

# Investigating the Use of Proportion and the Change Factors in Post-1950s Public Buildings of Kathmandu

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## Abstract

The composition of any buildings is based on the proportion of Individual element from part to whole or whole to Part. Over the course of the last three thousand years, architects and builders have consistently utilized proportional systems in the creation of numerous iconic structures around the globe. Yet, a departure from the longstanding tradition of grounding architectural design in rational and mathematical foundations emerged paradoxically during the relatively recent epoch of rationalism and the Enlightenment [1]. While in context of Nepal, the buildings used to follow some proportional system while constructing the temples, public buildings and house. However, a significant research gap exists with regards to study of proportion in architectural application in the post 1950s era of Nepal. The main objective of this research is to identify and document the proportional system used in public buildings that are constructed post 1950 A.D buildings of Kathmandu valley. This research also aimed to study why and how architectural proportion change over time, focusing on the factors that shape the proportions and overall appearance of the building. Under constructivist paradigm, this research is conducted using the philosophical foundation of phenomenology and hermeneutics to gain the knowledge. In this process, Qualitative design method followed by Multiple case study method is applied. Purposive sampling is used to select case with 10 years gap of establishment. Analysis of archival documents and site surveys are done and Interviews with the pioneer architects of Nepal are taken for Cross-case analysis. Qualitative analysis tool is used to synthesize and analyze the data. Findings shows that ideas of proportional system such as golden ratio and square roots were used as key position by the architects from 1950,1960,1970 to shape the public building in Kathmandu. However, its importance diminished over time, giving way to site, specific and functional concerns, influenced by shifting economic, political and cultural dynamics.

## Keywords

Proportion, Architecture of Kathmandu, Public Buildings, Modern Context

## 1. Introduction

In the context of architecture and design, proportion pertains to how various element or parts of building or object relate to each other. A proportion is formed from ratios and a ratio is a comparison of two different sizes, quantities, qualities or ideas and is expresses by the formula a:b [2].Proportion is one of the important tool that has been used since ages to create any piece of Art and Architecture. Over the course of the last three thousand years, architects and builders have consistently utilized proportional systems in the creation of numerous iconic structures around the globe [1].The composition of any buildings is based on the proportion of Individual element from part to whole or whole to Part. Some studies shows that proportion in building is maintained for structural stability and for its aesthetic beauty [3]. While P.H. Scholfield [4] disregards the structure firmness and focuses on the search for a rule of beauty in design.

Many Authors urge for a revitalization of proportional system [4, 5].Studying proportion enables a connection with historical traditions and fosters creative innovation. Research done by Jaiswal [6] on Approaches to the use of geometry in Modern Architecture “A Study of its Development in a Nepalese Context” has summarized methods for using geometry in modern architecture. The research agrees the history acts as determinant characteristics in building along with drawing from local architectural context. In the recent

study, Prof. Tiwari’s scholarly investigation in 2022 showcased the implementation of Vastushastra principles and the Shreeyantra symbol in the construction of Malla Temples constructed till 17th century [7]. Many other public places such as Kasthamandap, is proportioned as Mandap Temple with square sanctum [8]. Therefore, we can say that the proportion in architecture of traditional buildings of Kathmandu Valley is influenced from Vastushastra principle. However, an important juncture in Nepal’s architectural history unfolded in 1946, with the introduction of reinforced concrete cement, marking a significant departure from traditional building methods. Ar. Biresh Shah in Spaces Nepal Blog has written that the influx of foreign architects, each bringing their own design sensibilities and modernist influences post 1950 has marked a departure from conventional architectural paradigms [9].

Yet, a significant research gap exists with regards to study of proportion in architectural application in the post 1950 era of Nepal. Researches also shows the gap in the exercise of compiling references on chronology, evolution and development of style, Materials and technology, with very few literatures available on the study of Nepali architecture leading to lack of agreement regarding its evolution and development [7]. This research gap hinders the attainment of a comprehensive comprehension of the intricate interplay between architectural theories, cultural context and the practical facets of design. The main objective of this research

is to identify and document the proportional system used public buildings in the post 1950s contemporary buildings of Kathmandu Valley. This research also aims to study why and how architectural proportion change over time, focusing on the factors that shape the proportions and overall appearance of building.

## 2. Literature Review

The concept of sacred geometry has intrigued artists, architects and thinkers for centuries and it continues to be a subject of study and exploration in various fields including Proportion. It is commonly seen as connection that links mathematics, artistic expression and spirituality, providing understanding of how the physical and metaphysical aspects of existence are intertwined [1]. This concept echoes in Plato's Mathematical concepts, Euclid's Geometry, Alberti's humanistic values, Vitruvius study of historical structures and Le Corbusier's Modernist principles [2]. Despite their unique contexts and approaches, these concepts are interconnected as contributors to architectural thought, demonstrating the evolution of ideas from antiquity to modernism and embodying the principles of change and continuity within architectural discourse. Oymen Gur [10] summarizes Foundationalist theory in architecture asserts itself as the ultimate basis for practice, whereas Anti-foundationalism emerges as a critical response to this idea. Furthermore, post-positivism marks a significant transition, akin to a shift in architectural thinking from structured, holistic forms to more fluid, fragmented forms. In the broader context of postmodern thought, the abandonment of humanistic ideals grants architectural practice greater freedom in shaping the connections between function, form, and meaning. Aristotle argued that change and continuity are fundamental aspects of reality. He believed that everything in the natural world is subject to change, but there is also an underlying continuity that provides order and stability [11].

D.K Ching's Book "Form, Space, and Order" classifies the proportion into three types: Manufactured proportion, Material proportion and structural proportion[12]. Despite these proportional restrictions, the designer retains the capacity to govern the proportions of forms and spaces within and surrounding the structure. These choices rely on proportioning systems that establish consistent visual relationships among the building's components and between these parts and the whole structure. Proportioning systems extend beyond the practical and technical factors of architectural design to provide an aesthetic justification for their dimensions. They can visually harmonize elements, create a sense of organization, and enhance the seamless flow of spaces in a sequence.

In the course of history, a variety of ideas of "desirable proportions" have been created such as golden section, classical orders, Renaissance theories, Modular, Ken, Anthropometry and Scale. The underlying principles and their importance to the designer remain the same, even while the actual system changes from time to time.

## 2.1 Theories of Proportion

### 2.1.1 Golden Section

The Golden Section is a relationship between two line segments or two plane figure dimensions in which the smaller of the two is equal to the larger as the larger is to the total of both. A rectangle whose sides as proportioned according to the golden section is called golden rectangle and its ratio resonates to 1.648.

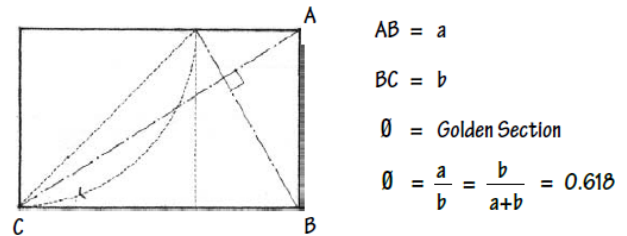


Figure 1: Golden rectangle  
Source:Ching2007

### 2.1.2 Renaissance Theories

The architects of Renaissance returned to Greek mathematical system of proportion and expresses in simple numerical progression such as 1:2, 1:3, 2:3, 3:4. Just as Greek conceived music to be geometry translated into sound, Renaissance architects believed that architecture was mathematics translated into spatial units. Several ideal plan shapes for rooms were proposed as "the most beautiful and proportion able manners of room". Palladio also proposed several methods for determining the height of a room. Also, during the Renaissance era, architects utilized root rectangles, which are derived from the golden ratio, as a geometric technique to craft structures and artworks that possessed visual appeal and a sense of balance and harmony.

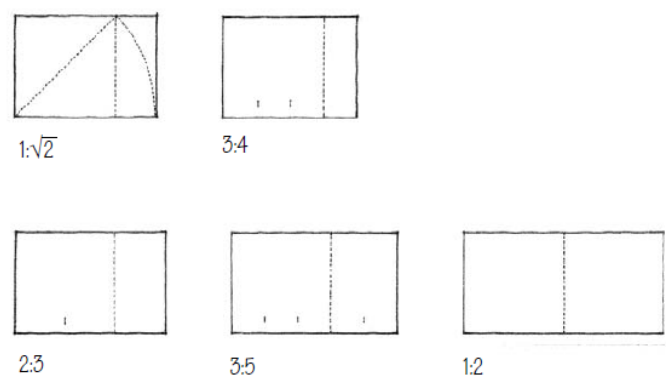


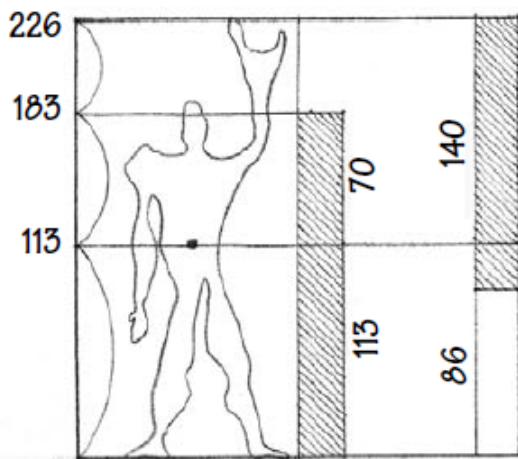
Figure 2: Ideal Plans and Method for determining height of Room

Source:Ching2007

### 2.1.3 Modular

Le corbusier based his measuring tool, the Modular, on both mathematics (the aesthetics of the Golden section and the Fabonacci Series), and the proportion of Human body (functional dimension) the basic grid consists of three

measures, 113, 70, and 43 centimeters, proportioned according to the Golden Section.



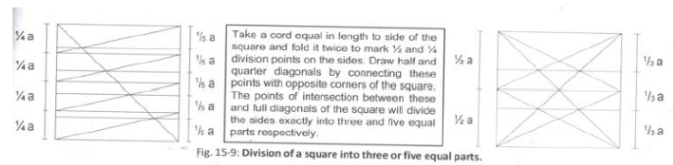
**Figure 3:** The Modular by Le Corbusier  
Source: Ching 2007

### 2.1.4 Proportional System in the Context of Nepal

The book authored by Prof. Tiwari in 2022, titled "Temples of the Nepal Valley," provides valuable insights into the orientation, measurement, and proportion of temples constructed in the Kathmandu valley over several centuries. The book's findings suggest that the temples' orientation and proportions are influenced by the principles of Vastushastra, enriched with distinct local characteristics. It affirms that the manuscript serves as written evidence supporting the continued use of Vastushastra in the development of these revered temples. The utilization of a square shape in the temple's layout symbolizes both the universe and the divine presence on Earth. This concept aligns with the analysis conducted by Korn (1998) [13], which also highlights the prevalence of square-shaped temple plans during the Malla period.

In essence, the initial dimensions of a temple are determined by measuring the lengths of the donor's forearm and then converting them into standard measurements known as Ku and Angul. The rules dictate that the calculated tithi (lunar day) and bara (solar day) should not only be auspicious but also align with the actual lunar and solar calendar days. Additionally, site considerations are taken into account. Following the doctrine of remainders in yoni computation, the temple's orientation is established. Prof. Tiwari refers to this process as the governing attribute for the temple's ground plan.

The proportioning of a temple is achieved by dividing a square, similar to the Vastu Purusha Mandala, in specific ways. This can be observed by comparing the sizes of various elements like the sanctum room, circumambulatory passage, wall thickness, doorways, and the ratio of upper floor brick cores to the sanctum's size, or the size of square-shaped temples. The Vastu Purusha Mandala isn't merely an artistic expression but a powerful symbol representing a supreme personality. Prof. Tiwari (2022) has provided a sketch that demonstrates the process of creating the Vastu Purusha Mandala using 9 and 25 squares (which involves 3 and 5 divisions of the sides).



**Figure 4:** Division of a square into three or five equal parts  
Source: Tiwari 2022

Professor Tiwari's examination of temple proportions involved defining specific parameters, including: -Ratios measurements of width of various cores; Wall thickness, Shape of the plan based on 64, 81, 25, 9 squares, Height of floors, Size of windows and doors, Material used in temple, Structure system and construction technology, Events that changed the skyline of the temples. With change in time and context, all these parameters are not feasible to look upon the modern building, but these parameters will be taken as reference for further analysis.

Also, the elevation of Nepali tiered temples is often described later in Vastushastra literature as being derived from and named after mountains. Numerous manuscripts depict temple drawings overlaid with three triangles stacked on top of each other to form the finial's height. The ratio of height to the triangle's base varies, with proportions often derived by dividing the width into 3, 5, or 9 parts, resulting in ratios of 1:1, 8:9, 7:9, 4:6, or 2:3. While the variation is significant, these proportions necessitate the use of specific modules based on the division of width into those specific parts.

## 3. Methodology

This research operates under the ontological assumption that the knowledge about architectural proportion and its evolution is not static, objective truth; instead, it is shaped by the cultural, historical and contextual factors that impact architects, builders and stakeholders in the area. The research aligns with constructivist perspective. Using the philosophical foundation of phenomenology and hermeneutics, this research follows qualitative approach as It intends to investigate the real-life experiences and viewpoints of architects, builders, and stakeholders who played roles in designing and constructing public buildings in Kathmandu after the 1950s.

This qualitative research design method is followed by case study method to analyze a representative sample of post 1950s public buildings in Kathmandu. Purposive sampling is used for case selection, site surveys and data collection. To compare and analyze the changes that have occurred over time that vary contemporary architecture, the record of the drawing available is surveyed. Interviews with the pioneer architects of Nepal and the architects of corresponding contemporary buildings is taken for cross case analysis. The data's thus collected is then synthesized, analyzed and Interpreted using qualitative analysis tool NVIVO 20.

### 4. Case area Selection

Case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident [13]. This research has been narrowed down its focus to Kathmandu's core as the locus of this study. Many literatures' from renaissance period of public building suggests that the public buildings should be made proportionate. It is because its design and layout accommodate diverse user needs and demographics effectively. That is why, public buildings are focused in this research. Multiple case studies are taken with 10-year gap of establishment.



Figure 5: Map of the selected buildings position in Kathmandu

Saraswati sadan is of interest because it is the first R.C.C Building of Nepal. Ministry of Foreign Affairs was taken as it is the state of art modern building of that era. Ministry of Health and Population is the building designed by Foreign architect Louis I Kahn. Rastriya Banijya bank is the representative building from 1980 and office of the Attorney general is the representative building of the present contemporary architecture. The archival plans and documents are collected and analyzed under following parameters:

- Geometric proportion analysis using the golden rectangle and square root as tools
- Analysis of sizes of windows, height of floors and other building elements in building Elevation
- Structure
- Construction technology
- Construction Material

For cross-case analysis, interviews with pioneer architects of Nepal from different time period were selected. The interviews were then transcribed and further synthesized and analyzed to get the result.

### 5. Analysis of Cases and Findings

**Case 1:** Extensive developments in the 1950s and the establishment of Saraswati Sadan, the first R.C.C Building of Nepal by Bed Prasad Lohani, along with many foreign architects working in the valley such as Louis I Kahn with the building Ministry of Health and Population, marks the start of modern era of Nepal. On analyzing 5 buildings from 1950 to 2015, findings show that modern public buildings did not have much relation to traditional proportional system.

Saraswati Sadan, Designed by Er. Bed Prasad Lohani in the year 1944 A.D is Nepal's First R.C.C Building of Nepal. Mr. Lohani was educated from India. British Architecture influenced in India at that time. So the Building can be said to be the product inspired from British architecture. The use of Rotunda, curves, domes for the light in the building are few of the elements that is seen in the building which were then used in the architecture and form of Indian buildings. Lohani was a self-educated man [14], who had keen interest in gaining knowledge. On analyzing the Plan of the building, there seems the use of proportional system to determine the order and complexity of the plan.

Upon analyzing the above plan, there seems a plausible utilization of the golden rectangles and squares in laying out the plan of Saraswati Sadan. Before, the plan of traditional buildings used to be in square and rectangular shapes. But the use of different shapes of building can be seen in the building. Moreover, with the change in material from wood and mud to R.C.C material, change in floor height has been noted. The Idea of Proportion of space got introduced in Nepal with the change in floor height at different levels. As aforementioned, the idea of use of fan in India might have brought change in Height of the building. In addition to this, the height of the library hall seems to be 1/3 of the width which is the ideal room height defined by the renaissance theory of proportion.

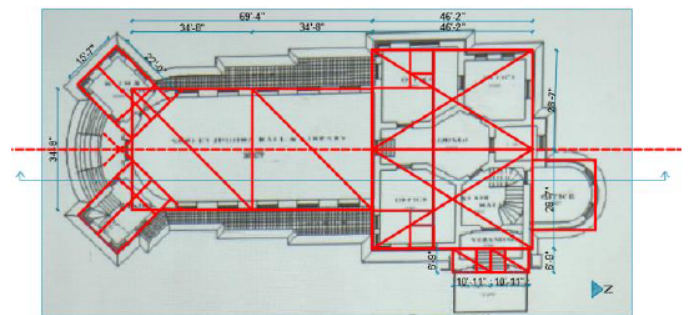


Figure 6: Analysis of Proportional System Using the geometrical tool

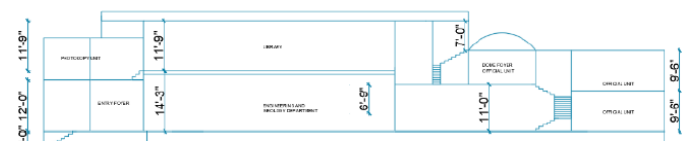


Figure 7: Proportion of Space with change in internal height

Therefore, even if he used new material and he had new ideas, he seems to adapt the material in same proportional system.

This is the architectural idea he has regarding the proportion. Along with the change in construction technology, the proportion of window changed. Windows of different sized, which is of size 5'X8' can be seen in the building which is another standard size whole ratio is 1.6 near about to golden ratio. This also marks a change in proportion of building. In addition to this, the construction technology of Inverted Beams has made the Large Cantilevers in the building possible. Also, use of colors like yellow and green with contrast wooden windows in the building has helped to define the visual proportion of the building.



Figure 8: Front view of saraswati Sadan

Case 2: Another Similar Case is the Case of Ministry of Foreign Affairs by Shankarnath Rimal established in the year 1960. The Introduction of new material and idea he collected from Germany in 1959 [15] , Er. Rimal has redefined Nepali Architectural Space. He Believes in Spiritual Quality in Design Which can also be seen in the Plan of the mentioned Building.

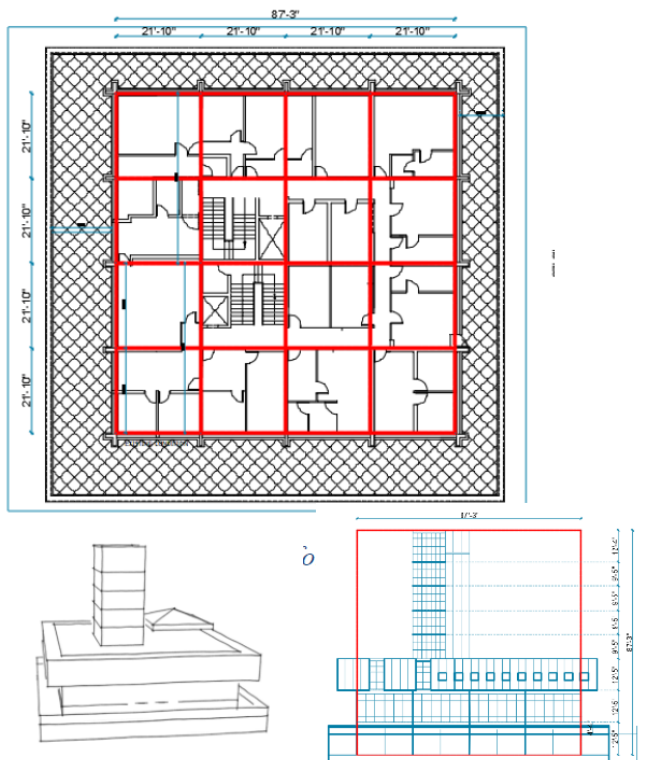


Figure 9: Analysis of Elevation

The plan is Square in Shape in the ratio 1:1, symmetrical which from literature we can say that the square represents the universe. The designer emphasized in on the purity of form. Along with this, the introduction of two lift duct, two staircases placed symmetrically, the plan is also based on Function. He puts his view as Planning, Aesthetic and structure should be given equal importance. Upon analyzing the Elevation, the elevation also seems to fit a square in the height and width ratio of 1:1. This ratio the ratio seen in renaissance theory and is also recognized by the theory of proportion practiced in temples of Kathmandu valley the purity of form is represented by superimposed cubes. This is again the architectural idea what Er. Rimal had regarding the proportion of the building.

The proportion of Building is distorted by using various horizontal and vertical elements. We can also see different sized of windows. In the building. Large glass windows of metal frame break the horizontality of first floor. Also, two large windows combined with other small squared windows patterned with the vertical lines also breaks the horizontality of the buildings. First three floors of the building is 12' 5" and rest five storied are 9'5". The height of the building is played in such a way that the light gets inside the building.



Figure 10: Use of Large Glass Plane as Focal Point

The alignment of tower also seems strategically placed asymetrically. Also, the proportion of Glass and white wall of the tower seems to in the ratio of 2.38. this ratio is close to the Golden ratio of root 5 which is equal to 2.23. Also, windows placed in the second floor seems to follow the ratio of 1:3. The proportion of window sill and frames are kept according to human proportion. Position of Large Glass panels in the tower which is visible from the main Singa Durbar road is also eye catching as it is trying to show its existence. A focal point has been created in this building using this large glass façade in the south-west direction. Use of R.C .C frame structure has allowed the designer to achieve the form he wanted. As mentioned earlier, large Cantilevers has also allowed the building to express itself. Square grid pattern with Beams and

columns has made the plan more easily function able. The use of light structures such as glass and aluminum has made the building lighter with apple amount of natural light and provided a good view from the interior.



Figure 11: Structural Beauty of General Administration

**Case 3:** It is very evident that many foreign architects were invited to Nepal to design Various of Buildings after 1950s [9]. Due to various political events that changed the socio-political History of Nepal Made this possible. Ministry of Health and Population is the result of this trend by Designed by Pioneer Architect Louis I Kahn built in 1970s.



Figure 12: Monumental look of Ministry of Health and Population

The new idea brought by many foreign architects brought new horizon in proportion of the building. Studies have shown that Louis I Kahn follows Le Corbusier and Paul Cret [14]. The most powerful works of Le Corbusier and Louis Kahn uses the Thematic play of Geometry and proportion. The Primal Severity of form was an iconic end in Kahn's work. Also, Joseph Burton argues that Khan's ambition was to make a symbolic architecture the elemental primacy which goes back to volume zero, the origins, the language of god. Khan claimed "no matter what, I always start with a Square". In the matured works of Louis I Kahn, pure geometric figures; clear zoning of served and service spaces; innovative use of structures. Poetic use of material and thoughtful analysis of program as generator of form is seen. The plan is generally said to be pin wheel of square. General massing and fenestration of the building is based on the same geometrical system of golden rectangles.

In the building designed by Khan, Ministry of Health and Population, one can see the use of squares in the plan. On analyzing the Plan in detail, the use of golden means and the square as the geometrical strategy. The aforementioned sets of square is subdivided into rooms according to both proportions and dimensions which seems to have been pulled

from Le-Corbusier Modular. The building is surrounded by a square void on the perimeter.

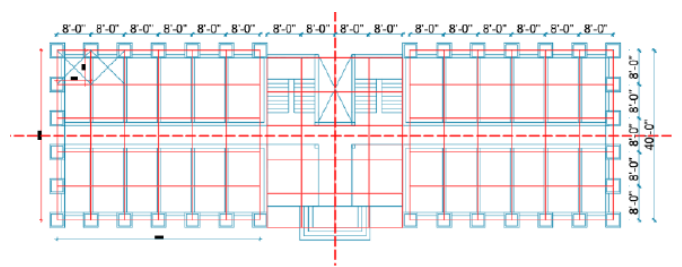


Figure 13: Use of Squares in the Plan

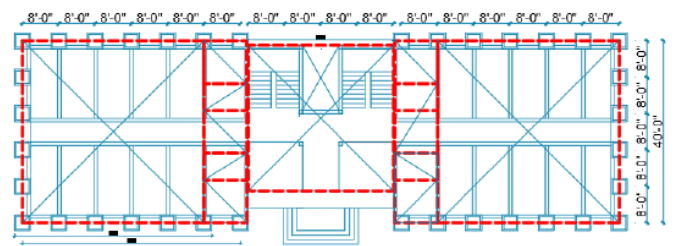


Figure 14: Use of Squares and Golden Section in the Plan

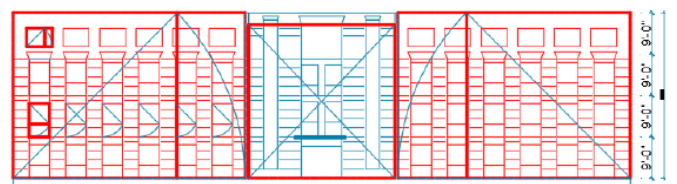


Figure 15: Basic Proportion in Elevation

Kahn Continues to Play with the 2 rectangles and squares in the treatment of façade. The splay of jack arches over the windows is used in this building as well to increase the size of the window visually and diminish the mass. Also, the windows also seem to use the golden proportion and the proportion of root 2. Louis I Kahn has always came for grandeur. He maintained his grandure of the building by using the vertical elements in the building formed by the square voids in the perimeter of the square. Chhajjas were the element of decoration back then in the context of Nepal. But Khan, avoided to use the chajjas gain to maintain the grandureness of the building. Also, free façade at the top of the building was created with the rectangular voids of proportion containing root 2 in order to maintain its proportion of its elevation. Addition of metal roof at the top of the building made this building the most controversial projects in the country. The original masterplan of the site contained two building planned in courtyard concept addressing the local context of Kathmandu valley. But unfortunately only 1 building was constructed. Therefore, Khan always described his method of working as a search for pure form which is then tested with the burdens of site and program.

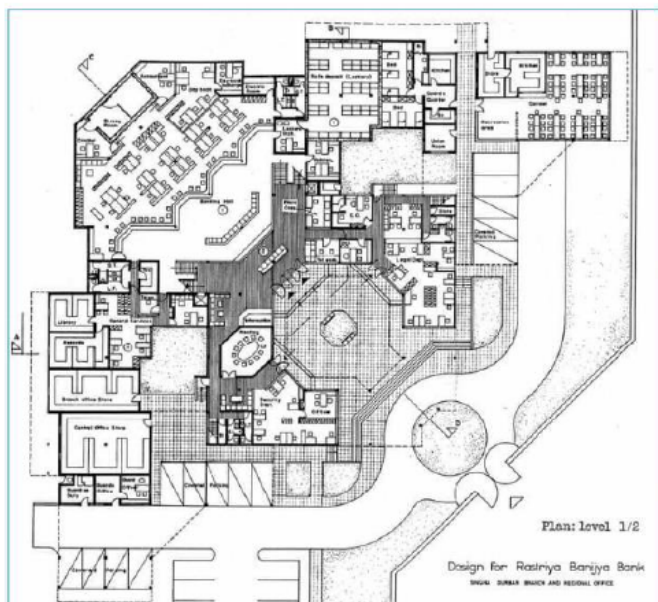
**Case 4:** Another modern building that was constructed in 1980 is the building of Rastriya Banijya Bank. This building was designed by a French origin architect Marina Shrestha. The plan of the building seems to be developed according to the

shape of the the site. The use of Concrete pillars allowed it to have large column span that caters the function of the building. However, the concept of the building seems like it has tried to bring the visual focal at the entry point.



**Figure 16:** View of Building from the center of Singhadurbar road

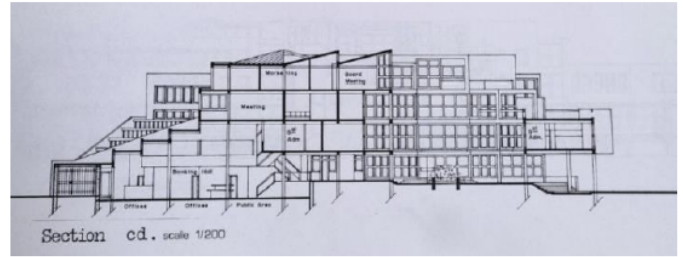
On upon asking the architect about the building, the organic development of the plan responding to the site and its context and fulfilling the functional requirement of the client was found. Since the corner plot was given to design, the view point from the center of the road was the factor the architect wanted to use as the generator of the form. The architect says the shape of the plan happened to be square, but it was not intended. All the development was varying organic and freely designed. The main factor for the shape of this type was to get light to every corner of the building.



**Figure 17:** Plan of the Rastriya Banijya Bank

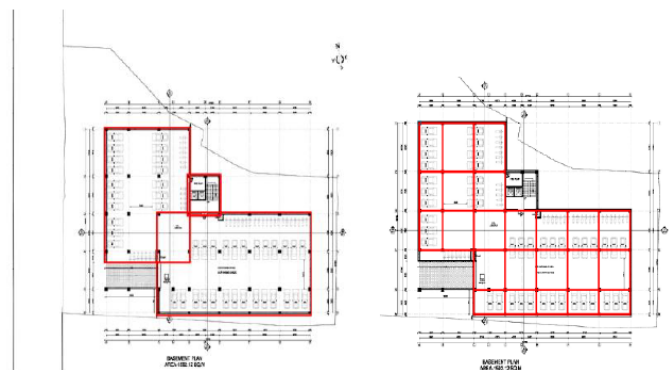
That is why, the building was planned to courtyard system. Also, the use of Brick balancing it with the grey plaster combination is seen in the elevation. The use of this combination is found the be the personal choice of the architect adhering to the context. The building has R.C.C column structure. Material and construction technology has allowed the building to play with different heights in its

volume.



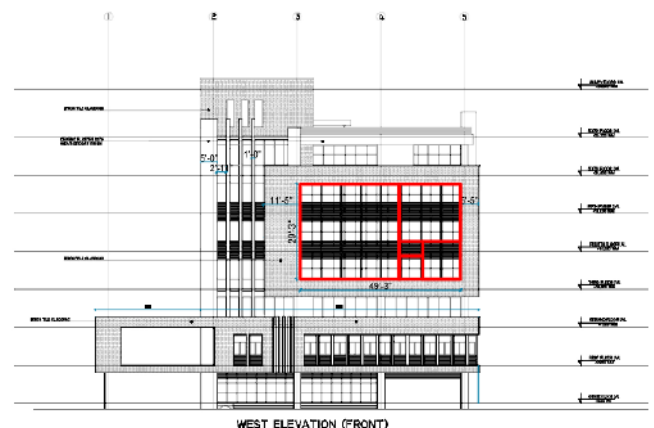
**Figure 18:** Section of the Building

**Case 5:** The final case reviewed is the case of the office of attorney general. This is the contemporary building built by the contemporary architecture firm in 2015. The Plan of the buildings seems to be guided by shape of the site and Bylaws consideration. The plan is in rectangular grid having maximum structural span of 10 m center to center. As in earlier buildings, the grid pattern is not regular and is not in perfect square or doesn't follow any of the golden proportional system. The plan seems to respond to the important function of the building. The building plan is formed by the composition of 2 rectangles. A central courtyard is placed to get the light inside the building.



**Figure 19:** Plan of Attorney General

When analyzing the Form of the Attorney General, the central focal rectangle of the building with large glass panels and horizontal railing pattern seems to fit in the golden rectangle proportion with the length to the height ratio (49.3/29.3) 1.618.



**Figure 20:** Elevation of attorney General

but when asked to architect of this building, they refused to use idea of any of the fundamental proportional system. building is 8 storied high with equal height.



Figure 21: Attorney General

The form of the building is designed in different levels. The composition of building with repetition, harmony, color contrast in between the element seems to be present to break the vertical form. Horizontal metal bands are used for the aesthetic purpose. Brick is used as the building aesthetic as a finishing material. The concept of horizontal and vertical can be seen in the elevation. There is some kind of deterministic character in this building. Introduction of new industrial materials like WPC wooden boards, Marble tiles, contrast colors, metal, glass etc. has dominated the aesthetic of the building. The height of the building is maintained to be 3.6m (11ft. 8in). It is done to accommodate the Hvac Systems inside the building. The structure of this building is in R.C.C Frame structure. The structural grid of the structure allows the building to function properly. Patterns of Glass and metal railing with contrast color of brick has been done in the building. Cantilevers in the building at the front has allowed to create a rectangular volume of the building. The use of large glass panels with metal frames has allowed the building to have ample amount of natural light.

## 6. Findings

By reviewing all above analysis, we can see that representative buildings from 1950s, 1960 and 1970s seems to use the Architecture Idea of proportion while planning and designing the Elevations. Basic Shapes and geometries like squares and rectangles are the generator of forms and the size of these forms are highly influenced by the square and the root squares and the golden section.

*Before, the temples and buildings were built using the principles of sacred geometry as the generator of form- Ar. Bibhutiman Singh*

Also, due to the influence from the foreign ideas, there seems to be significant change in the proportion of space and height of the building. Along with the Geometric forms and proportions these buildings Seems to cater the functional requirement of the building and these buildings also seems to do justice to the

site, its local context and the history. There is some meaning to every building element as the rotundas in Saraswati sadan are from the influence from British, The large Glass windows in shankarnath Rimal shows the feeling of expression as to let it have perspective view from the road and the courtyard planning and the free facade in the topmost floor of Ministry of Health and population was done to adhere the local context and to create a monumental expression in architecture.

*We can see the change in material, change in Ideas has led to building new proportional system- Prof. SUDarshan Raj Tiwari.*

The Architects who understand the modern context rather get inspired from the traditional proportion system to create the masterpieces by addressing all the architectural theories and propotion. Even, with the socio-political change after 1950, and with the introduction of new materials and construction technology, we can find some architectural character and meaning in the buildings of that time. We can see the proportion aroused as an exceptional interest among the artists and architects. However, the interest seems to have vanished towards the recent years after 1970s. The plan of the buildings are now planned according to the site context, site shape and the structural stability and the grid form is determined according to the structural span that the concrete columns could take and the functional requirements.

*Geometry and proportion should be seen, but it has not been applied or it has been applied but not clearly seen- Prof. Sudarshan Raj Tiwari.*

Interview analysis showed that the type for need for architecture was not realized then. And there was hardly any proportion in the building. Even, the building facades are designed on the basis of composition theories. The contemporary architects find the use of traditional proportional system restrictive, and confined.

*The modern architects try to be free. They don't want to work under the constraints of golden ratio/Sacred Geometry- Ar. Bibhutiman Singh*

Of course, the change in material and construction technology has brought a significant change in scale of the building. But very few stick up to the previous thought. Contemporary architects believe in organic development of from and tries to find the asymmetrical balance in the building.

*Façade Becomes graphic design only withiout its relation to the function inside- Ar.Bibhutiman singh.*

*Façade Becomes graphic design only withiout its relation to the function inside- Ar.Bibhutiman singh.*



Contemporary Architects believes that the basic design taught in school guides the concept of proportion in architecture. All in all no mention was made of the system of proportion in contemporary reviews and publication of the project. This lack of evidence in the contemporary buildings suggest that the practice of proportion did not ensure directly from the theory and that the theory and the practice of proportion were for architects quite different things. Findings shows that changing economic and political conditions, resurgence of private practice, introduction of modern industrial products, Knowledge from various sources, Change in need and function and Change in construction technology, along with active development are the major factors that created a situation where aesthetic provided by the proportion became exaggerated.

*With the change in material and construction technology, the scale of the building has been huge. The rooms are large now and we decide the height of the building accordingly. Also, we have to see the building services in Keen matter. This is another reason for change in height of buildings- Ar. Damodar Acharya.*

Ruling Class aesthetic or bureaucrat aesthetic also seems to be dominant after 1970. The character of modern buildings is individualism. The uniqueness in architecture. People like to bring contrast in between similarity. Before, Architects tried to create Masterpieces using pure geometric forms and proportion as major aesthetic element, while in modern days it is more guided by the standardization of industrial material.

## 7. Discussions

As we delve into the evolution of architectural proportion within post-1950s public buildings in Kathmandu, we discern the profound impact of diverse architectural ideologies and theories. The earlier decades, particularly the 1950s, 1960s, and 1970s, were marked by a steadfast allegiance to foundationalist theory [10], where architectural proportion served as an unequivocal cornerstone of architectural practice. During this era, these buildings prominently relied on traditional proportional systems, rooted notably in geometric forms like squares and rectangles. Proportion played an instrumental role in shaping architectural forms and determining their dimensions, often guided by principles such as the square, root squares, and the golden section. This foundationalist approach also embraced external influences, leading to shifts in spatial proportions and building heights. Architectural elements were laden with significance, with design choices spanning from British-inspired rotundas to expansive glass windows for perspective, and free facades that harmonized with local contexts and historical narratives.

However, as we advance beyond the 1970s, architectural thought experiences a notable transformation, aligning more closely with postmodernism [10]. The principles of foundationalism, once regarded as unassailable, began encountering skepticism. Contemporary architects gradually

moved away from specific proportion systems, favoring broader dialogues about proportion over explicit admissions of their application. The practice of proportion receded in prominence, with architects finding greater creative freedom in their design decisions. The contemporary epoch ushered in an emphasis on asymmetrical balance, the organic development of architectural forms, and a reliance on the fundamental design principles instilled in architectural education. This shift can be attributed, at least in part, to broader sociopolitical changes, including the resurgence of private architectural practices, the introduction of modern industrial materials, and an abundance of knowledge sources and also the building bylaws. These factors, in conjunction with evolving functional requirements and advancements in construction technology, contributed to a scenario in which architectural aesthetics, once firmly anchored in proportion, began to recede. Furthermore, the ascent of ruling class aesthetics and bureaucrat aesthetics post-1970 fostered a sense of individualism and distinctiveness in architectural expression.

To further illuminate this shift, it is imperative to acknowledge the profound influence of industrialization on architectural discourse. Industrialization marked a departure from traditional artisanal practices, introducing mass-produced materials and standardized construction methodologies. This shift not only influenced the scale of buildings but also steered architects towards diverse design approaches. Essentially, this transformation echoes the transition from foundationalist theory to postmodernism. While proportion had previously occupied a foundational role, contemporary architects have adopted a more postmodern perspective, prioritizing diversity and individuality over rigid adherence to traditional proportion systems. The change and continuity theory, as espoused by Aristotle [11], underscores the profound role of both change and continuity in the evolution of architecture. It emphasizes how architects adapt to evolving economic, political, and cultural conditions, thereby shaping the proportion and overall character of buildings. These findings underscore the dynamic nature of architectural theory and practice, shaped by the ever-evolving cultural, contextual, and industrial factors influencing architects, builders, and stakeholders in the region.

In light of the aforementioned shifts, we are confronted with a pivotal juncture in architectural design, where the subject of proportion and its pragmatic application assumes growing significance. This period witnesses a transition from the theory of modern architecture, which cast architects as technical experts and underscored the role of architectural beauty arising from rational, cost-effective solutions to a building's function. This shift, in many ways, seemed to diminish the traditional and foundational role of architects as form-givers and creators. Amidst this architectural metamorphosis, the evolving landscape of architectural thought and practice is profoundly shaped by a multitude of influences, reflecting the ever-changing architectural milieu.

## 8. Conclusion and Recommendations

In summary, this research has successfully achieved its primary objective of identifying and documenting the proportional

systems utilized in public buildings constructed post-1950 in Kathmandu. Additionally, it has delved into the underlying causes and mechanisms driving the evolution of architectural proportion, with a specific emphasis on the forces shaping a building's proportion and its overall visual character.

This research has revealed a distinct shift in architectural thinking and practice over time. The decades spanning the 1950s to the 1970s were marked by a strong adherence to foundationalist theories, where traditional proportional systems rooted in geometric shapes played a pivotal role. Proportion was intricately woven into the fabric of architectural aesthetics, as demonstrated by design elements such as British-inspired rotundas and expansive glass windows that conveyed historical and contextual significance.

However, as we progress beyond the 1970s, the architectural landscape undergoes a substantial transformation. Postmodernism emerges as a catalyst for change, challenging the once-absolute foundationalist doctrines. Architects begin to explore broader discussions around proportion, moving away from rigid adherence to specific systems. Instead, they embrace asymmetrical balance, organic form development, and a reliance on fundamental design principles. This shift is not isolated but is part of broader societal changes, including the resurgence of private architectural practices and the influence of industrialization. Industrialization's impact on architectural production, with its standardized construction methods and mass-produced materials, amplifies the transition from proportion-centric aesthetics to a more diverse and individualistic architectural expression.

In essence, this research underscores the dynamic nature of architectural theory and practice, constantly shaped by changing economic, political, and cultural conditions. It illuminates the intricate interplay between architectural ideologies and external influences, showcasing the adaptability of architects in molding proportion and overall architectural character. In an era where architectural design is experiencing significant transformations, the subject of proportion and its practical application is regaining prominence. Architects are once again recognized as form-shapers and creators; as architectural beauty transcends utilitarian considerations. This research not only provides insights into the historical and contemporary contexts of architectural proportion but also serves as a foundation for further exploration of proportional systems in architectural design.

The recommendations stemming from this research encompass several key aspects. Firstly, it suggests the need to revive an appreciation for architectural proportion in the context of modern public buildings in Kathmandu. This revival should involve integrating traditional proportional systems into contemporary architectural practices. Additionally, the research underscores the importance of architectural education that combines historical and functional dimensions of proportion, fostering a deeper understanding of its significance among emerging architects. Furthermore, architects are encouraged to explore the creative

potential of proportion as a design tool. There is an appeal to preserve historical buildings that serve as living examples of the intricate interplay between proportion and cultural heritage. Lastly, this research can serve as a foundation for analyzing various proportional systems used by foreign architects in Nepal, enabling a comparison between their work in Nepal and their international projects to assess how their architectural ideologies adapt to local contexts.

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### References

- [1] Ralf Weber and Sharon Lerner. The Concept of Proportion in Architecture: an Introductory Bibliographic Essay. *Art Documentation: Journal of the Art Libraries Society of North America*, 12(4):147–154, 1993.
- [2] Robert Lawlor. *Sacred Geometry*, volume 6. Thames & Hudson Ltd., London, 1st editio edition, 1982.
- [3] Shayan Mahmoudi, Ali Rezvani, Seyed Alireza, and Hosseini Vahdat. Decoding geometry, proportions and its relationship with aesthetics in traditional Iranian architecture. 11:82–90, 2020.
- [4] Michela Rossi. P. H. Scholfield : Review of The Theory of Proportion in Architecture P. H. Scholfield : Review of The Theory of Proportion in Architecture. *Nexus Network Journal*, (April 2014), 2018.
- [5] Matthew A Cohen. Conclusion: Ten Principles for the Study of Proportional Systems in the History of Architecture. *Architectural Histories*, 2(1):7, 2014.
- [6] Aditi Jaiswal and Sanjay Uprety. Geometry in Modern Architecture and Postmodern Architecture in Nepal. 8914:607–613, 2022.
- [7] Sudarshan Raj Tiwari. *Temples of The Kathmandu Valley*. Himal Kitab Pvt.Ltd, Kathmandu, 1st edition, 2022.
- [8] Sudarshan Raj Tiwari. History of Kasthamandap – Its Archaeology compared with some Inscriptions , Legends and Cultural Practices. pages 1–12, 2017.
- [9] Biresh Shah. The Architecture of Foreign Architects in Nepal. *Spaces Nepal*, 2016.
- [10] Sengül Öymen Gür. Modernity vs . postmodernityin architectural education. *Journal of Architectural and Planning Research*, 24(2):91–108, 2007.
- [11] Richard Padovan. *Proportion: Science, Philosophy, Architecture*.
- [12] Francis D. K. Ching. *Architecture: Form, Space, and Order*. 2007.
- [13] Wolfgang Korn. Traditional Architecture of the Kathmandu Valley, 1998.
- [14] Jacqueline Gargus and Alexander Pope. Mathesis Bound : Kahn ' s Geometry and Its Context. pages 106–114, 1995.