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Research Paper

STEMing Educational Panorama: Architectural Analysis of Style and Structure

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Abstract

Architectural design is a fundamental intrinsic aspect of human endeavors. This paper aims to provide an analysis of architectural styles and structures at the Technological University of the Philippines—Manila to showcase the different styles and their unique characteristics and how they have shaped the overall visual identity and functionality of the institution. This study used qualitative analysis anchored by a descriptive method to analyze the style and structures of university landmarks. The researchers studied each photo to determine its architectural style, design elements presented, the arrangement of the structure, materials used, and colors. The findings underscore the need for a comprehensive approach to future development that considers not only visual appeal but also the functionality and adaptability of the structures to promote an enriched educational experience within the Technological University of the Philippines-Manila. Understanding the impact of architectural choices on students and teachers can encourage a broader societal conversation about investing in educational infrastructure that promotes creativity, engagement, and overall well-being. The study concludes that there are various architectural styles used within the buildings of the university; each style has its own visual identity and functionality. This investigation is recommended to extend its relevance to society by emphasizing the role of well-designed campuses in fostering and enhancing educational settings.

Keywords: *Architectural Analysis; Visual Identity; Architectural Style; Functionality; Structure; Technological University of the Philippines-Manila*

INTRODUCTION

The Technological University of the Philippines—Manila Campus, established in 1901, is a premier state university with recognized excellence in engineering and technology. Analyzing and conducting a visual inspection of the exterior and interior of different departments of TUP-M buildings helped in a deeper understanding and the significance of how the structures and buildings reflected the university's history, culture, vision, and mission. These structures serve as a testament to the institution's enduring legacy and a reflection of dynamic architectural styles. From classical designs to contemporary innovations, TUP-M's architectural structures encompass a broad spectrum of styles, each contributing to the overall visual identity of the campus. Analyzing architectural styles with their visual identity and functionality provides insights into their quality and innovation, demonstrating excellence and responsiveness to the needs of students and stakeholders.

Architectural style embodies the distinctive features, design principles, and construction techniques inherent in a structure or building, and represents a particular period or cultural context. It guides the layout, selection of building materials, and incorporation of ornamental

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details into completed structures (Mitchell, 2023). It reflects historical contexts, impacts, and cultural influences, especially the events, times, and places during the construction of the structure. Knowledge of these styles helps individuals understand the evolution of societies, economies, and architectural principles. According to Treis and Jimenez (2022), architectural style is influenced by cultural norms, the state of technology at the time, and the social and economic circumstances of the age. It communicates identity and language to the surrounding community, which connects with nearby structures and people. Architectural design has a broad and complex range that changes over time due to evolving beliefs, new ideas, fashions, materials, and technology, which make new styles possible.

Visual identity, which encompasses design elements, their arrangement, and material choices, is the foundation that sets apart one architectural style from another (Alavi & Tanaka, 2023). It serves as a visible expression of the principles and factors that influence a particular architectural style. The arrangement of these design elements forms the distinct character of each architectural style, composing a visual symphony. This composition not only shapes the esthetic appeal of a structure but also conveys the architectural philosophy and intent behind its creation. In essence, visual identity is the unique visual language that emerges from the interplay of design elements and materials, giving each architectural style its own signature. It encapsulates history, cultural influences, and design ethos, leaving a lasting impression on the built structure.

Moreover, the function of architectural design is a fundamental aspect intrinsic to all human endeavors. It holds immense significance because it aligns function with form and affirms the authenticity and fulfillment of a design. Ensuring functionality is paramount to architecture because it serves as a fundamental principle that must be upheld in every design. (Majeed et al., 2019). While the clarity of the concept requires no elaborate explanation, its comprehension remains pivotal to encompass critical aspects such as motion paths, ventilation, lighting, spatial relationships, technical requirements, and diverse human needs, whether psychological, social, or cultural. Considering all these factors, function becomes an indispensable requirement for successful architectural design (Al-Shemi, 2013).

The Technological University of the Philippines—Manila, encompasses diverse structures reflecting various architectural styles. However, significant challenges, including a lack of analysis, preservation challenges, and the absence of guidance for future developments, hinder the comprehensive understanding and effective preservation of architectural heritage. Hence, this study provides an analysis of the architectural styles at the Technological University of the Philippines—to showcase the different styles and their unique characteristics and how they have shaped the overall visual identity and functionality of the institution. The research shed light on the preservation and promotion of the university's academic and cultural legacy and provides inspiration for future architectural developments at the university.

LITERATURE REVIEW

As explained by Eicher (2023), an architectural style is a unique set of features that contribute to a building's distinct recognition and historical significance. While certain elements may overlap across styles, each architectural style possesses a specific combination of characteristics, including form, esthetics, construction techniques, materials, and regional influences. Additionally, Shalunts et al. (2015) highlighted the importance of architectural styles in the context of historical periods, regions, and cultural influences. Their study indicated how the classifications contribute to categorizing the developmental phases of architecture, highlighting the dynamic nature of architectural evolution over time and its intricate connections to cultural and historical contexts. This insight emphasizes the role of architectural styles not only in creating visual diversity and acting as a tangible timeline that narrates the evolution of architectural thought

and practice.

In a study conducted by Ramdan et al. (2020), it was explained that visual identity refers to the unique essence that a building possesses, which is influenced by its specific physical features like its shape and other characteristics, and is connected to a time and place. It is also stated that authenticity can be achieved when the design and features of a building are linked to its location, which is familiar to people, and the structure stands out from others. Alzahrani (2022) further emphasized that visual identity is visible from two perspectives: how architects shape and express it in their work, and how the public perceives and comprehends the resulting designs. The dual perspective stresses the interactive and dynamic nature of visual identity. Understanding visual identity involves not only the creative choices of architects but also the societal and cultural responses to these choices, adding layers to the intricate relationship between architectural styles and the communities they serve. This multifaceted understanding of visual identity delves into its role as a cultural artifact that shapes and reflects the collective identity and values of the society in which it exists.

Visual identity within architectural styles involves the incorporation of design elements, their deliberate arrangements, and material choices that distinguish styles from one another. These elements collectively serve as the foundation for expressing creativity and ensuring the functional cohesion of a specific architectural style, as emphasized by Hameed (2023). Through the integration of these visual components, architects can shape a structure's distinctive character, influence its overall design language, and contribute to the identity of a particular architectural style. Fundamentally, the meticulous selection and interaction of design elements, arrangements, and materials create a visual language that conveys the intended narrative and purpose of a building. This approach not only enhances esthetics but also establishes a unique identity, effectively differentiating architectural styles from one another.

According to Moussavi (2015), style in architecture is not just about external appearance but is also rooted in building's organizational ideas. Functionality and architectural style are not mutually exclusive; rather, they are interdependent. This suggests that the style of a building should be derived from its function and that the two should be integrated in a way that enhances the overall experience of the building's occupants. Architecture goes beyond esthetic appeal to incorporate the organizational principles inherent in a structure. The symbiotic relationship between functionality and architectural style emphasizes interdependence rather than separation. This viewpoint advocates for a design ethos in which a building's stylistic expression flows naturally from its intended use. This idea suggests that a building's style should come from what it is meant to be used for, and that the two should be blended together in a way that enhances the experience of being inside the building for the people using it.

In their research conducted by Ariani and Mirdad (2015), which focused on the impact of architectural styles on students, they compared structures' architectural style characteristics between public and private schools and assessed the academic performance of students based on the average of final achievement scores. Notably, the findings underscore the significant influence of architectural design on students, with those in private schools exhibiting higher average final exam scores. Ariani and Mirdad (2015) emphasized the pivotal role of sound architecture and effective planning in fostering an environment conducive to learning, asserting that a well-designed educational setting can serve as a catalyst for student inspiration and progress. Furthermore, the research suggests that an effectively designed educational environment not only cultivates a strong desire to study but also stimulates increased levels of creative thinking among students and educators. This intricate relationship between architectural design and academic outcomes underscores the profound impact of the built environment on educational institutions' overall efficiency and success.

These studies reaffirm the distinctiveness of architectural styles, each with its own unique visual identity. These findings highlight that beyond mere esthetics, architectural styles encompass a language of design elements, their arrangements, and material choices. The intricate details woven into visual identity become the defining features that separate one architectural style from another, enriching our understanding of diverse styles in architecture.

RESEARCH METHOD

This study employed a qualitative and descriptive approach to comprehensively analyze various structures within the Technological University of Manila, Philippines. Following the comprehensive framework laid out by Dye (2021), the researchers rigorously applied the five steps of qualitative data analysis. These steps encompassed the initial gathering and collection of qualitative data, organization, and connection of the gathered information into a qualitative dataset, coding the qualitative data for systematic analysis, extracting insights from the analyzed data, and ultimately reporting on the insights derived through meticulous analysis.

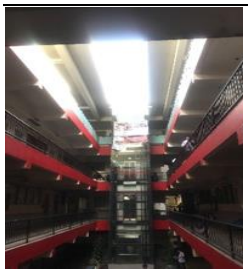
The selected structures were subjected to architectural analysis at prominent landmarks of the university, such as the College of Architecture and Fine Arts, College of Engineering, College of Science, College of Liberal Arts, College of Industrial Technology, College of Industrial Education, Technological University of the Philippines Grounds, and University gates. Utilizing digital tools, the researchers conducted visual documentation of these areas at Technological University of the Philippines-Manila. This method of capturing images served as a fundamental means of gathering and collecting qualitative data, aligning with the principles outlined by Dye (2021) in qualitative data analysis.

Upon collecting the visual data, the researchers systematically organized and classified the images based on their commonalities and distinguishable features. Each photograph underwent a detailed examination to discern architectural styles, identify design elements, assess the arrangement of structures, examine materials, and note the color palette employed. Subsequently, the researchers conducted an in-depth analysis of the architectural philosophy, visual identity, and functionality of each structure captured in the images. Generalizing key findings from areas or structures sharing common characteristics allowed the researchers to draw meaningful insights from the collected data, providing a comprehensive understanding of the diverse architectural landscape at the Technological University of the Philippines in Manila.

FINDINGS AND DISCUSSION

This section presents the collected data. The presentation, analysis, and interpretation were made using figures.

Table 1. Contemporary Architectural Style of the Technological University of the Philippines

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 CLA Building	The design elements are characterized by a modern transom-style window placed on top of glass doors and larger windows.	The windows are arranged asymmetrically.	Glass and steel were used as frames.	“I see no division between architecture, landscape, and gardening; they form a unified whole for me.” — Luis Barragán	Expansive windows allow additional natural light into the space and are designed to seamlessly integrate with the surroundings.
 Campus Library	The design elements are characterized by the use of clean lines and minimalist frames.	The windows have the same dimensions, indicating their symmetrical balance arrangement.	The materials that are used were acoustically treated glass and steel for frames.	"Silence can possess a captivating beauty in buildings.” — Peter Zumthor	An acoustically treated glass window is used to reduce external noise levels entering the interior space. They absorb, reflect, or block sound waves, resulting in a quieter and more peaceful indoor environment that is necessary for a library.
 CIE Atrium	The design element is characterized by its harmonious shape and lines.	The hallway has a symmetrical balance	Concrete and steel grills	"Design encompasses more than just appearance and sensation; it extends to functionality.”	The steel grills can be functional by serving as safety barriers for balconies and staircases, securing windows

				— Steve Jobs	and doors, and allowing ventilation.
 CIT Building	The design elements are characterized by the use of matching grilles and frames by elegant molding.	The windows have a symmetrical arrangement.	The materials used are steel casement and glass.	"A design remains incomplete until someone engages with it." — Brenda Laurel	The functionality allows natural light and provides good ventilation as air passes in and out of the building, providing comfort to students.
 CAFA Atrium	The contemporary designed atrium embraces clean lines, abundant natural light, and open spaces, fostering a visually inviting environment conducive to learning.	Orchestrates a harmonious blend of symmetry through carefully aligned corridors and mirrored architectural features, creating a visually balanced space.	the fusion of sleek steel barricades and polished concrete surfaces embodies the essence of contemporary architectural style.	" Architecture goes beyond mere shelter; it should evoke excitement, instill calmness, and provoke thought." — Zaha Hadid	The placement of elements enhances natural light, fostering a vibrant and inclusive atmosphere within the atrium. The materials not only contribute to durability but also create a versatile, low-maintenance space that is conducive to both social interaction and focused learning.

The research conducted by Mouratidis and Hassan (2020) provided valuable insights into the global expansion of contemporary architecture, which draws inspiration from postmodernism and high-tech architecture. This architectural style was characterized by asymmetry, minimal ornamentation, and an industrial esthetic. The widespread growth of contemporary architecture can be attributed to the overarching influences of global urbanization, urban densification, and globalization, reflecting the evolving dynamics of the modern world.

When examining the Technological University of the Philippines-Manila (TUPM) campus, it

became evident that the architectural landscape mirrored the surge in contemporary design. Figure 1 illustrates the diverse range of contemporary architectural styles that can be observed across different buildings on the campus. Noteworthy examples included the College of Liberal Arts (CLA) Building, which featured modern transom-style windows, and the Campus Library, emphasizing clean lines and a minimalist design ethos. The College of Industrial Education (CIE) atrium used harmonious shapes, while the College of Industrial Technology (CIT) Building exhibited elegant molding and symmetrically arranged windows. Each of these structures demonstrates the adaptability and versatility inherent in contemporary architectural design. The College of Fine Arts and Architecture (CAFA): Atrium, in particular, stood out as a compelling case study within the Technological University of the Philippines-Manila campus. Prioritizing clean lines, abundant natural light, and open spaces, this design represented a harmonious blend of symmetry that fostered an inclusive and vibrant ambiance throughout the campus. This observation aligned with the broader findings of Mouratidis and Hassan (2020), who found that contemporary architecture often sought to create spaces that were not only esthetically pleasing but also conducive to diverse and dynamic uses.

Table 2. Classical Architectural Style of the Technological University of the Philippines

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 COS Column	The design element is characterized by its plain, sturdy shaft and simple shape.	The column has harmonious and balanced proportions:	The material used is concrete	"Understanding the requirement is the fundamental prerequisite for design." — Charles Eames	Classical order, proportion, simplicity, and the use of concrete material work together to ensure that columns are not only visually appealing but also structurally robust and practical in architectural applications.

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 TUP Main Gate	The design element is characterized by the harmony of the shapes used.	The gate pattern exhibits harmonious and symmetrical balance	Concrete and aluminum were used.	"The craft architecture is to organize it. Organize what? Functions and objects." — Le Corbusier	The use of a steel gate as a material affects the functionality in terms of durability and resilience. Additionally, the pattern of the gate provides sun shading and good ventilation.

As Bern (2023) demonstrated, classical architecture's distinctive features, such as columns and pediments, serve as defining elements. In the article "Classical Architecture: A Guide to Classical Architecture" (2021), it is mentioned that Vitruvius' principles seamlessly merged with the design philosophy of ancient Greece. Grounded in logic and order, the Greeks prioritized perfect symmetry and proportion in their architectural approach. The design of the columns, which are characterized by a plain and sturdy shaft, exemplifies simplicity in shape, embodying classical order, proportion, and practicality through the use of concrete.

Table 2 shows the classical styles present in structures at the Technological University of the Philippines. The columns in the College of Science (COS) embody the Classical esthetic. The plain and sturdy shaft, crafted from concrete, not only reflects historical design principles but also serves as a testament to the enduring influence of Classical architecture. Similarly, the university gate pattern, constructed from a combination of concrete and aluminum, exhibits a harmonious and symmetrical balance in line with Classical ideals.

Le Corbusier's insight that "to create architecture is to put it in order—function and objects" is exemplified in the thoughtful design of the Technological University of the Philippines-Manila gate. The incorporation of steel in the gate enhances the durability and resilience, which is aligned with a holistic approach that considers both esthetics and functionality. The gate's pattern not only serves as sun shading but also facilitates effective ventilation, presenting a contemporary interpretation of classical principles in architectural design.

Table 3. Modern Architectural Style of the Technological University of the Philippines

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 COE Elevator	The design element focuses on functionality and simplicity with minimal ornamentation.	The glass and silver framing of the elevator incorporates rhythm and symmetry.	The materials used are steel, glass, and concrete.	"I think that Architecture can influence people's lifestyles to some extent." — Tadao Ando	The concrete wall, steel frame, and glass walls of the elevator combines modern esthetic with structural durability, offering passengers accessibility and view, integrated through advanced technology for safety and efficiency.

Routledge (2016) distinguished modern architecture by its hallmark features of clean, geometric shapes, the utilization of contemporary materials and technologies, and a pronounced emphasis on functionality over excessive ornamentation. Within the context of the Technological University of the Philippines-Manila (TUPM), a tangible embodiment of this modern architectural style is exemplified in the College of Engineering (COE) elevator, as shown in Table 3. The deliberate material choices of the steel frame, glass walls, and concrete components not only contribute to the esthetic appeal associated with modern architecture but also play a pivotal role in enhancing structural durability.

The College of Engineering (COE)'s adherence to the principles of modern architecture extends beyond visual esthetics to a thoughtful consideration of functionality. The design prioritizes the integration of modern technology to ensure safety and efficiency for users. The choice of materials, such as steel and glass, aligns with the clean and minimalist ethos of modern architecture while serving practical purposes. The transparency afforded by glass walls not only contributes to the modern esthetics but also provides users with enhanced views, fostering a sense of openness and connectivity within the space.

Furthermore, the College of Engineering (COE)'s commitment to modern architectural principles extends to its focus on minimal ornamentation, emphasizing simplicity and purposeful design. This approach not only aligns with the core tenets of modern architecture but also addresses the pragmatic needs of users by providing unobstructed access and a seamless integration of technology.

Table 4. Neoclassical Architectural Style of the Technological University of the Philippines

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 IRTC Building	The design element is characterized by the minimal ornamentation, cleans lines, and prioritizes functionality and practicality.	The windows have a symmetrical arrangement.	The materials concrete, glass, and metal.	"Less is beneficial only when an excess of more becomes undesirable." — Frank Lloyd Wright	Multiple-paned windows allow ample natural light into the room, which brightens the room and enhances ventilation. The symmetrical arrangement of the windows emphasizes the building's features, creating a harmonious and visually engaging design. The minimalist design adds visual appeal by creating a tidy and clean appearance.

In accordance with Balafoutis et al. (2018) findings, the distinctive features of simplicity, durability, strict uniformity, and a peaceful ambiance associated with Neo-classical architecture are expressed in the architectural design of the Integrated Research and Training Center (IRTC) building, as shown in Table 4. This Neo-classical influence is particularly evident in the careful symmetrical arrangement of the building's central facade, which is adorned with recurrent classical morphological elements. Notably, the IRTC building goes beyond mere homage to traditional architectural principles; it stands as a contemporary adaptation that seamlessly blends Neo-classical esthetics with modern considerations.

The meticulous emphasis on balance and symmetry within the IRTC building demonstrates a commitment to the Neo-classical style, creating a visually harmonious and enduring structure. Architectural design strategically incorporates symmetrical windows, not only for their esthetic appeal but also for their functional significance. Thoughtfully arranged, these windows prioritize the infusion of natural light, enhancing the interior environment and contributing to energy efficiency. Simultaneously, the emphasis on ventilation aligns with modern sustainable practices, ensuring a comfortable and environmentally conscious space. Furthermore, the IRTC building's architectural choices evoke a sense of permanence, functionality, and practicality. The deliberate integration of Neo-classical elements connects the structure to a timeless architectural tradition, projecting an enduring quality.

Table 5. Neo-modern architectural style of the Technological University of the Philippines

Picture	Visual Identity			Analyzation	
	Design Elements	**Arrangement of Elements**	**Material used**	**Architectural Philosophy**	**Functionality**
 TUP Court	The design element is characterized by light-colored panels spanning the entire ceiling and the exposed roof truss, which provides a line texture.	The ceiling features a symmetrical balance in its trusses and contrasts with other features of the structure.	Steel and polycarbonate sheets were used.	"Architecture should remain authentic to its essence, its surroundings, and its community. The design of the constructed space mirrors humanity's articulation of its lifestyle, emotions, philosophy, religion, technology, and material values in addressing its needs and environmental obstacles."	The light-colored panels added natural light to the interior of the structure without the glaring of sunlight. The impressive height of the ceiling, with the opening at the top, also helped with ventilation.

— Francisco "Bobby" Mañosa

According to Johnson (2023), Neo-Vernacular architecture has been defined as a modern style of building that combines traditional and modern architectural design features. It creates esthetically pleasing yet functional buildings with a distinctively regional character by using elements of indigenous architecture. Lamudi (2019) expanded on the definition of Neo-vernacular architecture as a way to emphasize the uniqueness of Filipino architecture by predominating Filipino architectural features in architectural design. Large windows and courtyards were used to maintain the traditional esthetic while incorporating modern aspects like minimalist and user-centered design. This involves the integration of technology, the use of locally sourced materials, and a focus on sustainability.

The Neo-vernacular style of the TUP Court was mainly distinguished by the light-colored panels and high ceiling, in addition to the symmetrical balance and contrast of the features of the structure, as presented in Table 5. The design of the structure was focused on functionality and comfort for end users. The system prioritized natural light and ventilation using local materials and techniques while incorporating the modern needs of users and the regional climate. The TUP Court's commitment to using local materials and techniques demonstrates a rootedness in regional identity, highlighting a conscious effort to foster a connection with the local context. Simultaneously, the architectural choices reflect an awareness of the modern demands of the region and its climatic conditions. By prioritizing natural light and ventilation, the design not only enhances the comfort of users but also underscores the adaptability of Neo-vernacular architecture to local climate nuances.

CONCLUSIONS

The Technological University of the Philippines—Manila, encompasses diverse structures reflecting various architectural styles. Hence, the project shed light on the preservation and promotion of the university's academic and cultural legacy and provides inspiration for future architectural developments at the university.

Beyond their esthetic appeal, the diverse architectural styles observed across the Technological University of the Philippines (TUPM) campus play a pivotal role in shaping a multifaceted learning environment. Pereira's (2018) assertion that the design of a school building can significantly influence the learning experience of students, teacher behavior, and overall school efficiency underscores the importance of analyzing the architectural styles present in TUPM for guiding the university's future development. The recognition of architectural diversity in this study emphasizes the necessity for a comprehensive approach to future development in which visual appeal is balanced with functionality and adaptability to promote an enriched educational experience within TUPM Manila.

This investigation extends its relevance to society by emphasizing the role of well-designed campuses in fostering enhanced educational experiences. The positive impact of architectural styles goes beyond mere esthetics; it contributes to improved learning outcomes, teacher effectiveness, and overall institutional efficiency. As the study concludes, various architectural styles within the university each possess a distinct visual identity and functionality, highlighting the importance of acknowledging and harnessing this diversity for the benefit of the Technological University of the Philippines in Manila.

Additionally, the societal impact of this research is notable. A well-designed educational

environment positively influences not only the immediate university community but also contributes to the broader societal landscape. A campus that prioritizes diverse and effective architectural styles sets a precedent for other educational institutions, highlighting the significance of thoughtful design in fostering better learning experiences. Furthermore, understanding the impact of architectural choices on students and teachers can encourage a broader societal conversation about investing in educational infrastructure that promotes creativity, engagement, and overall well-being. Therefore, this research makes a valuable contribution to discourse on the societal implications of architectural decisions in educational settings.

LIMITATION AND FURTHER RESEARCH

This study provides an analysis of architectural styles and structures at the Technological University of the Philippines—to showcase different styles and their unique characteristics and how they have shaped the overall visual identity and functionality. However, this paper is limited to selected architectural landmarks from the Technological University of Manila, Philippines. The findings of this study may not be generalizable to other architectural analysis contexts.

Further research could expand on this study by using an analysis of the graphical representations not only on its esthetic aspect but also the framework and dimensions. Moreover, future researchers could also utilize other forms of research design to investigate characteristic architectural styles and how they affect educational landscapes. In addition, future researchers may also study the architectural styles and functionality of other universities, particularly historical buildings, which will be used in related literature and in academic settings.

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