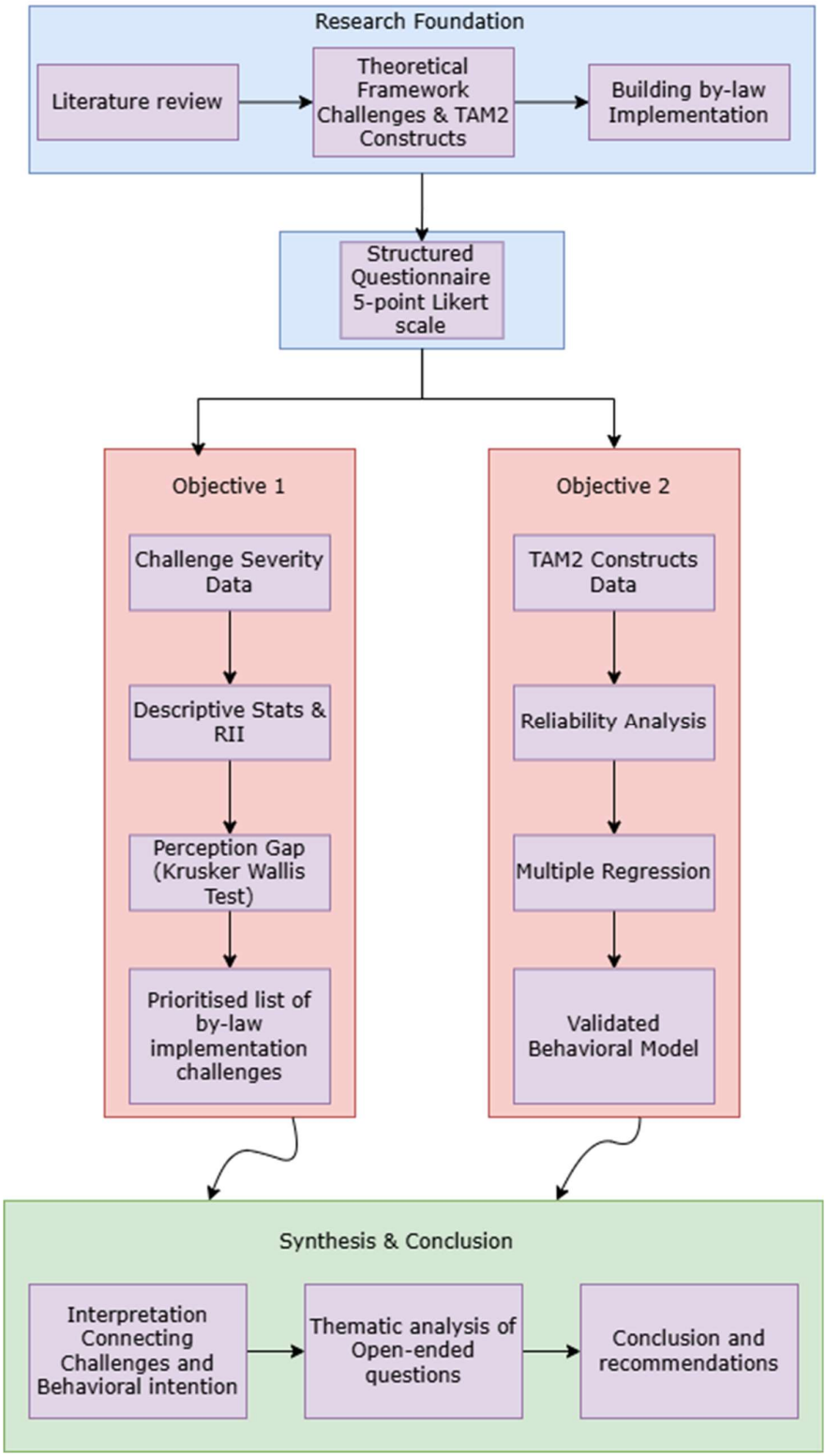

Figure 5: Conceptual Framework

3.3 Research Matrix

Table 4: Research Matrix

Objective	Data Source	Data Collection Technique	Target Stakeholders	Data Analysis Tools	Expected Outcome
To identify and categorise the major challenges of building by-laws implementation in Kathmandu Metropolitan City	Secondary source: Literature review Primary source: Questionnaire survey, Key Informant Interviews (KII)	Structured questionnaire with 5-point Likert scale factors focused on the five challenge categories	KMC Registered Designers, Ward engineers, Municipal officials (Permit/Planning)	Descriptive Statistics, Relative Importance Index (RII), Kruskal-Wallis test	Prioritized ranking of challenges across 5 categories, Perception gap Analysis
To analyse the factors influencing the intention of regulators and registered designers to comply with building by-laws, using adapted TAM2 framework	Secondary source: Literature review, Primary source: Questionnaire survey, Key Informant Interviews (KII)	Structured questionnaire with 5-point Likert scale statements focused on adapted TAM2 constructs	KMC Registered Designers, Ward engineers, Municipal officials (Permit/Planning)	Descriptive Statistics, Multiple Regression	Identifying the key factors that most significantly influence the intention to comply with building by-laws
To identify possible themes to enhance existing permit system	Primary source: Questionnaire Survey	Open ended question	KMC Registered Designers, Ward engineers, Municipal officials (Permit/Planning)	Thematic Analysis	Themed groups for enhancing exiting permit system

3.4 Study Area, Population and Sampling

The research focuses on building by-law and permit system within Kathmandu Metropolitan City. This research focuses on residential building less than 17m and by-laws and regulations governing it. The study population are professionals directly interacting with permit system i.e.

- KMC registered designers
- Ward technical engineers
- Municipal officials (Permit/Planning Section)

Total population of ward officials (27) and Municipal Officials (11) were approached for the survey. Purposive sampling was done for registered designers. Using Cochran's formula, the sample size for KMC registered designers was determined as 68.

$$\mathbf{n_0 = z^2pq/e^2}$$

where:

n_0 is the minimum required sample size
z is the z-score value from standard normal distribution determined by confidence level
p is the expected population proportion,
q = 1 - p,
e is the maximum allowable sampling error.
Here, for a 90% confidence level,

z =1.64,
e =0.1,
p =0.5, and q =0.5,
n_0 =1.642 ∗0.5∗0.5/0.12

n_0 = 68

3.5 Data Collection Methods

3.5.1 Primary Data Collection

In this research, the primary data for analysis was collected through a questionnaire survey. The questionnaire was distributed digitally using Kobo Toolbox and shared with professionals via email, personal visits and professional networks. Key Informant Interview (KII) was done check for the content validity, wording and flow of the questionnaire.

3.5.2 Secondary Data Collection

Secondary data were collected through

- National and International academic research papers of building by-law and permit system
- Technical reports on implementation challenges
- National and municipal policy and by-law documents

3.6 Questionnaire for Data Collection

3.6.1 Categorisation of Implementation Challenges

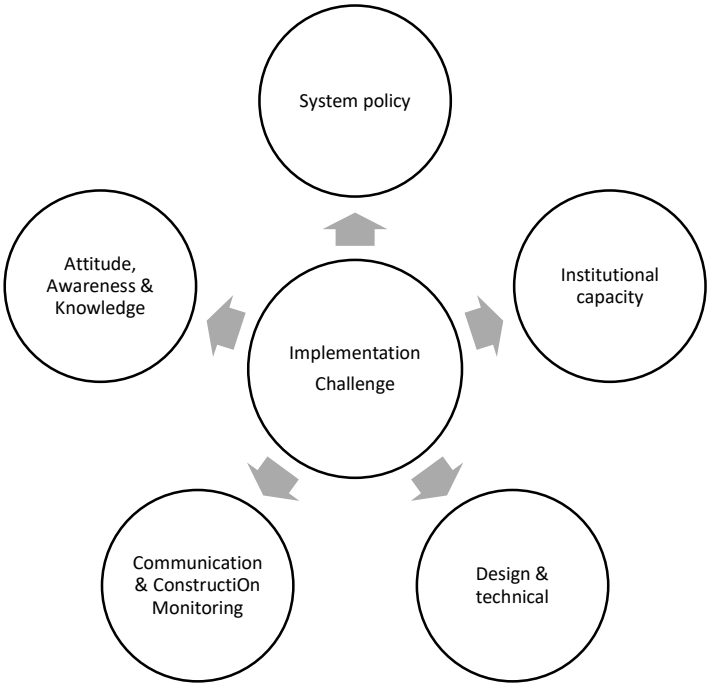

Figure 6: Categorisation of Implementation Challenges

The challenges identified through literature review are categorized using a synthesized framework that combines a process-oriented action plan (Subedi & Mishima, 2008) with a structural subsystem taxonomy (Fauth et al., 2023) The categorized challenges were then refined through expert opinion, finalizing 42 challenges categorized under 5 groups. The table below shows the derivation and categorization of implementation challenges into 5 primary categories, namely, *System Policy, Institutional Capacity, Design and Technical Planning Aspects, Communication and Construction Monitoring* and *Attitude, Awareness and Knowledge of Stakeholders*.

Table 5: Derivation of Challenge Categories

Primary Challenge Category	**Corresponding Phase in Action Plan Framework**	**Relevant Subsystem in Permit System Taxonomy**	**Challenges Identified**
System Policy	**System, Process and Policy**	**Legislative, Procedural**	• Inconsistent/Inadequate building regulations
			• Lack of clarity in building by-law clauses
			• Overlapping jurisdiction
			• Poor coordination between municipal & national policies
			• Cost of compliance due to rigid policy
			• Inaccurate cadastral maps & irregular plot subdivision
			• Inconsistent GLD and setback designations
			• Lack of public engagement in policymaking
Institutional Capacity	**Capacity Building**	**Organisational**	• Lack of technical expertise among staff
			• Lack of internal accountability and ethics
			• Corruption, malpractice and political interference
			• Inadequate staffing and financial resources
			• Conflict of interest (regulators involved in design)
			• Lack of data & records
			• Inefficiencies and delays in the approval process
			• Frequent transfers of key officials
			• Lack of technical assistance and help desk
Design & Technical Planning Aspects	**System, Process and Policy / Capacity Building**	**Technological, Procedural**	• Limited integration of by-laws in design phase
			• Insufficient knowledge/training among designers
			• Frequent resubmissions (digital formats, incomplete data)
			• Weak review mechanisms prior to submission
			• Digitized drawings not aligning with site conditions

			• Lack of standardization in digital drawing formats
			• Inconsistent evaluation of drawings
			• Lack of qualified designers
Communication & Construction Monitoring	**Field Monitoring**	**Procedural, Organisational**	• Lack of standardized inspection protocols
			• Poor inter-department coordination
			• Poor communication channels (owners, regulators, practitioners)
			• Lack of regulatory construction inspection
			• Weak penalties and legal backing for enforcement
			• Unregulated contracting/subcontracting
			• Lack of construction supervision by engineers
			• Limited collaboration with utility providers
Attitude, Awareness & Knowledge of Stakeholders	**Awareness**	**Spans all Subsystems**	• Low awareness of by-laws among house owners
			• Willful defiance towards compliance
			• Lack of public trust in regulatory bodies
			• Inflation/unaffordability
			• Perceived high cost and time for compliance
			• Bribery and informal negotiations
			• No formal integration of bylaws in academic curricula
			• Prioritizing profit over compliance
			• Lack of trained contractors and masons

3.6.2 Adaptation of Technology Acceptance Model 2 (TAM2) Core Constructs:

By adapting TAM2 (Venkatesh & Davis, 2000) to mandatory bylaw system, this study aims to understand what drives professionals to comply with building by-laws. In our research, the building permit process is treated as the "system" to be accepted, and the decision to comply is the "behavioral intention". The model helps us test how the identified constructs influence respondents' intention to comply with by-laws. This approach provides a structured framework to identify the key reasons behind compliance behavior. Voluntariness, as a construct was omitted given the mandatory setting of building by-law and permit system.

Table 6: TAM2 Core Constructs & Their Adaptation

TAM2 Construct	Original Meaning	Adapted Meaning
Perceived Usefulness (PU)	The degree to which a person believes that using a system would enhance their job performance.	The degree to which a professional believes that complying with building by-laws will lead to better outcomes.
Perceived Ease of Use (PEOU)	The degree to which a person believes that using a system would be free of effort.	The degree to which a professional believes that the process of compliance is clear and straightforward
Subjective Norm (SN)	The person's perception that most people who are important to them think they should or should not use the system.	The perception of social pressure from peers, clients, and industry colleagues to either comply or find shortcuts.
Image (IM)	The degree to which using a system is perceived to enhance one's status in one's social system	The degree to which being known as a compliant professional enhances one's reputation among clients and colleagues
Job Relevance (JR)	The degree to which an individual believes that the system is applicable to their job.	The degree to which knowledge of building by-laws is seen as a fundamental part of one's job.
Output Quality (OQ)	How well the system performs tasks.	The degree to which the system is seen as effective, practical and efficient
Result Demonstrability (RD)	The tangibility of the results of using the system.	The ability to see the positive results of compliance
Behavioral Intention to Use (BI)	The degree to which a person intends to use the system.	The degree to which a professional intends to fully comply with the building by-laws in their current or next project.

3.6.3 Questionnaire Design

The questionnaire was created using Kobo Toolbox, an online/offline survey platform. It was divided into four sections:

1. **Participant's Background**
    - Name
    - Role/Designation
    - Years of experience
    - No. of permit application/processing
    - Interaction/experience with building permit system

2. **Challenges to Building By-law Implementation**

   Challenges categorised into five groups with 5-point Likert scale (Very minor to Very major) to assess its impact on by-law implementation

   - System Policy
   - Institutional capacity
   - Design & technical planning Aspects
   - Communication & Construction Monitoring
   - Attitude, awareness & Knowledge of Stakeholders

3. **Behavioral Intention of Compliance**

   Statements with 5-point Likert scale (Strongly disagree to Strongly agree) to assess the adapted TAM2 constructs for intention to comply with by-laws

4. **Open Ended Question**

   - Suggestions to enhance existing permit system
   - Benefits/Drawbacks of digital permit system

3.6.4 Questionnaire Validation

The questionnaire was refined and validated with the help of three key informants from the construction and academic sector, with extensive experience in building by-laws and building construction.to check for content validity, wording and flow. Their seasoned expertise played a vital role in validating the questionnaires prior to their distribution to research participants.

3.7 Data Analysis Tools

The data was analyzed using both quantitative and qualitative statistical methods to extract meaningful insights:

1. **Descriptive Statistics**

   Descriptive statistics like mean, standard deviation, etc. were done to understand response distribution. Comparative pie charts were done to understand the response distribution.

2. **Relative Importance Index (RII)**

   Challenges were prioritised using the Relative Importance Index (RII), a standard technique for ranking Likert-scale items in construction management research.

For each item j,

$$\mathrm{RII}_j = \frac{\sum W}{A \times N}$$

Where,
W is the 1-5 weight chosen by respondents
A =5 is the maximum weight
N is the number of valid responses

RII takes values in [0,1], with higher values indicating higher perceived criticality. The response matrix was cleaned and then converted the Stage-1 item columns to numeric rankings and computed the RII of each item using pairwise non-missing N ($N = 96$ for all items). Items were then ranked within their respective groups. Finally, each group's mean RII was computed to provide a high level comparison across challenge groups.

3. **Kruskal-Wallis Test**

To test whether stakeholder groups (Designers, Municipal Officials, Ward Officials) differ in their perceived severity of building bylaw implementation challenges by category, Kruskal–Wallis test was done. It is a non-parametric test suitable for ordinal data and unequal group sizes. (Kruskal & Wallis, 1952)

For each category, we compare the three independent groups:

$$H = \frac{12}{N(N+1)} \sum_{i=1}^{k} \frac{R_i^2}{n_i} - 3(N+1)$$

Where,

k is the number of groups

N is the total number of observations across groups

n_i is the size of group i

R_i is the **sum of ranks** for group i after ranking all observations together

The resulting H-statistic is referenced against the chi-square distribution with $k-1$ degrees of freedom to obtain the **p-value**.

Epsilon Squared

ε^2 is a measure of **effect size** for Kruskal-Wallis tests. It estimates the proportion of variance in the ranked data explained by group membership.

$$\varepsilon^2 = \frac{H - (k-1)}{N - k}$$

Where,

H= Kruskal–Wallis statistic

k= number of groups

N= total sample size

Interpretation:

- ≈ **0.01** → Small effect
- ≈ **0.06** → Medium effect
- ≥ **0.14** → Large effect

4. Composite Scores

Composite scores were calculated to represent each TAM2 construct as a single value for each respondent. For each construct, the composite score was computed as the **row-wise mean of its items**, using the following formula:

$$\text{Composite Score for Construct } C_j = \frac{\sum_{i=1}^{k} x_{ij}}{k}$$

where,

x_{ij} = response of respondent j to item i within construct C

k = number of items in the construct

5. Multiple regression

To test the TAM2 constructs, two **multiple linear regression models** were estimated using the composite scores computed for each construct. (Wooldridge, 2020)

- **Model 1: Predictors of Perceived Usefulness (PU)**

$$PU = \beta_0 + \beta_1(SN) + \beta_2(IM) + \beta_3(JR) + \beta_4(OQ) + \beta_5(PEOU) + \beta_6(RD) + \varepsilon$$

Dependent Variable: Perceived Usefulness (PU)

Independent Variables: Subjective Norm (SN), Image (IM), Job Relevance (JR), Output Quality (OQ), Perceived Ease of Use (PEOU), Result Demonstrability (RD)

- **Model 2: Predictors of Behavioral Intention (BI)**

$$BI = \beta_0 + \beta_1(PU) + \beta_2(PEOU) + \varepsilon$$

Dependent Variable: Behavioral Intention (BI)

Independent Variables: Perceived Usefulness (PU), Perceived Ease of Use (PEOU)

Ordinary Least Squares (OLS) was used to estimate the regression coefficients. (Field, 2018; Wooldridge, 2020). For each model the **beta coefficients (β)** were computed by minimizing the sum of squared residuals:

$$\hat{\beta} = (X'X)^{-1}X'Y$$

Where, X is the matrix of predictors (including a constant term) and $Y$is the dependent variable.

Standard errors were derived from the variance-covariance matrix with σ^2estimated from residual variance.

$$\text{Var}(\hat{\beta}) = \sigma^2(X'X)^{-1}$$

t-statistics and **p-values** were computed to test the significance of each predictor. Model fit was assessed using:

- R^2: proportion of variance explained by the model.
- Adjusted R^2: accounts for number of predictors.
- F-statistic and p(F): overall model significance.
- Multicollinearity was assessed using Variance Inflation Factor (VIF), with values >5 indicating potential concerns (Field,2018) (Hair et al., 2021)

3.8 Ethical Considerations

Informed Consent, Confidentiality and Voluntary Participation were well considered and respected during survey.

3.9 Reliability and Validity

- **Pilot Testing:** The questionnaire was tested with a small group of professionals.
- **Expert Review:** Industry experts reviewed the questionnaire for clarity.
- **Cronbach's Alpha:**

  Reliability analysis using Cronbach's alpha was done for the TAM2 constructs, with α ≥0.70 considered acceptable. When dealing with psychological constructs, value below 0.7 can be expected because of the diversity of the constructs being measured (Field, 2018). The analysis revealed that most constructs showed excellent reliability with PU (α=0.845), PEOU (α=0.832), JR (α=0.754), RD (α=0.813), and BI (α=0.879). SN (α=0.674) was slightly below the threshold, but was retained because item deletion did not improve reliability (Field, 2018). For all multi-item constructs, deleting any item did not improve α meaningfully. The largest observed change was for PEOU (+0.001), which is negligible. This confirms that all items contribute positively to their respective constructs. For the two-item constructs (IM, JR, OQ, RD), the mean inter-item correlations (ranging from 0.523 to 0.685) were above the recommended 0.50 supporting their internal consistency. IM(α=0.697) and OQ(α=0.684) were retained with careful consideration of inter item reliability. Alpha-if-deleted analysis confirmed that no item deletion would substantially improve the reliability of any construct. Thus, all constructs were retained for further analysis.

Table 7: Reliability Analysis of TAM2 constructs

Construct	Items	Cronbach's α	Mean Inter-Item Correlation
PU	pu1, pu2, pu3, pu4	0.845	0.580
PEOU	peou1, peou2, peou3, peou4	0.832	0.552
SN	sn1, sn2, sn3	0.674	0.414
IM	im1, im2	0.697	0.535
JR	jr1, jr2	0.754	0.616
OQ	oq1, oq2	0.684	0.523
RD	rd1, rd2	0.813	0.685
BI	bi1, bi2, bi3	0.879	0.708

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Demographic Profile

4.1.1 Role/Designation

The study involved stakeholders within building bylaw implementation who were directly involved or interact with permit system. Out of 96 responses collected, 69 were KMC Registered Designers (72%), 20 were Ward Officials (21%) and 7 were Municipal Officials (7%). The response rate for ward officials was 20 out of 27 and for municipal officials, it was 7 out of 11.

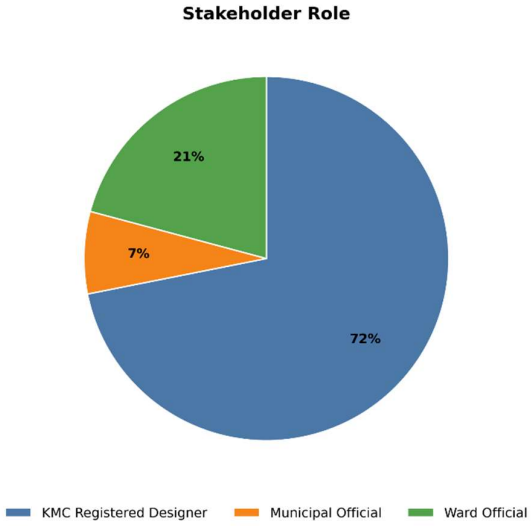

Figure 7: Stakeholder Role

4.1.2 Experience

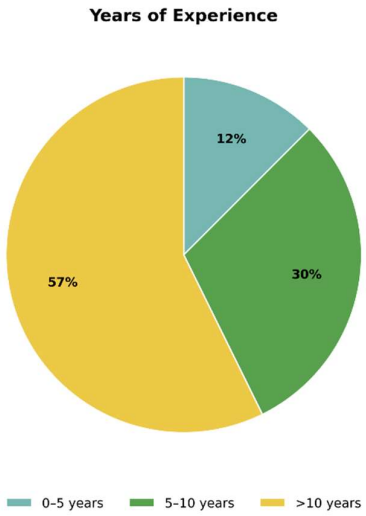

Figure 8: Years of Experience

Regarding experience in construction/building sector, 57% of the respondents has more than 10 years of experience, 30% had 5-10 years of experience and 12% had 0-5 years of experience.

4.1.3 Permit Applications (Designers)

Regarding no. of yearly permit applications by designers, 32% designers applied for 6-10 permit application yearly, followed by 22%for1-5projects, 22% for more than 50 projects, 9% for 11-20 projects and 3% applied for none.

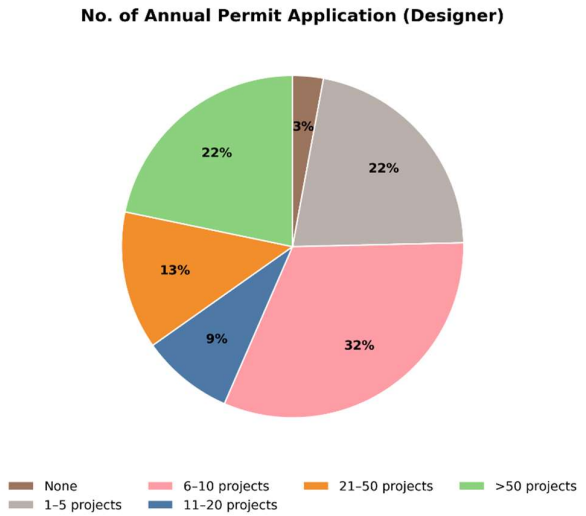

Figure 9: No. of Annual Permit Application (Designer)

4.1.4 Permit Processing (Regulatory Officials)

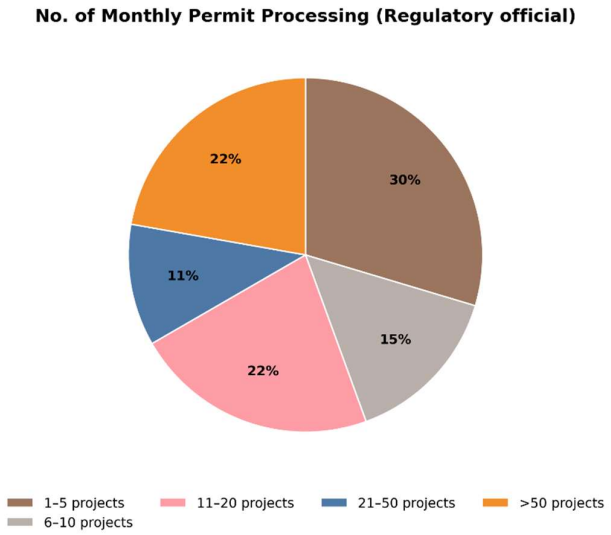

Figure 10: No. of Monthly Permit Processing(Regulators)

For regulatory officials' monthly workload, 1–5 permit applications (29.6%) and more than 50 applications (22.2%) are most common, followed by 11–20 applications (22.2%), 6–10 applications (14.8%), and 21–50 applications (11.1%).

4.1.5 Interaction with Permit System

The typical permit approval time is 1–3 months (76.0%), with 16.7% achieving approval in <1 month and 5.2% taking 4–6 months. 2.1% marked 'Not Applicable'. Interaction with the permit system is mostly digital (58.3%), with 40.6% reporting a mix of both and 1.0% relying on mostly paper/manual processes.

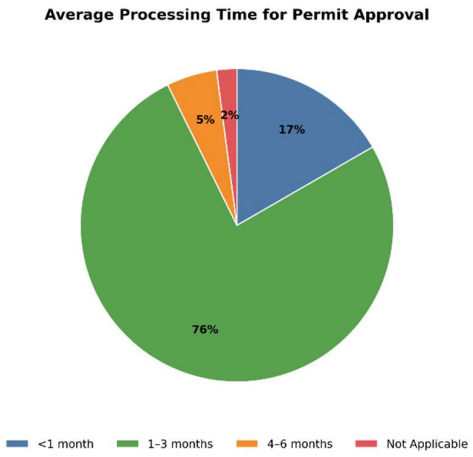

Figure 11: Average Processing Time for Permit Approval

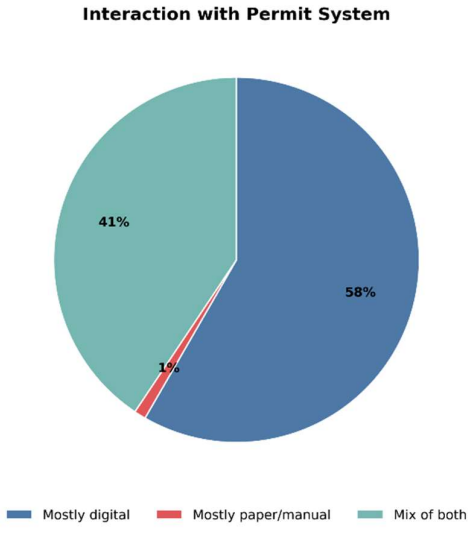

Figure 12: Interaction with permit system

4.2 Ranking and Interpretation of Challenges to Building By-Law Implementation

4.2.1 Top Critical Challenge Ranking

Table 8: Overall Top 15 Challenges by Relative Importance Index

Challenge Group	Code	Challenge	RII	Overall Rank
Attitude, Awareness & Knowledge of Stakeholders	a1	Low awareness of building by-laws among house owners	0.829	1
Attitude, Awareness & Knowledge of Stakeholders	a9	Lack of trained contractors and masons	0.783	2
Communication & Construction Monitoring	c8	Limited collaboration with utility providers (road, electricity, water, drainage)	0.769	3
Communication & Construction Monitoring	c7	Lack of construction supervision by engineers	0.767	4
Attitude, Awareness & Knowledge of Stakeholders	a7	No formal integration of building bylaws in academic curricula	0.765	5
Communication & Construction Monitoring	c4	Lack of regulatory construction inspection	0.763	6
Communication & Construction Monitoring	c6	Unregulated contracting and subcontracting practices	0.758	7
System Policy	s6	Inaccurate cadastral maps & irregular subdivision of plots	0.756	8
Attitude, Awareness & Knowledge of Stakeholders	a2	Willful defiance towards by-law compliance	0.754	9
Communication & Construction Monitoring	c3	Poor communication between houseowners, regulators & practitioners	0.740	10
System Policy	s7	Inconsistent GLD, river setback & high-voltage setback designations	0.740	11
System Policy	s8	Lack of public engagement in policymaking	0.738	12
Attitude, Awareness & Knowledge of Stakeholders	a8	Prioritizing profit over compliance	0.733	13
Attitude, Awareness & Knowledge of Stakeholders	a3	Lack of public trust in regulatory bodies	0.731	14
Institutional Capacity	i7	Inefficiencies and delays in the approval process	0.721	15

To address the first research objective, Relative Importance Index (RII) analysis was employed to rank individual challenges. The RII analysis identified the most critical challenges affecting building by-law implementation in Kathmandu Municipality.

Attitude, Awareness & Knowledge of Stakeholders related challenges dominated the top rankings, with **'Low awareness of building by-laws among house owners'** (RII = 0.829) emerging as the most critical barrier. This was closely followed by **'Lack of trained contractors and masons'** (RII = 0.783). Challenges from the *Attitude, Awareness & Knowledge of Stakeholders* category constituted six of the top 15 challenges, highlighting the major stakeholder and capacity-related issues over purely technical or regulatory challenges. Five *Communication and Construction Monitoring* related challenges ranked in the top 15 rankings, including **'Limited collaboration with utility provider'** (RII=0.769) and **'Lack of construction supervision by engineers'** (RII=0.767).

System policy issues such as **'Inaccurate cadastral maps'** and **'Inconsistent GLD and setback designations'** within the top 15 highlights the relation of lack of policy level infrastructure and implementation challenges. *Design & technical planning* and *Institutional capacity* related challenges ranked relatively lower indicating stakeholder awareness and communication are more critical than shortages in technical and institutional capacity. These findings suggest that effective by-law enforcement requires focus on investment in stakeholder capacity building and communication mechanisms.

4.2.2 Top Critical Challenge Within Groups

1. System Policy

'Inaccurate cadastral maps and irregular plot subdivisions' (RII=0.756), is ranked the top challenge within *System Policy* indicating that even the most well-designed regulations cannot function properly when basic cadastral data is unreliable. This foundational data problem exists throughout the regulatory system, as decisions about setbacks, land use, and development rights depend on accurate plot information. **'Inconsistent GLD, river setback & high-voltage setback designations'** (RII=0.740). create confusion for both regulators and practitioners, leading to irregular enforcement and frequent violations. The third-ranked challenge of '**Lack of public engagement in policymaking**' (RII=0.738) potentially explains why policies often fail

to address ground realities. The low ranking of compliance costs (RII=0.625, 8th) is tells that financial burdens, while present, are not the primary challenge to compliance.

Table 9: Implementation Challenge Ranking (System Policy)

Code	Challenge	RII	Rank within group
s6	Inaccurate cadastral maps & irregular subdivision of plots	0.756	1
s7	Inconsistent GLD, river setback & high-voltage setback designations	0.740	2
s8	Lack of public engagement in policymaking	0.738	3
s4	Poor coordination between municipal, national policies and urban development plans	0.698	4
s1	Inconsistent/Inadequate building regulations	0.644	5
s2	Lack of clarity in building by-law clauses	0.644	6
s3	Overlapping jurisdiction (Ward, Municipality, etc.)	0.644	7
s5	Cost of compliance due to rigid policy	0.625	8

2. Institutional Capacity

Table 10:Implementation Challenge Ranking (Institutional Capacity)

Code	Challenge (Group: Institutional Capacity)	RII	Rank within group
i7	Inefficiencies and delays in the approval process	0.721	1
i2	Lack of internal accountability and ethics	0.704	2
i5	Conflict of interest due to regulating staff involved in building design	0.698	3
i3	Corruption, malpractice & political interference	0.694	4
i9	Lack of technical assistance and help desk	0.667	5
i6	Lack of data & records	0.648	6
i4	Inadequate staffing and financial resources	0.629	7
i8	Frequent transfers of key officials	0.629	8
i1	Lack of technical expertise among staff	0.623	9

‘Inefficiencies and delays in the approval process’ (RII=0.721) ranking as the most critical issue within *Institutional Capacity*, shows that bureaucratic delay actively hampers by-law implementation. This suggests that stakeholders experience the permit approval system as very obstructive. **‘Lack of internal accountability and ethics’** (RII=0.704) and **Conflict of interest** (RII=0.698) ranking 2nd and 3rd tells that

implementation challenges are not just from capability gaps, but from deeper issues of institutional culture and professional conduct. **Corruption, malpractice and political interference** (RII=0.694) ranking fourth further confirms this pattern.

Lower ranking of challenges relating to resource constraints such as lack of help desks, records and financial resources suggests that solution strategies to capacity related problems must focus first on process redesign and transparent governance rather than staff training or budget increase.

3. Design & Technical Planning Aspects

Frequent resubmissions due to digital file issues or incomplete data (RII=0.690) ranks as the most critical challenge within the group. It shows a critical failure where digital systems intended to make the processes fast and efficient instead create new obstacles. **Weak review mechanisms for drawings prior to submission** (RII=0.681) ranking as 2nd most critical challenge suggests that designers often have to submit drawings without adequate feedback and pre-review guidelines. **Insufficient knowledge/training & lack of local context among designers** (RII= 0.648) suggests that designers often have adequate technical knowledge but lack the local understanding of Kathmandu's regulatory landscape.

Table 11: Implementation Challenge Ranking (Design & Technical Planning Aspects)

Code	Challenge (Group: Design & Technical Planning Aspects)	RII	Rank within group
d3	Frequent resubmissions due to digital file formats or incomplete data	0.690	1
d4	Weak review mechanisms for drawings prior to submission	0.681	2
d2	Insufficient knowledge/training & lack of local context among designers	0.648	3
d5	Digitized drawings not aligning with physical site conditions	0.642	4
d7	Inconsistent evaluation of drawings	0.633	5
d8	Lack of qualified designers	0.598	6
d1	Limited integration of by-laws during the design phase	0.594	7
d6	Lack of standardization in digital drawing formats	0.594	8

Low ranking of **Limited by-law integration during design** (RII=0.594) and **Lack of standardization in digital drawing formats** (RII=0.594) suggests designers do

attempt to incorporate regulations, but are discouraged by confusing processes and inconsistent evaluations rather than willful defiance.

4. Communication & Construction Monitoring

Limited collaboration with utility providers (RII=0.769) ranked as the most critical challenge within the group suggests stakeholders experience the construction process as isolated, poorly coordinated approvals where water, electricity, and drainage connections become afterthoughts rather than integrated design components. **Lack of construction supervision by engineers** (RII=0.767, 2nd) and **Lack of regulatory construction inspection** (RII=0.763, 3rd) shows a major challenge during the actual building phase which creates a huge gap between drawings and actual construction.

Low ranking of **Weak penalties and legal backing for non-compliance** (RII=0.673, 7th) shows that cannot effectively penalize violations if you cannot detect it because of loack on inspection mechanisms Poor inter-department coordination ranks last (RII=0.671, 8th), suggesting that while bureaucratic gaps exist, stakeholders consider them less problematic than the more fundamental gaps in coordination and on-site supervision.

Table 12: Implementation Challenge Ranking (Communication & Construction Monitoring)

Code	Challenge	RII	Rank within group
c8	Limited collaboration with utility providers (road, electricity, water, drainage)	0.769	1
c7	Lack of construction supervision by engineers	0.767	2
c4	Lack of regulatory construction inspection	0.763	3
c6	Unregulated contracting and subcontracting practices	0.758	4
c3	Poor communication between houseowners, regulators & practitioners	0.740	5
c1	Lack of standardized inspection protocols & reporting for noncompliance	0.700	6
c5	Weak penalties and weak legal backing for field officers to act on noncompliance	0.673	7
c2	Poor inter-department coordination (Municipality, Ward, etc.)	0.671	8

5. Attitude, Awareness & Knowledge of Stakeholders

Low awareness of building bylaws among house owners (RII=0.829) stands as the topmost priority, suggesting that public awareness and knowledge overrides the effectiveness of well-designed regulations as homeowners, the primary stakeholders are in the dark. The second-ranked challenge of **Lack of trained contractors and masons** (RII=0.783) suggests a huge gap between regulatory and on-ground execution. Contractors are vital bridge between regulators and houseowners, yet they lack the formal training. **No formal integration of building bylaws in academic curricula** (RII=0.765) shows a systemic failure in professional education where future architects, engineers, and planners graduate without foundational knowledge of the regulations they will implement.

The low ranking of economic factors **Perceived high cost and time consumption for compliance** (RII=0.702) rank 8th and **Inflation/unaffordability** last (RII=0.673).suggest that while financial pressures exist, stakeholders do not view them as primary causes of non-compliance.

Table 13: Implementation Challenge Ranking (Attitude, Awareness & Knowledge of Stakeholders)

Code	Challenge	RII	Rank within group
a1	Low awareness of building by-laws among house owners	0.829	1
a9	Lack of trained contractors and masons	0.783	2
a7	No formal integration of building bylaws in academic curricula	0.765	3
a2	Willful defiance towards by-law compliance	0.754	4
a8	Prioritizing profit over compliance	0.733	5
a3	Lack of public trust in regulatory bodies	0.731	6
a6	Bribery and informal negotiations	0.713	7
a5	Perceived high cost and time consumption for compliance	0.702	8
a4	Inflation / unaffordability	0.673	9

4.2.3 Ranking of Challenge Groups

The group level analysis shows that *Attitude, Awareness & Knowledge of Stakeholders* (Mean RII=0.743) was rated as the most critical challenge group, followed by *Communication and Construction Monitoring* (Mean RII= 0.730) related challenges

and *System Policy* (Mean RII=0.686) issues. *Institutional Capacity* related challenges, ranked lower than stakeholder related factors, suggesting that human behavioral aspects outweigh purely policy and institutional capacity related challenges in building by-law implementation.

Table 14: Implementation Challenge Group Rankings by Mean RII

Challenge Group	**Mean RII**	**Group Rank**
Attitude, Awareness & Knowledge of Stakeholders (A)	0.743	1
Communication & Construction Monitoring (C)	0.730	2
System Policy (S)	0.686	3
Institutional Capacity (I)	0.668	4
Design & Technical Planning Aspects (D)	0.635	5

The group ranking by stakeholder group shows major similarity in ranking between Designers and Ward officials whereas municipal officials show slight difference in rankings.

Table 15: Challenge Group Ranking by Stakeholder Group

Challenge Category	**RII (Designers)**	**Designers Rank**	**RII (Municipal Officials)**	**Municipal Officials Rank**	**RII (Ward Officials)**	**Ward Officials Rank**	**Overall**	**Overall Rank**
Attitude, Awareness & Knowledge of Stakeholders	0.758	1	0.683	2	0.711	1	0.743	1
Communication & Construction Monitoring	0.746	2	0.757	1	0.664	2	0.730	2
System Policy	0.716	3	0.679	3	0.584	3	0.686	3
Institutional Capacity	0.709	4	0.613	5	0.548	4	0.668	4
Design & Technical Planning Aspects	0.662	5	0.629	4	0.545	5	0.635	5

4.2.4 Analysis of the Perception Difference between Designers, Municipal Officials and Ward Officials

Kruskal-Wallis tests shows statistically significant perception gaps across 3 respondent groups for 4 out of 5 challenge categories. The most significant differences were observed for *Institutional Capacity* challenges ($H=19.194$, $p<0.001$, $\varepsilon^2=0.185$), suggests huge gap in how groups experience capacity related barriers. Significant gap in perception with large effect size regarding *Institutional policy* suggests that municipal officials, ward officials, and designers appear to have very different views. This suggests that capacity means one thing to those managing the system from within office and quite another to those navigating it from outside as service users. *System Policy* challenges also showed significant differences ($H=12.010$, $p=0.002$, $\varepsilon^2=0.108$). officials may grapple with implementation hurdles where as designers confront restrictive technical requirements.

Table 16: Kruskal-Wallis Test for Challenge Category

Challenge Category	**H-statistic**	**P-value**	**Effect Size (ε^2)**	**Statistical Significance**
Institutional Capacity	19.194	0.00006**	0.185	Significant ($p < 0.01$)
System Policy	12.010	0.002**	0.108	Significant ($p < 0.01$)
Attitude, Awareness & Knowledge of Stakeholders	6.267	0.044*	0.046	Significant ($p < 0.05$)
Communication & Construction Monitoring	4.419	0.110	0.026	Not Significant
Design & Technical Planning Aspects	6.068	0.048*	0.044	Significant ($p < 0.05$)

Though statistically significant, the perception gaps for *Awareness, Attitude & Knowledge of Stakeholders* ($H=6.267$, $p=0.044$, $\varepsilon^2=0.046$) and *Design & Technical Planning Aspects* ($H=6.068$, $p=0.048$, $\varepsilon^2=0.044$) show small effect suggesting mild disagreements. *Communication & Construction Monitoring* was the only category where no significant differences in perception were found. This suggests that this area represents a common ground that could serve as a starting point for collaborative improvement.

4.3 Analysis of Behavioral Intentions and Influencing Factors

For the second research objective, this analysis uses the adapted Technology Acceptance Model 2 (TAM2) framework using descriptive statistics and multiple regression to identify key influencing factors of designers' and regulators' behavioral intention to comply with building by-law. Descriptive statistics analyse stakeholder perceptions across eight constructs, while multiple regression identifies key predictors of behavioral intention to comply with building by-laws.

4.3.1 Descriptive Statistics (Composite Score Analysis)

Composite score analysis shows how respondents perceive each TAM 2 construct in the context of perception about building by-law. Overall positive attitudes toward compliance can be seen, with *Behavioral Intention* (M=4.44), *Job Relevance* (M=4.44), and *Perceived Usefulness* (M=4.10) scoring highest, reflecting a clear willingness to comply and that professionals see compliance as very useful for their professional role. *Subjective Norm* (M=3.96), *Result Demonstrability* (M=3.91) and *Image* (M=3.57) were moderately high, showing that social expectations and reputation moderately influence attitude towards compliance. However, significantly neutral scores for *Perceived Ease of Use* (M=3.29) and *Output Quality* (M=3.27) suggest that there are major barriers related to process complexity and system inefficiencies. The high standard deviation in PEOU and OQ perceptions (SD > 0.88) suggests these are issues about how different stakeholders experience the same system differently requiring targeted interventions. Overall, it can be interpreted that while stakeholders value compliance and intend to follow official processes, improvements in system usability and efficiency are needed.

Table 17: Descriptive Statistics (Composite Scores) for TAM2 Constructs

Construct	N	Mean	Std. Dev	Min	Max
PU	96	4.104	0.717	1.750	5.000
PEOU	96	3.286	0.883	1.750	5.000
SN	96	3.955	0.676	2.333	5.000
IM	96	3.573	0.877	1.000	5.000
JR	96	4.438	0.638	2.000	5.000
OQ	96	3.271	0.951	1.000	5.000
RD	96	3.911	0.791	1.500	5.000

BI	96	4.441	0.618	2.000	5.000

4.3.2 Model 1: Predictors of Perceived Usefulness (PU)

$$PU = \beta_0 + \beta_1(SN) + \beta_2(IM) + \beta_3(JR) + \beta_4(OQ) + \beta_5(PEOU) + \beta_6(RD) + \varepsilon$$

Table 18: Multiple Regression Analysis: Predictors of Perceived Usefulness

Predictor	**Coefficient (β)**	**Std. error**	**t-value**	**p-value**
Subjective Norm (SD)	0.442	0.119	3.715	0.0002***
Image (IM)	0.251	0.075	3.339	0.0008***
Job relevance (JR)	0.188	0.094	1.995	0.046*
Output Quality (OQ)	-0.003	0.077	-0.036	0.971
Result Demonstrability (RD)	0.025	0.089	0.277	0.782
Perceived ease of use (PEOU)	0.044	0.080	0.543	0.587
Constant	0.420	0.492	0.853	0.393
Model Summary: n = 96. $R^2 = 0.486$, Adjusted $R^2 = 0.452$, F(6, 89) = 14.037, p < 0.001, RMSE = 0.524. All VIFs < 2. ***p < 0.001, **p < 0.01, *p < 0.05				

Significant Predictors:

- **Subjective Norm (SN)** (β ≈ 0.442, p < 0.001): Social expectations remain a strong determinant of perceived usefulness. Stakeholders perceive compliance as useful when it is socially endorsed by peers and officials.
- **Image (IM)** (β ≈ 0.251, p < 0.001): Professional reputation matters. Respondents who believe compliance enhances their image are more likely to view the by-law system as useful.

- **Job Relevance (JR)** ($\beta \approx 0.188$, $p \approx 0.046$): When compliance is seen as integral to one's role, perceived usefulness increases.

Non-significant Predictors:

- **Output Quality (OQ)** and **Perceived Ease of Use (PEOU)** remain non-significant, suggesting that by-law system being easy to use and having efficient outfit do not strongly shape PU in this context.
- **Result Demonstrability (RD)**, despite theoretical importance in TAM2, is not significant ($\beta \approx 0.025$, $p \approx 0.78$). This implies that even though respondents can observe benefits of compliance, RD isn't a prominent influencing factor for PU beyond SN, IM, and JR.

Model Fit: *Subjective Norm* (SN), *Image* (IM), *Job Relevance* (JR), *Output Quality* (OQ), and *Perceived Ease of Use* (PEOU) explained nearly half of the variance in PU(R^2=0.486).

4.3.3 Model 2: Predictors of Behavioral Intention to comply (BI)

$$BI = \beta_0 + \beta_1(PU) + \beta_2(PEOU) + \varepsilon$$

Table 19: Multiple Regression Analysis: Predictors of Behavioral Intention to Comply

Predictor	Coefficient (β)	Std. error	t-value	p-value
Perceived Usefulness (PU)	0.272	0.081	3.37	0.001**
Perceived Ease of Use (PEOU)	0.054	0.068	0.79	0.431
Constant	3.124	0.337	9.27	<0.001
Model Summary: n = 96. R^2 = 0.146, Adjusted R^2 = 0.127, F(2, 93) = 7.921, p < 0.001, RMSE = 0.540. All VIFs < 2. ***p < 0.001, **p < 0.01, *p < 0.05				

Significant Predictor:

- **Perceived Usefulness (PU):** The significant positive relationship between Perceived Usefulness and Behavioral Intention (β = .272, p = .001) confirms

that stakeholders who believe compliance leads to safer and organised city are more inclined to comply to building by-laws.

Insignificant Predictor:

- **Perceived Ease of Use (PEOU):** PEOU was positive but not significant (β = .054, p = .431)., indicating that ease of use alone does not drive professionals towards compliance without perceived usefulness. In Kathmandu's context, it can be interpreted as stakeholders appear are enduring bureaucratic complexity because they believe the outcomes are worthwhile.

Model Fit: For BI model $R^2 \approx 0.146$ meaning PU and PEOU together explain about 14.6% of the variance in Behavioral Intention. This also suggests for additional determinants (e.g., facilitating conditions, perceived risk, compliance requirements) that are typically incorporated in extended frameworks

Theoretical Implications and Model Extensions

To account for low variance that indicates that perceived usefulness alone isn't explanatory enough in a mandatory setting, future studies should consider incorporating additional constructs derived from standard models like Facilitating Conditions, Procedural Justice, Perceived risk of non-compliance, etc. These additional constructs can be catered and refined though identified critical challenges and themed group identified from open ended question to create a more explanatory model.

4.4 Identification of Themes to Improve Existing Permit System

4.4.1 Qualitative Overview of Open-Ended Questions

Question: Most significant change that could be made to existing permit system

The responses were meticulously studied to understand the common themes. Four major themes were recognized and responses were assigned to the selected theme If answers highlighted more than one theme, it was assigned to the primary theme it affected.

4.4.2 Identified Themes

1. **Process Simplification and Efficiency: 23 responses**

Responses like “more flexibility in system”, “more steps are to be minimize”, “has very lengthy process” point towards lengthy and inefficient permit process. Many diverse but relevant suggestions point towards actual procedural difficulties during permit approval such as concerns about ‘Sandhiyar notice’, pending files at desk, drawing resubmissions, deleting and commenting aspects

2. **Governance & Policy**: **21 responses**

Responses like "serious amendment in by-law", “Proper Land use plan before bylaw”, "Some bylaws are unclear” including 5 other similar responses suggest need for clarity and revisions in bylaws. Responses like "Co-operative technical expert”, “sincerity among staff” “corruption” and 3 other similar responses suggest improvement in governance and transparency

3. **Digital transformation and technical aspect: 15 responses**

Responses like "Automatic assignment of building by laws”, “scientific digital cadastral map”, “AI integration Chatbot” suggests that modern technology can make process efficient and less cumbersome. Differing suggestions about full digitization and paperless process being cumbersome point toward lack of tech efficiency and tech support.

4. **Communication & Stakeholder Support: 14 responses**

Responses like "Training and examination”, "Technical assistance desk” and 5 other similar response suggest need for technical support for designers. Responses like “Public consultation for public need”, “public awareness for orientation of client” and 2 other similar response suggest need for raising awareness and communication among house owners

4.5 Triangulating Stakeholder Perspectives

4.5.1 Validating Implementation Challenges Through House Owner Experiences

To triangulate findings from professional stakeholders, a supplementary survey of 14 house owners across eight Kathmandu wards was conducted. The questionnaire was distributed through google forms. The questionnaire was formulated surrounding the

major challenges identified. Both English and Nepali language was included in the questionnaire. The overall sections included

- General Information
- Basic Awareness
- Process Experience
- Construction & Inspection

4.5.2 House Owner Survey Result Summary

Table 20: House Owner Survey Results Summary (n=14)

Category	Percentage
Permit Awareness	
Very aware	50.0%
Somewhat aware	50.0%
Attitude toward permit	
Important but process should be simple	71.4%
Important for safety and planning	28.6%
Technical Knowledge	
Setback	100%
Right of way (ROW)	78.6%
Earthquake Resistant Design	64.3%
Ground coverage	57.1%
Floor Area Ratio	28.6%
Building Height Restrictions	28.6%
Permit Process Experience	
Somewhat Confusing	42.9%
Very complicated and difficult	28.6%
Very clear and straightforward	21.4%
Didn't go through the process themselves	7.1%
Permit approval Timeline	
1-3 months	85.7%
Less than 1 month	7.1%
3-6 months	7.1%
Major difficulties experienced	
Understanding documents	64.3%
Navigating offices	64.3%
Dealing with officials	64.3%
Time taken for approval	57.1%
Technical requirements	42.9%

Cost involved in approval	14.3%
Contractor Status	
Unregistered/ Unsure if registered	78.6%
Registered contractor	14.3%
No contractor	7.1%
Professional supervision by engineers/architects	
No supervision	71.4%
Partial Supervision	14.3%
Complete Supervision	14.3%
Municipal Inspection	
Inspection once or twice	42.9%
No inspection	28.6%
Regular inspection	21.4%
Not sure	7.1%
Utility Connection Experience	
Somewhat difficult	57.1%
Very difficult	35.7%
Very easy	7.1%

Awareness and Knowledge Gaps:

50% of houseowners were very aware and 50% were somewhat aware of the permit process. However, their technical knowledge was limited to basic concepts like setbacks (100%) with significantly lower awareness of more complex regulations like Floor Area Ratio (28.6%) and Building height restrictions (28.6%). This partial awareness aligns with the finding of "Low awareness of building by-laws among house owners" ranked as a critical challenge.

The attitude towards importance of permit was hugely positive with 100% respondent agreeing that permit is important with 71.4% among them saying the process could be a lot simpler. It can be interpreted that the lack of awareness comes primarily from process complexity and lack of access to knowledge rather than willful negligence. It can also be connected with our behavioral model that intention to comply is primarily driven by perceived usefulness rather than perceived ease of use. Future plans for implementation should focus on.communicating benefits of compliance.

Process Complexity and Delays:

42.9% described the permit approval experience as "somewhat confusing" and 28.6% "very complicated and difficult." The late permit approval timelines (85.7% experienced 1-3-month delays) further validate concerns about process inefficiencies. The most frequently cited difficulties were understanding required documents (64.3%), navigating different offices (64.3%) dealing with officials (64.3%)

Documentation comprehension, office navigation, and official interactions directly validates the institutional and communication gaps identified by professionals. This also reflects with Output Quality and Perceived ease of use having lower composite scores suggesting the system's inefficiency.

Lack of Construction Support and Supervision

Majority of house owners (78.6%) used unregistered contractors or were uncertain about their contractors' registration status, 71.4% proceeded construction without any engineering supervision. Frequency of inspection by regulators were 42.9% for one or two inspection and 28.6% for no inspection. 57.1% had some difficulty in getting utilities whereas 35.7% found the process very difficult.

This professional engagement deficit directly validates the challenges of "Lack of trained contractors and masons", "Lack of regulatory inspection" and "Lack of construction supervision by engineers" and "Limited collaboration with utility providers" identified in the RII analysis.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This research identified and categorised major challenges to building by-law implementation and also explored upon influencing factors of regulators and designers' intention to comply. Challenges related to awareness, knowledge and communication gaps showed to be most prominent. This suggests that building by-law implementation challenges in KMC are primarily from behavioral and communication challenges than from design/technical problems or institutional aspects. It can be interpreted that by-law implementation challenges show deeper issues in urban governance rather than technical deficiencies. Focusing resources primarily in communicating benefits and procedures of compliance to house owners as well as strengthening communication and construction supervision channels.

Perception gaps paired with RII gives insightful interpretation. No significant perception gap between stakeholders in *Communication & Construction Monitoring* group as well as being the second most ranked challenge group, it could act as a first step for successful intervention. Significant perception gap in *Institutional capacity* and *System Policy* suggests different stakeholders experience the same institution differently, especially regarding designers experiencing corruption and political interference more prominently than regulatory officials. This suggests that targeted intervention is required.

The intention to comply with by-laws seem to be driven by perceived usefulness. Stakeholders perceive compliance with bylaw useful which influences their intention to comply positively despite perceiving the system to be inefficient and complex. This gives insight to focus on magnifying positive attitude towards usefulness and benefit of compliance. This also relates to attitude and awareness being one of the most prominent challenge group in RII ranking, suggesting investing resource on stakeholder collaboration and training. Open ended questions having major recommendation about lengthy and complicated permit process, however, suggests that even though ease of use isn't an immediate factor for compliance intention, it can lead to frustration in long term, leading to gap between intention to comply and actual implementation.

Triangulation with houseowner perception further confirmed the findings. Triangulation confirmed lack of awareness is a major problem among houseowners while acknowledging the positive attitude of houseowners towards importance of bylaw. Making education and training more accessible to them can be a key step towards improving. Process complexity, difficult navigation and delay is major indicating institutional and communication gaps. Future interventions to solve major deficit in construction supervision and inspection should also be one of the priorities.

5.2 Recommendation

- Prioritise training and capacity building towards critical challenges identified through RII
- Targeted models and intervention to address perception gaps between stakeholders about challenges related to Institutional Capacity and System Policy
- Utilise similarity in perception about challenges related to Communication & Construction Monitoring with standardised inspection schedule and digital checklist, feedback and communication portal, etc.
- Reduce permit process complexity and steps through key point identified through qualitative feedback such as pre-submission checklist, feedback portals, etc.

CHAPTER SIX: RESEARCH APPLICATION & FURTHER RESEARCH

6.1.1 Research Application

- **Priority Based Resource Allocation:** The research establishes a data-driven insight for Kathmandu Metropolitan City to allocate limited resources where they will have maximum impact. By categorizing challenges into five intervention domains (*System Policy, Institutional Capacity, Design & Technical, Communication & Monitoring, Stakeholder Awareness*) and through RII and perception gap analysis, municipal authorities can move towards evidence-based resource allocation. This research can aid in creating feasibility matrix to formulate implementation strategy from immediate action to long term reform.
- **Stakeholder Specific Training Models:** The significant perception gaps identified through Kruskal-Wallis analysis, particularly in *Institutional Capacity* and *System Policy* suggests that 'one-size-fits-all' training approaches are ineffective. The research supports developing targeted training plan by considering knowledge gaps and different critical challenges experienced by different stakeholders**.**
- **Standardized Implementation Guidelines:** Through identified critical challenges, comprehensive implementation guidelines can be formulated to ensure effective building by-law implementation.

6.1.2 Further Research

- **Feasibility Analysis and Prioritization Matrix Development:** A research on developing prioritization matrix that compares severity of challenge to implementation feasibility can be done to further enhance the findings.
- **Expanded TAM2 Application with Additional Constructs:** The current application of TAM2 explained 14.6% of variance in behavioral intention, indicating significant room for theoretical expansion. Future research can explore upon additional constructs from other models to improve explanatory power in mandatory regulatory contexts such as facilitating conditions, perceived risks, trust factors etc.

- **Comparative Studies Across Different Municipalities in Nepal:** Comparative studies across municipalities in Nepal based on various criteria such as municipality size, institutional capacity and digital maturity can be done. This can help identify successful practices to be adapted and understand how national policies are translated locally in different levels.

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APPENDIX I: PRIMARY QUESTIONNAIRE

Analyzing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Municipality

Introduction

Dear Respondent, My name is Nishee Shrestha, currently pursuing a degree on Masters of Science in Construction Management(MSCOM). I am conducting a research study on **'Analyzing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Municipality'** as part of my Master's thesis at Pulchowk Campus, IOE. This study seeks to **identify the major challenges to the effective implementation of building by-laws implementation in Kathmandu Municipality** and **to understand how professionals (officials and designers) involved in the process experience the building regulatory system.** Your participation is vital for this research. By sharing your experiences, insights, and opinions, you will contribute to a deeper understanding of the challenges faced in the field and help identify actionable solutions to improve by-law implementation. The survey will take approximately 10-15 minutes to complete. Your responses will remain strictly confidential and will only be used for academic purposes. Thank you for taking the time to support this research. Your input is highly valued and greatly appreciated..

Section 1: Demographics

Q1. Name

_____

Q2. Role/Designation

- ◯ KMC Registered Designer
- ◯ Municipal Official
- ◯ Ward Official
- ◯ Others

Q2.1 If others, please specify your role/designation

_____

Q2a. KMC Registration Number

_____

Q3. Years of experience in the construction/building sector

- ◯ 0-5 years
- ◯ 5-10 years
- ◯ More than 10 years

Q4. In the past year, how many residential building projects have you applied for permit processing?

- None
- 1-5 projects
- 6-10 projects
- 11-20 projects
- 21-50 projects
- More than 50 projects

Q4. On average, approximately how many building permit applications do you review or process in a typical month?

- None
- 1-5 projects
- 6-10 projects
- 11-20 projects
- 21-50 projects
- More than 50 projects

Q5. Approximately how long does it take on average to complete permit approval for a residential projects?

- Less than 1 month
- 1 - 3 months
- 4 - 6 months
- 7 - 12 months
- More than 1 year
- Not Applicable

Q6. Which of the following best describes your interaction with existing building permit system?

- Mostly digital
- Mostly paper/manual
- A mix of both

Section 2: Challenges to Building By-Law Implementation

Instructions: This section seeks to identify the major challenges affecting the effective implementation of building by-laws in Kathmandu Municipality. Based on your professional experience, please rate the following challenges based on the degree each of the following act as a challenge to the effective building by-law implementation. (Use a 5-point Likert Scale: 1 = Very Minor, 2 = Minor, 3 = Moderate, 4 = Major, 5 = Very Major)

» Section 2A: System Policy

Q7. To what degree does each of the following act as a challenge to the effective building by-law implementation?	1. Very Minor	2. Minor	3. Moderate	4. Major	5. Very Major

Inconsistent/Inadequate building regulations	◯	◯	◯	◯	◯
Lack of clarity in building by-law clauses	◯	◯	◯	◯	◯
Overlapping jurisdiction (eg: Ward, Municipality,etc.)	◯	◯	◯	◯	◯
Poor coordination between municipal policies, national policies and urban development plans	◯	◯	◯	◯	◯
Cost of compliance due to rigid policy	◯	◯	◯	◯	◯
Inaccurate cadastral maps and irregular sub-division of plots	◯	◯	◯	◯	◯
Inconsistent Guided Land Development (GLD), river setback and high voltage setback designations	◯	◯	◯	◯	◯
Lack of public engagement in policy-making	◯	◯	◯	◯	◯

» Section 2B: Instituitional capacity

Q8.To what degree does each of the following act as a challenge to the effective building by-law implementation?	1. Very Minor	2. Minor	3. Moderate	4. Major	5. Very Major
Lack of technical expertise among staff	◯	◯	◯	◯	◯
Lack of internal accountability and ethics	◯	◯	◯	◯	◯
Corruption, malpractice and political interference	◯	◯	◯	◯	◯
Inadequate staffing and financial resources	◯	◯	◯	◯	◯
Conflict of interest due to regulating staffs being involved in building design	◯	◯	◯	◯	◯
Lack of data & records	◯	◯	◯	◯	◯
Inefficiencies and delays in the approval process	◯	◯	◯	◯	◯
Frequent transfers of key officials	◯	◯	◯	◯	◯
Lack of technical assistance and help desk	◯	◯	◯	◯	◯

» Section 2C: Design & Technical Planning Aspects

Q9.To what degree does each of the following act as a challenge to the effective building by-law implementation?	1. Very Minor	2. Minor	3. Moderate	4. Major	5. Very Major
Limited integration of by-laws during the design phase	◯	◯	◯	◯	◯
Insufficient knowledge, training and lack of local context among designers	◯	◯	◯	◯	◯

Frequent resubmissions due to digital file formats or incomplete data	◯	◯	◯	◯	◯
Weak review mechanisms for drawings prior to submission	◯	◯	◯	◯	◯
Digitized drawings not aligning with physical site conditions	◯	◯	◯	◯	◯
Lack of standardization in digital drawing formats	◯	◯	◯	◯	◯
Inconsistent evaluation of drawings	◯	◯	◯	◯	◯
Lack of qualified designers	◯	◯	◯	◯	◯

» Section 2D: Communication, Coordination and Construction Monitoring

Q10. To what degree does each of the following act as a challenge to the effective building by-law implementation?	1. Very Minor	2. Minor	3. Moderate	4. Major	5. Very Major
Lack of standardized inspection protocols and reporting mechanisms for non-compliance	◯	◯	◯	◯	◯
Poor inter-department coordination (e.g.: Municipality, Ward, etc.)	◯	◯	◯	◯	◯
Poor communication channels between houseowners, regulators and practitioners	◯	◯	◯	◯	◯
Lack of regulatory construction inspection	◯	◯	◯	◯	◯
Weak penalties and weak legal backing for field officers to act on non-compliance	◯	◯	◯	◯	◯
Unregulated contracting and subcontracting practices	◯	◯	◯	◯	◯
Lack of construction supervision by engineers	◯	◯	◯	◯	◯
Limited collaboration with utility providers (Road, electricity, water, drainage)	◯	◯	◯	◯	◯

» Section 2E: Attitude, Awareness, and Knowledge of Stakeholders

Q11. To what degree does each of the following act as a challenge to the effective building by-law implementation?	1. Very Minor	2. Minor	3. Moderate	4. Major	5. Very Major
Low awareness of building by-laws among house owners	◯	◯	◯	◯	◯
Willful defiance towards by-law compliance	◯	◯	◯	◯	◯
Lack of public trust in regulatory bodies	◯	◯	◯	◯	◯
Inflation/unaffordability	◯	◯	◯	◯	◯

Perceived high cost and time consumption.for compliance	◯	◯	◯	◯	◯
Bribery and informal negotiations	◯	◯	◯	◯	◯
No formal integration of building bylaws in academic curricula	◯	◯	◯	◯	◯
Prioritizing profit over compliance	◯	◯	◯	◯	◯
Lack of trained contractors and masons	◯	◯	◯	◯	◯

Section 3: Stakeholder Perceptions of the Building By-Law System

Instructions: This section seeks to understand your perceptions regarding the building by-law compliance process. Please indicate your level of agreement with the following statements based on your professional experience. (Use a 5-point Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)

» Section 3A: Perceived Usefulness (PU)

Q12. How beneficial do you believe compliance with building by-laws is?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
Complying with building by-laws results in structurally safer buildings.	◯	◯	◯	◯	◯
Following the by-laws leads to better planned and more livable urban areas.	◯	◯	◯	◯	◯
Overall, using the official by-law process improves the quality of construction projects	◯	◯	◯	◯	◯
Obtaining a building permit is necessary for ensuring the long-term value of a property.	◯	◯	◯	◯	◯

» Section 3B: Perceived Ease of Use (PEOU)

Q13. How easy or difficult do you find the process of compliance?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
The requirements for building permit approval are clear and understandable.	◯	◯	◯	◯	◯
The process of submitting documents for a building permit is straightforward.	◯	◯	◯	◯	◯
Navigating the different departments for approval is easy.	◯	◯	◯	◯	◯
Learning to navigate the compliance process is easy for me.	◯	◯	◯	◯	◯

» Section 3C: Social Influence

» » Subjective Norm

Q14. What are the expectations regarding compliance around your professional group?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
Most of my colleagues in the industry believe we should comply with building by-laws.	◯	◯	◯	◯	◯
People who influence my behavior (e.g., clients, senior professionals) think I should follow the official permit process.	◯	◯	◯	◯	◯
Municipal officials expect strict adherence to the building by-laws.	◯	◯	◯	◯	◯

» » Image

Q15. Does complying enhance your status or reputation?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
Being known as someone who always complies with by-laws improves my professional reputation..	◯	◯	◯	◯	◯
Clients respect professionals who follow all legal procedures.	◯	◯	◯	◯	◯

» Section 3D: Cognitive Instruments

» » Job Relevance

Q16. Is compliance relevant to your role?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
Knowledge of building by-laws is fundamental to my job.	◯	◯	◯	◯	◯
Applying for building permits is a necessary part of my work.	◯	◯	◯	◯	◯

» » Output Quality

Q17. How well does the system perform tasks?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
The permit system allows to perform the tasks without creating unnecessary delays or costs..	◯	◯	◯	◯	◯
The rules and regulations are practical for modern construction practices.	◯	◯	◯	◯	◯

» » Result Demonstrability

Q18. Are the results of compliance clear and obvious?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree

It is easy for me to see the positive difference between compliant and non-compliant buildings.	◯	◯	◯	◯	◯
The benefits of going through the official permit process are clear to me.	◯	◯	◯	◯	◯

» Section 3E: Behavioral Intention

Q19. Are the results of compliance clear and obvious?	1. Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
I intend to fully comply with building by-laws in my current/next project.	◯	◯	◯	◯	◯
I will always recommend following the official by-law process to my clients and peers.	◯	◯	◯	◯	◯
I predict I will use the official permit system for any future construction-related activities	◯	◯	◯	◯	◯

Section 4: Open-Ended Feedback (Optional)

Q20. Based on your experience, what is the single most important change that could be made to improve the building permit and approval process in Kathmandu, and why?

_____

Q21. What are the biggest benefits and/or drawbacks you have experienced with the shift towards digital permit systems?

_____

Thank you for completing this survey! Your insights will help in understanding the challenges and improving the building regulatory system in Kathmandu.

_____

APPENDIX II: SUPPLEMENTARY QUESTIONNAIRE

House Owner Experience Survey (घर मालिकको अनुभव सर्वेक्षण)

We are conducting research to understand house owners' experiences with the building construction process in Kathmandu. Your opinion will be highly appreciated.

(हामी काठमाडौँमा भवन निर्माण प्रक्रियामा घर मालिकहरूको अनुभव बुझ्न शोध गर्दैछौं। तपाईंको विचारहरू हाम्रो लागि धेरै मूल्यवान हुनेछन्।)

* Indicates required question

A. General information (आधारभूत जानकारी)

1. 1. Houseowner's name (घर मालिकको नाम) : *

2. 2. Ward no. (वडा नम्बर) :

3. 3. Has the construction completed (के निर्माण कार्य पूरा भएको छ) ? *

Mark only one oval.

- Yes (छ)
- No (छैन)

B. Basic Awareness (आधारभूत सचेतना)

4. 4. Before starting construction, were you aware that you need a building permit from KMC (निर्माण सुरु गर्नुभन्दा पहिले, के तपाईंलाई थाहा थियो कि काठमाडौँ महानगरपालिकाबाट भवन निर्माण अनुमति लिनु पर्छ)? *

Mark only one oval.

- Yes, very aware (हो, धेरै राम्ररी थाहा थियो)
- Somewhat aware (केही मात्रामा थाहा थियो)
- Not aware at all (बिल्कुल थाहा थिएन)

5. 5. Which of these technical building rules were you aware of (तपाईंलाई भवन निर्माणका कुन-कुन प्राविधिक नियमहरूको बारेमा थाहा थियो)? *

Select all that apply (लागू हुने सबै छनौट गर्नुहोस्)

Check all that apply.

- [ ] Setback (सेटब्याक (जग्गाको छेउबाट निर्माणको दूरी))
- [ ] Floor Area Ratio - FAR (फ्लोर एरिया रेसियो -एफएआर)
- [ ] Right of way - ROW (सार्वजनिक बाटोको दूरी- ROW)
- [ ] Ground coverage (ग्राउन्ड कभरेज)
- [ ] Building height restrictions (भवनको उचाइ सीमा)
- [ ] Earthquake-resistant design requirements (भूकम्परोधी डिजाइन आवश्यकता)
- [ ] Wasn't aware of any (कुनै पनि थाहा थिएन)

C. Process Experience (प्रक्रियाको अनुभव)

6. 6. How would you describe your experience with permit approval process (भवन निर्माण अनुमति प्रक्रियाको तपाईंको अनुभव कस्तो रह्यो)? *

Mark only one oval.

- Very clear and straightforward (धेरै स्पष्ट र सजिलो)
- Somewhat confusing (केही हदसम्म जटिल)
- Very complicated and difficult (अत्यन्तै जटिल र गाह्रो)
- I didn't go through the process myself (मैले यो प्रक्रिया आफैले भोगेको छैन)

7. 7. How long did the permit approval process take (भवन निर्माण अनुमति प्रक्रियामा कति समय लाग्यो)? *

Mark only one oval.

- ◯ Less than 1 month (१ महिना भन्दा कम)
- ◯ 1-3 months (१-३ महिना)
- ◯ 3-6 months (३-६ महिना)
- ◯ More than 6 months (६ महिना भन्दा बढी)

8. 8. What was the most difficult part about permit processing (भवन निर्माण अनुमति प्रक्रियामा कुन काम सबैभन्दा गाह्रो थियो)? *

Check all that apply (लागू हुने सबै बाकसहरू चयन गर्नुहोस्).

Check all that apply.

- ☐ Understanding what documents were needed (कुन कागजातहरू चाहिन्छ भनेर बुझ्नु)
- ☐ Knowing which office to go to (कुन कार्यालयमा जानुपर्छ भनेर थाहा पाउनु)
- ☐ Dealing with officials (कर्मचारीहरूसँग काम गर्नु)
- ☐ Cost involved in approval (अनुमति प्रक्रियामा लाग्ने खर्च)
- ☐ Time taken for approval (अनुमति प्रक्रियामा लाग्ने समय)
- ☐ Technical requirements- setbacks, FAR, etc.(प्राविधिक आवश्यकताहरू - सेटब्याक, FAR, आदि)

D. Construction and Inspection (निर्माण र निरीक्षण)

9. 9. Did you hire a contractor for your construction (तपाईंले निर्माणको लागि ठेकेदार लगाउनुभयो)? *

Mark only one oval.

- ◯ Yes, a registered contractor (हो, दर्ता भएको ठेकेदार)
- ◯ Yes, but not sure if registered (हो, तर दर्ता भएको/नभएको थाहा छैन)
- ◯ No, I managed without a contractor (होइन, ठेकेदार बिना नै निर्माण गरें)

10. 10. Did you hire an engineer or architect to supervise the construction (तपाईंले निर्माण सुपरिवेक्षणको लागि इन्जिनियर वा आर्किटेक्ट लगाउनुभयो)? *

Mark only one oval.

- Yes, throughout the construction (हो, पूरा निर्माणकालीन देखरेखको लागि)
- Only for occasional supervision (कहिलेकाहिँ देखरेखको लागि)
- No, I didn't hire any (होइन, कसैलाई लगाएको छैन)

11. 11. Did the municipality conduct any inspection during or after construction (महानगरपालिकाले निर्माणको दौरान वा पछि कुनै निरीक्षण गर्यो)? *

Mark only one oval.

- Yes, regularly (हो, नियमित रूपमा)
- Yes, but only once or twice (हो, तर एक वा दुई पटक मात्र)
- No, never (कहिल्यै गरेन)
- Not sure (थाहा छैन)

12. 12. How was your experience getting utility connections (electricity, water, drainage) for your building (तपाईंको भवनमा उपयोगिता जडान (बिजुली, पानी, ढल) पाउनुको अनुभव कस्तो थियो)? *

Mark only one oval.

- Very easy - the utility companies coordinated well (धेरै सजिलो - उपयोगिता कम्पनीहरूले राम्रो सहयोग गरे)
- Somewhat difficult - there were some delays and confusion (केही गाह्रो - केही ढिलाइ र अस्पष्टता थियो)
- Very difficult - it took a long time and required many visits (धेरै गाह्रो - धेरै समय लाग्यो र धेरै पटक जानुपर्यो)
- I haven't applied for utilities yet (मैले अझै उपयोगिताको लागि आवेदन गरेको छैन)

E. Overall Perspective (समग्र विचार)

13. 13. Do you think building permits are necessary (के तपाईंलाई लाग्छ भवन निर्माण अनुमति आवश्यक छ)? *

Mark only one oval.

- ◯ Yes, for safety and planning (छ, सुरक्षा र योजनाका लागि)
- ◯ Yes, but the process should be simpler (छ, तर प्रक्रिया सजिलो हुनुपर्छ)
- ◯ No, they're just bureaucracy (छैन, यो केवल प्रशासनिक झन्झट हो)
- ◯ Not sure (थाहा छैन)

14. 14. One suggestion to improve the system (Optional)
प्रणाली सुधार्ने एउटा सुझाव (ऐच्छिक): :

APPENDIX III: QUESTIONNAIRE VALIDATION FORM

QUESTIONNAIRE VALIDATION FORM

Research Title: Analyzing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Municipality

Researcher: Nishee Shrestha, MSCOM Student, Pulchowk Campus

Validation Purpose: Check relevance and clarity of questions for Nepali context

EXPERT INFORMATION

- **Name:** Dr. Santosh Kaini
- **Position:** Deputy Director General
- **Organization:** Department of Water Resources and Irrigation.
- **Expertise Area:** Civil engineering construction
- **Date:** 2082-07-27

SIGNATURE

I confirm I have reviewed this questionnaire for content validity:

Signature: _____

Date: 2082-07-27

QUESTIONNAIRE VALIDATION FORM

Research Title: Analyzing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Municipality

Researcher: Nishee Shrestha, MSCOM Student, Pulchowk Campus

Validation Purpose: Check relevance and clarity of questions for Nepali context

EXPERT INFORMATION

- **Name:** Pramod Krishna Karmacharya
- **Position:** Associate Professor
- **Organization:** Hillside college of Engineer
- **Expertise Area:** more than 26 years experience in Building construction
- **Date:** 2082-07-27

SIGNATURE

I confirm I have reviewed this questionnaire for content validity:

Signature: Pramod Krishna Kar
Date: 2082-07-27

QUESTIONNAIRE VALIDATION FORM

Research Title: Analyzing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Municipality

Researcher: Nishee Shrestha, MSCOM Student, Pulchowk Campus

Validation Purpose: Check relevance and clarity of questions for Nepali context

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- **Name:** Nava Raj Pyakurel
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- **Organization:** Ministry of Urban Development
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From:	"IOEGC-17 Working Committee" <ioegc17@gmail.com>
To:	"Nishee Shrestha" <079mscom017.nishee@pcampus.edu.np>
Date:	11/29/2025 6:10:20 AM
Subject:	[IOEGC17] Submission Acknowledgement

Nishee Shrestha:

Thank you for submitting the manuscript, "Analysing Challenges and Behavioral Intentions: A Dual-Perspective Study of Building By-Law Implementation in Kathmandu Metropolitan City" to 17th IOE Graduate Conference. With the online conference paper management system that we are using, you will be able to track its progress through the editorial process by logging in to the conference portal:

Submission URL: https://conference.ioe.edu.np/gc/index.php/17/authorDashboard/submission/648
Username: nishee_shrestha

If you have any questions, please contact me. Thank you for considering this conference as a venue for your work.

IOEGC-17 Working Committee

With Warm Regards,
IOEGC-17 Editorial Team

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