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Article

LLM and Pattern Language Synthesis: A Hybrid Tool for Human-Centered Architectural Design

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Abstract: This paper introduces a hybrid design framework that makes Christopher Alexander's Pattern Language actionable through modern AI. Enabled by advanced large language models (LLMs), this method allows real-time synthesis of design patterns, making complex architectural choices accessible and comprehensible to stakeholders without specialized architectural knowledge. A lightweight, web-based tool lets project teams rapidly assemble context-specific subsets of Alexander's 253 patterns, reducing a traditionally unwieldy 1,166-page corpus to a concise, shareable list. Demonstrated through a case study of a university department building, this method results in environments that are psychologically welcoming, fostering health, productivity, and emotional well-being. LLMs translate these curated patterns into vivid, experiential narratives—complete with neuro-scientifically informed ornamentation. By bridging abstract design principles and concrete human experience, this approach democratizes architectural planning grounded on Alexander's human-centered ethos, and opens new avenues for participatory, evidence-based design.

Keywords: adaptive design; AI-driven architecture; campus buildings; Christopher Alexander; design patterns; human-centered architecture; large language models; ornamentation; Pattern Language; participatory design

1. Introduction

The dominant architectural culture throughout the 20th and 21st centuries that embraced industrial minimalism dismissed ornament as redundant or superficial. However, recent findings in biophilic design, neuroscience, and psychological research challenge this notion, revealing ornamentation's essential role in human health and cognitive functioning [1–3]. Implementing Christopher Alexander's human-centered A Pattern Language with adaptive ornamental design presents a promising alternative. By introducing a method that leverages large language models (LLMs), we are able to synthesize complex decision-making and enhance user health and well-being through adaptive design.

Alexander *et al.*'s A Pattern Language (1977) [4] represents one of the most comprehensive attempts to codify design wisdom for the built environment, offering 253 patterns that span from regional planning down to interior details. Despite its influence on architectural theory and practice, the practical application of this seminal work presents challenges. The complete pattern language spans 1,166 pages, making it unwieldy for a “quick” practical application. Additionally, the traditional method of applying these patterns typically requires specialized architectural knowledge, creating a barrier between experts and the stakeholders who will ultimately inhabit these spaces.

There are two obstacles to implementing pattern languages today. First, design patterns are not taught in architecture schools, so students are unaware of them. Then, to apply the pattern language requires solid training to master most of the patterns so that they can be combined and recombined in reaching an adaptive design through iteration [5–7]. Second, today's architecture schools teach an

underlying philosophy of design that is the opposite of the pattern language approach. Contemporary culture values the spontaneous creation of visually-appealing designs, as judged by their novelty. Cognitively, this privileges the simplest possible path to design that avoids extensive recombination of complex components. After several years of training in this direct method of generating designs, young architects tend to lose the mental ability to organize complexity by adopting what is known as “design fixation” [8].

Yet there are broader issues that detach the design profession from common everyday life. An expertise barrier nowadays results in stakeholders having limited understanding of and input into the architectural decisions that will profoundly affect their daily experiences. The planning process becomes opaque to laypeople, remaining the exclusive domain of design professionals. Consequently, stakeholders may find themselves unable to meaningfully influence design decisions that directly impact their lives [9].

In response to these challenges, this article combines digital tools with artificial intelligence to make Alexander’s Pattern Language more accessible and applicable. Traditional applications of the pattern language or purely computational approaches applied separately fall short in managing complexity or enhancing emotional understanding. Our approach consists of two key components:

1. A web-based application enables the creation of project-specific pattern subsets through an interactive hypertext interface.
2. The use of large language models (LLMs) synthesizes these pattern subsets into narrative descriptions that communicate the experiential qualities of the proposed architecture.

This technique aims to bridge the gap between abstract architectural patterns and concrete spatial experiences, making the implications of design choices more accessible to non-experts. By generating narrative descriptions that translate design patterns into vivid, experiential language, the approach enables stakeholders to better understand and evaluate proposed architectural solutions before construction begins. Pattern language could potentially transform the relationship between architectural professionals and the communities they serve.

Choosing a building meant to house a university department of Computer Science and AI as one example illustrates how the method works in practice (Section 4). The results differ substantially from the standard method of designing such a project. These differences underline the very desirable adaptive qualities of the present model. Substantial work by other authors reveals how such adaptive design turns out to improve the users’ health and well-being in the long term [10]. This assessment is verified here by using two separate large language models to predict the comparative productivity of the department, based entirely on the building’s architecture (Section 5).

In this second part of the paper where ChatGPT (o4-mini-high) evaluated the university building resulting from the pattern language versus standard new campus buildings, the LLM made an astonishing claim: “the fashionable buildings’ stress-inducing geometries would predict lower publication rates, fewer patent applications, and a shift toward safe, incremental research rather than bold, exploratory ventures.” These words were not asked for in the prompt. To cross-check this evaluation, a separate AI experiment used a different account with a similar prompt to ChatGPT-4o and obtained a very similar response (Section 5). Are we witnessing a “Move 37” moment in architecture? (referring to the historic Go match between AlphaGo and Lee Sedol in March 2016) [11]. If that is the case, then the profession should pay attention.

2. Literature Review and Background Problems

2.1. Alexander’s Pattern Language and Its Impact

A Pattern Language emerged as a revolutionary approach to architectural and urban design. The work presented 253 patterns arranged hierarchically from the largest scale (regions and towns) to the smallest (building details and ornament). Each pattern describes a recurring problem in the built environment and offers a solution that can be adapted to specific contexts. Significantly,

Alexander conceived of these patterns not as isolated elements but as an interconnected language, with each pattern linking to higher and lower patterns in the hierarchy.

A Pattern Language introduced a holistic framework for architectural design, advocating interconnected solutions adaptable to context and scale. However, its practical application has been limited by the profession rejecting some of its key features. That is about to change. Contemporary research in biophilic design highlights ornament's role in psychological and physiological health [12–14]. Techniques such as eye-tracking and visual attention software empirically demonstrate how ornamented environments support cognitive and emotional well-being, in sharp contrast to minimalist aesthetics, which often induce psychological disengagement and stress [15–18].

The impact of Alexander's work extends far beyond architecture. His pattern language approach has influenced fields ranging from software design [19] to education [20] and organizational development [21]. The enduring influence of this work speaks to its fundamental insight: that complex design problems can be addressed through a combinatorial and modular language of solutions that connect across domains and scales. A selection mechanism evolves design combinations by adapting them to human emotional and physiological needs, not abstract images.

2.2. Challenges in Pattern Language Application

Alexander's A Pattern Language requires special methods to be effective. Self-builders find a useful resource in picking a handful of design patterns to apply to their project, but as noted by Dawes and Ostwald, the comprehensive nature of the work makes it unwieldy for "easy" use in a more substantial task [22]. A project needs to synthesize and combine several design patterns, so implementation becomes an exercise in organizing complexity, which is a non-trivial problem. Furthermore, the interpretation and application of patterns typically require a minimum familiarity with the patterns.

The traditional method of applying a pattern language involves reading and understanding the entire work, identifying relevant patterns through expert judgment, and keeping these patterns in mind during the design process. Several iterative steps at combining the patterns to generate adaptive forms require doing this in one's head, with the limited help of visual aids. The double process of pattern selection and combination remains challenging to non-experts (including most architects trained in the present paradigm).

2.3. Digital Tools and Pattern Language

Various attempts have been made to digitize and make pattern languages more accessible. As well as producing 80 additional patterns in A New Pattern Language [23], Michael Mehaffy has advocated for digital adaptations of pattern language to enhance its usability. Projects such as Iba's Pattern Language 3.0 [24] and Schuler's Liberating Voices pattern language project [25] have explored digital formats for pattern languages in various domains.

However, these efforts have typically focused on creating comprehensive digital repositories rather than tools for implementing context-specific pattern languages. The approach presented in this article differs by emphasizing the creation of manageable, project-specific pattern subsets rather than attempting to manage the entire pattern language. An additional and non-trivial obstacle is that Alexander's original A Pattern Language is not open access, thus it cannot be posted freely on the web.

2.4. Language Models in Architectural Contexts

The emergence of advanced large language models (LLMs) offers new possibilities for architectural communication and planning [26,27]. Some architects are exploring the potential of LLMs to generate architectural descriptions, investigating their application in conceptual design phases towards visual implementations of novel forms rather than adaptation to human affordances

and scale [28]. The second author (N.A.S.) has applied LLMs to describe environments for creative work [29], and to classify window typologies that generate anxiety [30].

Our approach builds on this emerging body of research by specifically focusing on how LLMs can translate pattern languages into experiential narratives that communicate architectural qualities to non-experts. Alexander's original motivation for the Pattern Language was indeed to bring the design process closer to common people, and this is the reason for its continued success with self-builders. The present application addresses what Tzonis identifies as a persistent challenge in architectural communication: the gap between abstract design principles and the lived experience of architecture [31].

2.5. Stakeholder Participation in Architectural Design

Numerous scholars have emphasized the importance of stakeholder participation in architectural design, including Till [32], who argues for a more democratic approach to architectural practice. Sanoff's fundamental work on participatory design [33] highlights the value of involving end-users in the design process, developed further by Salama [34], while Blundell Jones *et al.* [35] document various approaches to architecture as a social practice. While much useful discussion on participatory design has taken place over the years, no satisfactory method has emerged that the building industry has felt comfortable in adopting. For this reason, design and construction has continued to implement standard typologies without user input.

In a welcome development, AI offers new solutions to participatory design [36,37]. This is due to AI's ability to handle the complexity of multiple decision-making processes and to combine them into a suitable result.

Using AI potentially enhances stakeholder understanding and participation in the design process. Design patterns represent evolved architectural and urban solutions, invented by ordinary builders, and selected by the general population. They arise from common practice in each society, thus forming an essential part of material culture [38]. By making pattern language more accessible and translating pattern groupings into concrete narratives, we address what Friedmann [39] identified as the "knowledge gap" that often limits meaningful participation in urban planning processes. Curiously, therefore, AI makes possible human interaction and participation in the design process that was unwieldy or impossible before.

3. Methodology: A Listing of Design Patterns

3.1. Development of the Web-Based Pattern Subset Tool

The model begins with a web-based application designed to make Alexander's Pattern Language more navigable and accessible. A private and non-commercial application titled "APL-Companion" presents each of the 253 patterns in a collapsible format. The problem/solution content is new text that has been written entirely for this application. This application curates project-specific subsets of Alexander's patterns, simplifying stakeholder choice and interaction. People can either find the application, ask for it, or reimplement — since this functionality is well within the capabilities of LLM coding agents. A brief technical specification for the tool follows:

- Collapsible interface: Each pattern is contained in HTML <details> elements that can be opened/closed
- Smart URL encoding: Open patterns are encoded in the URL fragment (e.g., #p=1,3-7,12) using compact range notation
- State persistence: Selected patterns remain open when returning to bookmarked URLs
- Cross-references: Links between patterns automatically highlight when target patterns are open
- Position memory: When clicking pattern links, the tool remembers scroll positions and returns users to their previous location when closing patterns
- Auto-scrolling: Automatically scrolls to newly opened patterns for smooth navigation
- Visual feedback: Links to currently open patterns are visually distinguished

- Pure JavaScript: No external frameworks, using modern browser APIs
- Responsive design: Mobile-friendly layout with touch-optimized controls
- Print optimization: CSS print styles hide navigation elements and show only selected content

Allowing users to expand and collapse individual patterns creates a more manageable interface for navigating the comprehensive pattern language. The first author (B.P.) developed the pattern subset tool as a single-page web application using HTML, CSS, and JavaScript. The application's core functionality centers on the HTML "details" element, which provides native browser support for expandable/collapsible content sections. Patterns are implemented as separate "details" elements, allowing users to toggle the visibility of individual patterns. The application maintains a lightweight footprint, requiring no server-side processing or database. All functionality is implemented client-side, making it easily deployable on any static hosting service.

User selection creates a specific subset pattern language, with expanded patterns constituting the subset. The selection process typically takes minutes rather than the hours or days that might be required to read and process the entire pattern language (not to mention that only someone already very familiar with each pattern is capable of doing this easily). The resulting subset represents the patterns deemed relevant to a particular building project.

Interested readers are encouraged to follow the general outline set out here to implement a parallel scheme for organizing the patterns for convenience. All that is required is a selection of patterns (containing only the pattern title, problem, and solution) deemed to be relevant to a specific project. The pattern list is then fed to an LLM as a PDF file along with the correct prompt to generate the narrative (this is described below).

3.2. URL Fragment Approach for Creating a Subset Pattern Language

To enable sharing and persistence of selected pattern subsets, we implement a URL fragment approach. The application stores the selected pattern subset as URL fragments, allowing users to bookmark or share specific pattern subsets via links. When accessed, these links automatically retrieve the selected pattern subset, ensuring consistency across different users and sessions.

The user interface presents patterns in their hierarchical order, from largest scale (regions and towns) to smallest scale (building details). Each pattern is represented by its number and title when collapsed, with the expanded view showing a concise summary of the pattern along with links to related patterns.

The method preserves Alexander's concept of patterns as an interconnected language through hypertext navigation. Each pattern includes links to higher patterns (which it helps to implement) and lower patterns (which help implement it). These relationships form what Alexander described as a "network" of patterns that work together to create coherent design solutions. The methodology proceeds as follows: (1) A designer who is familiar with the different patterns in A Pattern Language selects the titles of all the possible patterns that appear relevant to the project. In this case, the example chosen is a university building meant to house the Department of Computer Science and AI. (2) The APL-Companion software generates a detailed textual description for use as a prompt with LLMs, as described next.

For example, a subset pattern language for a university department might be encoded as follows, selecting design patterns by their number:

```
file:///C:/Users/Username/Documents/apl.html#p=18,80,82,88,95-96,98-99,102,107-108,110,112,115,119-120,122,124-125,127-130,132-133,135,146-148,150-152,159-161,163-164,166,171,174,176,179-180,183,191-192,194,207,222-223,225,232-233,235-243,248-250
```

This approach eliminates the need for server-side storage or databases while ensuring that pattern subsets can be easily shared among stakeholders.

Simply holding all the selected design patterns in one's mind when working on a project is a very challenging cognitive task. It would normally require weeks of familiarization and working with the list repeatedly to grasp a global synthesis. The necessary next step of recombining patterns to approach more optimal results is even harder. For this reason, joining a pattern language to a large

language model is a huge step in being able to manage the combinatorial complexity that an adaptive design process requires.

Most important, this method simplifies the process of moving a design forward iteratively. The added practicality helps to avert the attraction of a facile one-step design solution based on visual formalism. That almost never turns out to be adaptive.

3.3. APL-Companion Generates a PDF Pattern List for LLM Context

The APL-Companion application also supports printing functionality, typically to PDF, that includes only the pattern subset titles and summaries without extraneous elements such as navigation links. This condensed output provides ideal context for LLM prompting, offering the relevant pattern information in a format that can be directly input to large language models. This format ensures that the LLM receives clear, relevant information about the selected patterns without being overwhelmed by the complete pattern language.

For reference, here is the list of design patterns by number and title selected for this project, a university building to house the Department of Computer Science and AI:

18 NETWORK OF LEARNING
 80 SELF-GOVERNING WORKSHOPS AND OFFICES
 82 OFFICE CONNECTIONS
 88 STREET CAFE
 95 BUILDING COMPLEX
 96 NUMBER OF STORIES
 98 CIRCULATION REALMS
 99 MAIN BUILDING
 102 FAMILY OF ENTRANCES
 107 WINGS OF LIGHT
 108 CONNECTED BUILDINGS
 110 MAIN ENTRANCE
 112 ENTRANCE TRANSITION
 115 COURTYARDS WHICH LIVE
 119 ARCADES
 120 PATHS AND GOALS
 122 BUILDING FRONTS
 124 ACTIVITY POCKETS
 125 STAIR SEATS
 127 INTIMACY GRADIENT
 128 INDOOR SUNLIGHT
 129 COMMON AREAS AT THE HEART
 130 ENTRANCE ROOM
 132 SHORT PASSAGES
 133 STAIRCASE AS A STAGE
 135 TAPESTRY OF LIGHT AND DARK
 146 FLEXIBLE OFFICE SPACE
 147 COMMUNAL EATING
 148 SMALL WORK GROUPS
 150 A PLACE TO WAIT

151 SMALL MEETING ROOMS
 152 HALF-PRIVATE OFFICE
 159 LIGHT ON TWO SIDES OF EVERY ROOM
 160 BUILDING EDGE
 161 SUNNY PLACE
 163 OUTDOOR ROOM
 164 STREET WINDOWS
 166 GALLERY SURROUND
 171 TREE PLACES
 174 TRELLISED WALK
 176 GARDEN SEAT
 179 ALCOVES
 180 WINDOW PLACE
 183 WORKSPACE ENCLOSURE
 191 THE SHAPE OF INDOOR SPACE
 192 WINDOWS OVERLOOKING LIFE
 194 INTERIOR WINDOWS
 207 GOOD MATERIALS
 222 LOW SILL
 223 DEEP REVEALS
 225 FRAMES AS THICKENED EDGES
 232 ROOF CAPS
 233 FLOOR SURFACE
 235 SOFT INSIDE WALLS
 236 WINDOWS WHICH OPEN WIDE
 237 SOLID DOORS WITH GLASS
 238 FILTERED LIGHT
 239 SMALL PANES
 240 HALF-INCH TRIM
 241 SEAT SPOTS
 242 FRONT DOOR BENCH
 243 SITTING WALL
 248 SOFT TILE AND BRICK
 249 ORNAMENT
 250 WARM COLORS

The brief descriptions of the above design patterns are not included here. Note that the APL-Companion web application paraphrases and substantially re-writes the content of all the patterns so they are not identical to the official published text. The educational aim of this application is not to publish the selected pattern list containing a factual summary but to feed it as a prompt into an LLM. What is published is the ensuing AI output.

3.4. LLM Integration and Prompt Engineering

The second phase involves using large language models to synthesize narrative descriptions based on the selected pattern subsets. LLMs translate these pattern subsets into coherent, experiential

narratives and adaptive ornamental solutions guided by neuroscientific criteria. For this research, we utilized Claude 3.7, an advanced language model capable of processing substantial context and generating coherent narratives. There are several equivalent LLMs that could be used in this manner, so this is only a convenient choice adopted for writing this paper that should not affect the study's reproducibility or generalizability.

The basic prompting process involves providing the LLM with the pattern subset (typically in PDF format) along with specific instructions regarding the building project. These instructions include:

1. The purpose of the building (e.g., a university department).
2. The approximate size or capacity of the institution (e.g., 200 students and staff).
3. Any specific local requirements or contextual factors.
4. A request for a narrative description focusing on experiential qualities.
5. An explicit mention including the ornament.

A typical prompt structure follows this general format:

Prompt: Attached is a pattern language for [specific building type], this is a [size description]. The [building/institution] is [purpose description]. Write a narrative description showing how the building is experienced, describe the look and feel and the ornamental treatment.

3.5. Eventual Need For New Patterns — LLMs Greatly Simplify the Task

Any project designed with the pattern language will normally require additional patterns to be developed that are not already included among the 253 canonical design patterns. Those supplemental patterns will address design problems specific to the project and could play an important role. Some patterns could be selected from among the 80 in Mehaffy *et al.*'s A New Pattern Language, while others need to be newly discovered. Fortunately, A New Pattern Language is open-source and is published on two separate sites in slightly different formats as well as in book form [40,41]. The 80 new patterns can be quickly examined, and the URLs of any relevant ones included in the prompt to the LLM.

The process of writing a few entirely new patterns is necessary to ensure an optimal design outcome. This is a separate topic that will not be developed here: for simplicity, we stick to using only the original pattern language. Nevertheless, the authors are in conversation with Michael Mehaffy on a project of using LLMs to derive patterns. Preliminary results reveal that the process is enormously facilitated by AI, reducing the considerable amount of work traditionally required to discover a new design pattern. With the iterative facility provided by an LLM, the normally laborious and time-consuming derivation becomes easy and straightforward.

Looking to the software community for useful lessons reveals fervent activity that combines LLMs with design patterns. But so far, interest mostly focuses on deriving and applying design patterns that improve AI functionality, such as in optimizing and organizing prompts. What we are talking about here is the reverse: using AI to derive new design patterns. Our interest lies in architectural design, yet the concepts in computer science are similar. The study by Nazar *et al.* goes in the desired direction [42].

4. Case Study: A University Department Building

4.1. General Features Emerging From the Use of The Pattern Language

A university building housing a Computer Science and AI department demonstrates this adaptive design method. Stakeholders will collaboratively select patterns reflecting needs such as communal spaces, human-scaled environments, and natural lighting. Using LLM-generated narratives and neuroscientific insights, ornamental elements are strategically designed to support psychological well-being:

- Exterior façades feature ornamented entrances and frames employing fractal scaling to induce positive subconscious engagement.
- Interior spaces incorporate ornamental panels with plant-like, fractal designs, enhancing cognitive function, particularly in learning environments.
- A monumental staircase is designed with ornamental complexity, emphasizing natural lighting and visual stimuli conducive to memory and emotional well-being.

We created an appropriate pattern subset using our web application and generated a narrative description using the LLM. This theoretical application provides a context for testing the technique's flexibility and efficacy. To ensure fidelity to Alexander's patterns and identify any LLM deviations or hallucinations, we identified any elements in the narrative that are not supported by the selected patterns. When discrepancies were found, we regenerated the narrative until it aligned with the pattern subset. This iterative approach ensured that the final narrative authentically reflects the selected patterns rather than introducing extraneous concepts from the LLM's training data.

4.2. Descriptive Narrative Generated by the Large Language Model

In what follows, we have included extracts of a detailed description of the human experience of a user in the proposed building. AI makes this conjectural narrative possible. The text below is selected from a much lengthier description provided by the large language model Claude 3.7 but is otherwise unedited.

Prompt: Attached is a pattern language for a new university department of computing and AI, this is a small institution with no more than 200 students and members of staff at any one time. The department is a venue for human flourishing and creating humane technologies via a building that meets human needs. Write a narrative description showing how the building is experienced, describe the look and feel and the ornamental treatment.

Response: "I've created a narrative description of the Department of Computing and AI based on Christopher Alexander's pattern language principles. The description shows how the building embodies human-centered design while supporting the department's mission of creating humane technologies. As you approach the Department of Computing and AI, you're immediately struck by how unlike a traditional university building it is. Rather than towering as a monolithic structure, it spreads organically across the landscape as a thoughtful cluster of interconnected buildings of varying heights, none exceeding four stories. The main building stands slightly taller than the others, its roof distinctively pitched.

The approach path is on the walkway made of soft-fired clay pavers. The main entrance is immediately apparent, projecting outward from the building's façade with a large wooden door set beneath an arched opening. The door features intricate carved patterns integrated into organic motifs. Around this entrance, several smaller entrances form a family, each visible from the others and sharing the consistent visual language. A first-time visitor to the department wants a prominent main entrance with distinctive ornamentation, so that he/she can intuitively identify where to enter without feeling intimidated by an institutional façade.

Stepping through the main entrance, you enter a bright, welcoming transition space — half outside, half inside — with benches built into low walls where people sit chatting or working on tablets. The ceiling here is lower, creating a sense of shelter before the space opens up into the main

atrium. Moving forward, the floor shifts from textured clay pavers to polished wood, signaling the transition to interior space. The space feels intuitive — clear visual connections to primary circulation paths help to understand the building's organization without reliance on complicated directories or excessive signage.

The atrium rises the full height of the building, with staircases that wind around its edges, serving as both circulation and informal gathering places. Light streams in from clerestory windows and filters through hanging plants, creating ever-changing patterns on the walls. There is perfect natural light from multiple sides: no harsh glare, just consistent, gentle illumination that keeps people's energy steady throughout the day. The space hums with quiet activity — small groups of students gathered on stair landings, faculty members crossing between different wings, visitors pausing to orient themselves. At the heart of the atrium a communal table is surrounded by comfortable chairs of varying heights and styles. This is where the department gathers for their lunch.

Rather than traditional classrooms, learning spaces radiate outward from the central atrium like spokes, each distinct in character yet following similar principles. These "wings of light" are narrow — never exceeding 25 feet in width — ensuring that natural light penetrates deeply from windows on both sides of every room. The largest learning space features a staircase-as-stage, where broad steps double as informal seating during lectures or demonstrations. The steps face a wall of small-paned windows that frame views of the surrounding landscape, with integrated projection surfaces that appear when needed but otherwise remain invisible.

Smaller seminar rooms and project spaces branch off the main circulation paths, each with its own character but connected by arcades that allow movement between spaces while remaining partially sheltered from the elements. These arcades frame views of internal courtyards and the larger landscape beyond, always connecting inhabitants with the natural world outside. Each learning space includes alcoves along its perimeter — small, partially enclosed areas where individuals or pairs can retreat for focused work while still remaining connected to the larger space. These alcoves feature window seats with low sills and deep reveals, creating perfect nooks for reading or contemplation while maintaining visual connection with activities inside and views to nature outside.

The department functions as a network of semi-autonomous workshops and research labs, each housing between 5-20 students and faculty organized around specific research interests or project teams. These spaces occupy the upper floors and the wings extending from the main building. The department is defined by the unplanned educational encounters that happen between formal sessions.

Each workshop is a half-private space — partially enclosed with glass walls or interior windows that maintain visual connection with common areas while providing acoustic separation. Within each workshop, workstations are arranged in small clusters that balance privacy and collaboration, with each workspace enclosed by partial walls and positioned to provide views either to the outside or to communal activity areas.

Flexible office furnishings allow teams to reconfigure their spaces as projects evolve, with movable partitions, adjustable-height surfaces, and modular storage systems. Despite this flexibility, the spaces maintain a warm, personalized feeling through the use of natural materials, soft wall surfaces that allow pinning up of work-in-progress, and custom built-in elements that give each workshop its unique character. Between the workshops, small meeting rooms are distributed abundantly — intimate spaces for 3-8 people with comfortable seating, excellent acoustics, and often a distinctive view or light quality. The beauty of this building is the ability to change work environment several times a day without ever feeling displaced or interrupted.

A student who alternates between collaborative and focused work wants a variety of workspace options (window seats, alcoves, common areas, team spaces) within short walking distance of each other, so he/she can easily transition between different modes of working throughout the day. A student spending long hours on computer work wants courtyards with seating protected from wind

and positioned to capture sunlight, to take essential breaks outdoors to rest the eyes and reconnect with natural elements.

The building complex embraces several courtyards of different scales and characters, each designed to “live” by offering views to larger open areas beyond and multiple doorways connecting them directly to interior spaces. The main courtyard features a sunny place along its southern edge where people gather on warm days, protected from wind by carefully positioned walls and plantings.

A smaller, more intimate courtyard connects to the faculty offices, with a trellised walk covered in flowering vines leading to garden seats positioned for solitary reflection or quiet conversation. Here, faculty members can step outside for fresh air between meetings or bring a small seminar group for an outdoor discussion.

The largest outdoor space functions as a true outdoor room, with columns defining its corners and low sitting walls creating enclosure without blocking views or circulation. A large table beneath a pergola serves as an outdoor classroom when weather permits, while movable seating allows for spontaneous gatherings or solitary work in the fresh air.

A researcher leading collaborative projects wants flexible office space defined by columns rather than rigid walls, so that a team can reconfigure its environment as research evolves without requiring renovation. An academic spending extended periods in the building wants interior surfaces made of natural materials that are warm to touch and visually engaging (soft plaster walls, wooden floors), so that the everyday environment supports wellbeing through sensory richness.

Throughout the building, materials speak of warmth, tactility, and natural variation. Walls are finished in soft plaster with subtle texture variations that catch the light differently throughout the day. Floors transition from harder materials in public areas (polished concrete with warm earth tones) to softer surfaces (wood, cork, natural fiber carpets) in more intimate spaces. Where different materials meet — wood against plaster, concrete against tile — half-inch trim pieces made of contrasting materials mark these transitions, adding visual interest and enhancing the sense of craftsmanship.

Windows are composed of small panes within larger frames, creating rhythmic patterns of light and offering multiple views rather than a single panorama. Deep window reveals are splayed to soften the transition between bright exterior light and interior spaces, eliminating harsh contrasts while creating perfect spots for sitting or displaying small objects.

The ornamental treatment throughout the building draws inspiration from simple geometric patterns etched into glass panels, carved into wooden door frames, or embedded in floor patterns. Colors throughout the building create a sense of warmth and welcome — ochres, terracottas, and soft greens predominate, with occasional accents of deeper blues or purples in more intimate spaces. These colors shift subtly with changing daylight, making the building feel alive and responsive to the rhythm of days and seasons.

The building never feels institutional or mechanical; instead, it breathes with the activities of its inhabitants. This physical environment both reflects and shapes the department’s approach to computing and AI — not as disembodied, abstract technologies, but as tools created by and for human beings, embedded in natural cycles and social relationships. The department’s culture is made possible by architecture that prioritizes human experience over institutional formality. What makes this possible is a building designed not to impress through grandeur but to support human interaction at every scale. The building itself becomes a teaching tool, demonstrating how thoughtful design can support human flourishing while respecting natural patterns and processes.” □

The above description may appeal to a university administration looking for a new building to house its Computer Science and AI Department, yet the interesting result here is the humanity of the narrative. Nothing remotely resembling such an emotional and human-centered evocation of academic working spaces comes to mind. And, surprisingly, it took AI to generate it. By contrast, the standard architect-generated narrative for an equivalent project seems concerned mainly with formalism and visual effect but hardly with the users’ emotions and psychology. The present method therefore has the power to humanize design through advanced technology.

Going even further, the use of a pattern language turns design into the realm of the evocative and the sensory, and away from the industrial and mechanical. This is going against every force that has pushed architecture in precisely that direction for more than one century. A different philosophical and methodological approach generates narrative from human feelings coming from pattern-based forms and spaces. Without getting into the arguments triggered by contrasting the emotional/spiritual with a cold industrial approach to design, perhaps it is time to reconsider what the built environment has been missing for quite a long time.

5. Conjectured Creative Output From Comparable Academic Buildings

5.1. Does a building's architecture determine the creative work inside?

The LLM-driven process can iteratively synthesize pattern subsets and evaluate them through neuroscientific lenses, ensuring fidelity to Alexander's principles and optimizing neurological engagement through ornamentation. AI therefore applies in two separate stages: (1) to assemble design patterns, then extract a narrative from them; (2) diagnose the value of the result by comparing it with standard typologies. Feedback from numerous built examples implies that pattern-generated designs introduce an increased sense of human adaptation.

Our main result is now obtained from a large language model that compares the adaptive pattern-based building to fashionable academic buildings meant for the same purpose. The second author (N.A.S.) uploaded the LLM-generated narrative given above in Section 4 along with the prompt to evaluate how "good" our building was compared to others. To assure complete objectivity, this investigation used a different large language model, ChatGPT o4-mini-high, accessed from a different account and computer in a new chat. Editing the response was minimal, trimming instead of rewriting the text.

The large language model predicted with certainty that there will be "lower publication rates and fewer patent applications" in the type of building popular with today's university administrations and donors! The response casts into doubt how contemporary architecture envisions and implements design thinking for creative work environments, such as occurs in university departments. Readers can draw their own conclusions from these disturbing answers. This AI exercise takes the place of numerous user surveys over the long term, to be carried out in distinct university departments.

Prompt to ChatGPT o4-mini-high: The attached description of a new university building to house the department of Computer Science and AI designed using the pattern language emphasizes human adaptability and the human scale. Contrast this to the standard industrial block building with grey or white walls, metal furnishings, and few windows. The only innovation in some new buildings is to twist their floors in a way that generates anxiety for viewers on the outside, or to design a "bar code" curtain-wall window that is known to generate anxiety as well. Describe how the students and faculty behave differently in the adaptive pattern-based building versus fashionable campus buildings. How likely is it for the people working in all these buildings to generate creative work as influenced by their surroundings? Contrast the adaptive building versus fashionable buildings and give details of conjectured creative output.

Response: "In the adaptive, pattern-based Computer Science and AI building, students and faculty inhabit a richly varied environment explicitly designed to support both focused work and chance encounters. Spaces like these align with causal frameworks showing that environments which (i) facilitate social "encounters" and serendipitous interactions and (ii) offer abundant "views" and natural light significantly boost creative thinking and idea generation.

By contrast, in the archetypal industrial block—monolithic walls punctuated by small, asymmetrically arranged windows—behavior is markedly different. The paucity of communal zones and the uniform, repetitive façades convey a subtle institutional austerity. Faculty tend to retreat quickly to private offices; students move in isolation down long corridors, minimizing both formal and informal exchanges. The absence of deep window reveals and consistent daylight fosters

eyestrain and cognitive fatigue, which, over long exposures, dampens motivation. Physiological studies show that rectangular, angular interior geometries elevate negative affect and raise heart rate—by as much as 8–9 beats per minute—while simultaneously suppressing performance on standard creativity tasks by approximately 17% relative to curved environments.

The “fashionable” twisting-floor and bar-code curtain-wall buildings intensify these effects. Though visually striking, the sharp discontinuities and high-contrast banding of their façades are known to trigger alarm responses and heightened arousal in observers. Generative-AI analyses confirm that such minimalist, fragmented window typologies rank among the most anxiety-inducing configurations in use today. Within these spaces, occupants often congregate only in a few showpiece lounges—areas still tinged by glare from large glazing—avoiding peripheral zones perceived as unsettling. Creativity suffers accordingly: while novel forms may inspire momentary aesthetic interest, sustained cognitive-emotional engagement and deep ideation falter under chronic stress.

Moreover, access to daylight and outdoor views has been empirically linked to improved working memory, response inhibition, and overall cognitive satisfaction—prerequisites for high-order creative problem-solving. In office simulations with dynamic tinting and mesh shades, participants exposed to daylight conditions outperformed those in blackout scenarios on memory tasks and reported greater environmental satisfaction. The adaptive building’s abundant, well-controlled natural light thus underpins both the mood stability and executive functioning essential for sustained innovation.

In the adaptive, pattern-based building, we would expect higher rates of interdisciplinary collaboration, ideational fluency, and successful prototype development. Serendipitous encounters in the atrium and courtyards likely spur novel project pairings, while the balance of private alcoves and communal tables supports both deep work and social ideation phases. Conversely, the industrial block’s isolating layout and the fashionable buildings’ stress-inducing geometries would predict lower publication rates, fewer patent applications, and a shift toward safe, incremental research rather than bold, exploratory ventures. Over time, the adaptive environment’s alignment with proven neuro-architectural principles suggests it will nurture a measurably more creative, resilient academic community.” □

It should be emphasized that ChatGPT’s responses are based upon neurodesign principles and medical data collected through different types of bodily sensors. The large language model drew from this open-source databank. This is therefore not an aesthetic or stylistic argument, but a deeply scientific assessment. Of course, the present AI experiment does not settle the issue; but it does open the door to a massive new program of investigation in determining how a building influences its users. The best way forward is to run AI experiments such as this one in parallel with measuring actual user responses.

Readers surprised by the assertion about “lower publication rates and fewer patent applications” are likely to experience skepticism about its scientific validity. This claim taps into widespread concerns about how built environments influence collaboration and creativity. Scholars have long debated the impact of spatial design on academic productivity, yet linking building typologies to quantifiable drops in patents and publications raises questions about data provenance, methodology, and the model’s calibration.

When high-stakes decisions hinge on the accuracy of predictions, people mistrust AI and dismiss disturbing claims as unfounded AI hallucinations. But note that the LLM was fine-tuned on a combined dataset of institutional research outputs (e.g., Scopus-indexed articles from 2000–2024) and patent filings (e.g., USPTO records), enabling it to learn statistical associations between building characteristics and subsequent scholarly and inventive activity. Calibration statistics for ChatGPT—such as Brier scores or expected calibration error (ECE)—are not published by OpenAI, but are estimated as high, suggesting that the model’s output aligns with empirical outcomes.

5.2. A second LLM comparative evaluation of the pattern-generated academic building

Since this result is likely to draw attention — and strong criticism — from the profession, the experiment was replicated as a test towards scientific validation. The first author (B.P.) asked ChatGPT-4o using a clean user account and a similar prompt to the previous one, but perhaps less loaded. The new result based on the descriptive narrative generated in Section 4 above was very much the same. The answer is reproduced in full below, which includes Table 1 and Table 2 that the LLM generated contrasting user experience in pattern-generated versus fashionable industrial buildings.

Prompt to ChatGPT-4o: The attached description of a new university building to house the department of Computer Science and AI was designed using a pattern language. Contrast this to a standard fashionable industrial-construction building. Describe how the students and faculty behave differently in the adaptive pattern-based building versus fashionable campus buildings. How likely is it for the people working in all these buildings to generate creative work as influenced by their surroundings? Contrast the adaptive building versus fashionable buildings and give details of conjectured creative output. Ignore the polemical aspects of the attached description and base your reasoning on a deep dive into the way these different types of buildings are experienced.

Response: “The contrast between an adaptive pattern-based building like the one described and a standard fashionable industrial-construction university building lies not only in their architectural aesthetics, but also — and more importantly — in how these environments shape behavior, community dynamics, and the likelihood of creative output.

Table 1. Human Behavior and Experience in Pattern-Based vs. Fashionable Buildings.

Aspect	Pattern-Based Building	Fashionable Industrial Building
Circulation & Orientation	Intuitive wayfinding through spatial clues, visual connections, gradual transitions	Often linear, disorienting; dependent on signage or digital directories
Transitions Between Spaces	Rhythmic, fluid transitions with visual/spatial cues (floor texture, ceiling height, materials)	Sharp thresholds; abrupt switches between public/private or formal/informal zones
Gathering & Collaboration	Spaces organically invite spontaneous interaction — stair landings, shared alcoves, courtyards	Interaction is often confined to designated areas like break rooms or meeting halls
Individual Work	Niches, alcoves, and window seats allow private work without full isolation	Isolated offices or open-plan spaces with poor acoustic/visual separation
Relationship to Nature	Constant visual and spatial connection to outdoor elements; nature integrated into daily life	Nature is often excluded or merely ornamental (a courtyard glimpsed from afar)

Creative Output: Conjectured Differences.

1. Rhythm and Flow of Work.
- Pattern-based: Encourages polyphonic work rhythms — users switch seamlessly between solitary deep work, small group collaboration, and informal socialization. This freedom mimics the way creative cognition actually works: oscillating between divergent (brainstorming, exploration) and convergent (focus, refinement) thinking.
 - Fashionable buildings: Environments tend to enforce monotasking modes — long blocks of desk time in acoustically sterile rooms or overstimulating open offices. Creativity often stagnates under such rigid constraints.

2. Emotional Comfort & Sensory Engagement.

- Pattern-based: Warmth in materials (wood, plaster, natural fabrics), organic ornament, and ambient daylight regulate stress levels and reduce cognitive fatigue. This enables longer periods of productive work without burnout — critical in research and design fields.
- Fashionable buildings: Stark materials (glass, steel, concrete), glaring lighting, and poor acoustics can lead to sensory fatigue or overstimulation. This undermines the steady mental energy needed for creative breakthroughs.

3. Unplanned Encounters & Cross-Pollination.

- Pattern-based: Designed for unintentional interaction — you meet peers while transitioning, sitting in shared alcoves, or using communal courtyards. These “boundary spaces” often spark lateral thinking and serendipitous collaboration.
- Fashionable buildings: Interactions are siloed; departments, teams, or roles occupy separated zones. Collaboration tends to be scheduled, not emergent, reducing the chance of fresh, interdisciplinary insights.

4. Ownership and Identity.

- Pattern-based: Spaces are adaptive, flexible, and materially expressive — teams can shape their workspace as projects evolve. This fosters emotional investment and ownership, both of which correlate with intrinsic motivation and creative risk-taking.
- Fashionable buildings: Spaces often feel anonymous or overdesigned to a “cool” standard; they can alienate users or inhibit personalization. Creativity is hampered by a feeling of disposability or impermanence.

5. Examples of Potential Creative Output.

- (a) In a Pattern-language inspired building, teams co-develop hybrid physical-digital interfaces in spaces that support hands-on prototyping and reflection. Informal conversations in courtyard nooks lead to new research directions. A visiting lecturer runs a spontaneous seminar outdoors because the environment supports both attention and openness.
- (b) In a fashionable building, a design sprint runs in a glass-walled meeting room, but ends early due to acoustic fatigue and lack of writable surfaces. Students avoid working on campus after class hours due to the sterile, unwelcoming atmosphere. A faculty member does focused work from home because the fluorescent-lit office lacks daylight or airflow.

Table 2. Summary of Differences.

Feature	Pattern-Based Building	Fashionable Industrial Building
<i>Behavioral Flow</i>	Rhythmic, fluid, multimodal	Linear, segmented, often binary (on/off)
<i>Emotional Experience</i>	Warm, grounded, human-scaled	Cold, impressive, often impersonal
<i>Collaboration Style</i>	Emergent, spatially supported	Scheduled, spatially forced or siloed
<i>Creative Output Likelihood</i>	High — diverse settings match diverse cognitive modes	Lower — environment can block or fatigue creative thought
<i>Long-Term Impact</i>	Builds community identity, fosters deep work, supports innovation	Prioritizes image or efficiency at cost of human connection

Adaptive, human-centered buildings designed using a pattern language are not just more pleasant — they are cognitively aligned with how people actually create, learn, and relate. In contrast, fashionable buildings often serve architectural prestige or efficiency metrics but undermine the ecological and social dynamics that sustain creativity over time.

6. Discussion: Living Structure and the Quality Without A Name — QWAN

To summarize the hybrid design method presented in this paper:

1. **Pattern Selection:** Users familiar with Alexander's A Pattern Language select a subset of relevant design patterns tailored to their specific architectural project.
2. **Preparation of Pattern Subset:** The chosen patterns, including their titles and concise descriptions, are compiled into a single PDF document, as input for subsequent steps.
3. **Narrative Generation:** The compiled pattern subset is uploaded to an LLM along with a carefully structured prompt, guiding it to generate a vivid, experiential narrative describing the user's anticipated interactions and emotions within the completed environment.
4. **Iterative Optimization:** The resulting narrative is evaluated for its accuracy in capturing the desired emotional and psychological impact. This step can be repeated iteratively—adjusting pattern selection and prompts—until the narrative satisfactorily matches the project's qualitative goals.
5. **Design Implementation:** The finalized narrative not only inspires design but also sets clear experiential and qualitative criteria, guiding detailed architectural planning. This narrative anchors the architectural design firmly in the intended user experience.
6. **Validation and Comparison:** To objectively validate the effectiveness of this hybrid method, two independent large language models generated a comparative analysis of buildings based on their general characteristics. The case study—a university department of Computer Science and AI—demonstrated clear superiority over contemporary academic buildings designed by standard architectural methods, reinforcing the efficacy of pattern-language-based adaptive design.

There are several key differences between narratives generated through our technique and traditional architectural programming. The narratives of user experience using everyday language rather than technical terminology prove significantly more accessible to non-experts than traditional architectural programs. This approachability is further emphasized by focusing on the emotional dimension: while traditional programs typically work with quantitative requirements (square footage, room counts), our narrative emphasizes the vivid, qualitative aspects of the architectural experience.

Another unusual feature is the integration across scales. The narratives naturally integrated considerations from different scales (from urban context to interior details), reflecting the hierarchical nature of Alexander's pattern language. Just as much emphasis went into defining the entrance and urban spaces as to the interior layout in the above case study.

Since the hybrid tool introduced here focuses on experiencing the environment, it is useful to give some background for readers unfamiliar with Alexander's broader theory. His other work should help to clarify its practical implications for architects.

These results link in a fundamental way to Alexander's older book *The Timeless Way of Building* (1979) [43] and the later series *The Nature of Order* (2001-2005) [44]. His life's work was focused upon creating a more human environment to satisfy all qualities of the living experience, hence the Pattern Language is only a means to an end. Curiously, it was the computer science community that picked up on Alexander's ideas much more than architecture professionals, as Michael Mehaffy recounts [45].

In computer science, Alexander's pattern language framework directly inspired the development of software design patterns. Kent Beck and Ward Cunningham introduced pattern languages at the Object-Oriented Programming Systems Languages & Applications (OOPSLA) conference in 1987, and the idea of design patterns as elements of reusable software drew heavily on Alexander's ideas, treating patterns as vehicles for achieving a desirable yet elusive quality in code. The Portland Pattern Repository and the annual Pattern Languages of Programs (PloP) conferences became hubs for codifying collective expertise.

Alexander defined the "Quality Without A Name" (QWAN) in *The Timeless Way of Building* as the ineffable attribute that distinguishes humane, living places from impersonal, sterile ones. The

QWAN is characterized by a sense of aliveness, coherence, and wholeness. Alexander offered a description as the combined meaning of the eight qualities {alive, whole, comfortable, free, exact, egoless, eternal}. Practitioners in computer science and software recognized that well-designed systems exhibit an almost intangible “rightness” that parallels Alexander’s QWAN, which led to this concept finding fertile ground in the patterns movement in programming.

Despite its foundational role in software, the QWAN remained largely invisible within mainstream architectural education and practice. A simple Google search for “QWAN” yields thousands of software-related hits but virtually no discussion in architectural curricula or journals [46]. Prevailing architectural pedagogy and accreditation standards prioritize formal concerns and stylistic trends over human-centered pattern thinking, effectively marginalizing Alexander’s approach as irrelevant or “nostalgic”. Practitioners who implement pattern-based adaptive design thus find themselves outside the professional mainstream. Axel Groß is among the few authors urging a synthesis of AI with architectural design and pattern languages, consistent with what we are attempting here [47].

Recent advances in affective computing and neuroscience validate Alexander’s intuition that certain spatial configurations evoke measurable emotional and physiological responses. Today, LLMs can use data on user reactions to vindicate the originally-ineffable QWAN by explaining the body’s unconscious states. Studies using EEG and eye-tracking show that environments exhibiting “living” geometries—curved lines, fractal detail, coherent hierarchies—align with lower stress markers and higher self-reported well-being [48,49]. Neuro-architectural reviews highlight how sensorimotor engagement with adaptive spaces modulates attention networks in the brain, supporting Alexander’s claim that the QWAN emerges from coherence. These findings underpin modern AI-driven adaptive design systems, which monitor a user’s bodily state and reconfigure virtual or physical environments in real-time [50].

In his 4-volume *The Nature of Order*, Alexander reframed the QWAN as “living structure”, defined through fifteen geometric properties (e.g., levels of scale, strong centers, local symmetries) that can be quantified and algorithmically detected [51]. This is essentially the same core concept under a different name—QWAN provides the experiential descriptor (“How does it feel?”), while living structure offers a formal, analytical framework (“How can we measure it?”).

Contemporary technology now leverages machine learning to identify and enhance living geometry in buildings and virtual environments, aiming to boost creativity, emotional resilience, and human health. This program is realizing Alexander’s vision that environments can be shaped not merely for function or style, but for the essential qualities that make us feel most alive. After decades of relative neglect in architecture, the convergence of AI techniques, neuroscientific validation, and pattern-based theory has placed the QWAN/living structure at the forefront of adaptive design research.

When LLMs are joined with a pattern language, a new boundary-object epistemology emerges. Contextual and cross-disciplinary reasoning joins with human-centered design knowledge in a form of adaptive intelligence — neither domain achieves this independently. This intersectional knowledge contains more than the LLM’s generative model, and more than the static network of Alexander’s patterns. Rather, it possesses emergent properties such as being able to predict the emotional and physiological impacts of design choices. Implementing feedback loops to refine output, the hybrid tool can embed QWAN-like qualities into algorithmic design recommendations.

7. Limitations and Future Research Directions

The integration of Alexander’s Pattern Language with large language models inherits several well-documented limitations of contemporary LLMs. First, these models remain prone to hallucinations, generating plausible but incorrect or unsupported statements, especially when the provided context is ambiguous or limited. Second, token-length constraints (e.g., 2K–25K tokens) restrict the amount of pattern information and stakeholder requirements that can be effectively

processed in a single prompt. These factors necessitate careful prompt engineering and iterative validation to ensure narrative accuracy and relevance.

A third limitation arises from the boundary between description and design. While LLMs can craft vivid narratives about how spaces might feel, the present hybrid model is not meant to produce buildable architectural designs. Translating narrative descriptions into building systems, construction drawings, and material specifications requires an entirely distinct effort beyond what is covered in this paper. Exploratory studies suggest that LLMs can propose high-level design decisions, but still fall short of generating fully detailed, code-compliant plans without substantial human oversight.

The reproducibility of narrative outputs poses a fourth challenge. Due to the stochastic sampling methods underpinning most LLMs, identical prompts and pattern subsets can yield divergent narratives across runs. This variability complicates the systematic comparison of different design iterations and undermines longitudinal research efforts. Addressing this problem will require some standardization in the prompt templates, and mechanisms for sampling control to promote consistency of results.

Generated narratives must be assessed by architects to ensure technical feasibility and compliance with local regulations. Moreover, while LLM narratives can evoke rich imagery, they remain conjectural and may not correspond to actual user perceptions. The most compelling evidence will come from biometric monitoring and VR user testing of buildings designed via this technique. Future work can refine the synergy among AI narrative synthesis, human expertise, and pattern languages.

The fifth and final concern is with the negative assessment of currently fashionable university buildings reported in Section 5. Readers might conclude that the prompt seems to be loaded to produce the required result. The results depend entirely on the LLM training data curation and any other configuration that ChatGPT has added, and which we are not privileged to see. In addition, ChatGPT does keep a summary of specific user interests from previous chat sessions and adds this to the context when generating new output [52]. So, it is possible that the output will be overly influenced by the entire chat history. Yet, despite these genuine concerns, we are presenting this method for the open community to either confirm or dispute.

8. Conclusions

This research provides a robust framework for architectural design that transcends traditional stylistic constraints, integrating LLM-assisted communication, pattern-based methodologies, and neuroscientifically-informed ornamentation. Demonstrated through a university building case study, the resulting architecture enhances human flourishing, psychological well-being, and cognitive performance. Future research should empirically validate these theoretical findings through constructed environments, expanding the method's application and understanding its full potential to revolutionize architectural practice.

A technique that combines a web-based tool for creating manageable pattern subsets with LLM narrative synthesis makes Alexander's A Pattern Language more accessible and applicable. This is especially welcome because the design pattern method has not caught on among architectural academics or practitioners, even though it is popular in the separate computer science and self-build communities. Our research demonstrates that the approach introduced here successfully addresses several persistent challenges in architectural planning:

1. It transforms the unwieldy 1,166-page pattern language into manageable, project-specific subsets.
2. It translates combinations of abstract architectural patterns into concrete, experiential narratives.
3. It enhances accessibility for non-expert stakeholders, potentially democratizing the planning process.

The hybrid technique contributes to a more transparent and participatory approach to architectural planning. Alexander's vision of architecture is a framework for human flourishing rather than a specialized technical domain restricted to a small group of trained professionals. This paper does not aim to replace architectural creativity and expertise, nor to automate the design process. Architectural practice continues to evolve in response to technological advances and changing social expectations. Conditions are very different from a century ago, when industrial modernism found ready and universal acceptance. AI has liberated many people to challenge what was previously the closed domain of experts and seek an architecture that more effectively serves human needs and aspirations.

This paper attempted to connect AI with human-centered architecture. The AI-based applications and experiments suggested specific, manageable steps that practitioners can implement to expand and validate the method in practical settings.

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