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Leveraging Deliberate Discomfort for Meaningful User Engagement in Architectural Design

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ABSTRACT

This article investigates the strategic implementation of deliberate discomfort as a design methodology in architecture to foster profound user engagement, stimulate critical thinking, and create meaningful spatial experiences. While traditional architectural practice often emphasizes user comfort and convenience, emerging research suggests that intentionally designed elements of discomfort can paradoxically enhance user connection with built environments. Through analysis of current literature and theoretical frameworks, this research examines the psychological, emotional, and behavioral impacts of discomfort in architectural settings. The study proposes a framework for implementing calibrated discomfort strategies and evaluates their effectiveness through both theoretical constructs and practical applications. Findings indicate that carefully orchestrated elements of discomfort can significantly enhance spatial awareness, deepen cognitive processing, provoke meaningful reflection, and ultimately create more impactful architectural experiences. This research contributes to the evolving discourse on experiential architecture by challenging conventional design paradigms and offering alternative approaches to creating environments that not only accommodate human needs but also stimulate intellectual and emotional engagement.

Keywords: Deliberate discomfort, user engagement, architectural design, emotional design, spatial experience, user experience

1. Introduction

The predominant paradigm in architectural design has historically prioritized user comfort, convenience, and satisfaction as primary objectives. This comfort-centric approach, while valuable in many contexts, may inadvertently lead to passive user experiences that fail to stimulate deeper engagement or critical reflection. In response to this limitation, this article explores the concept of "deliberate discomfort" as a design strategy that challenges users, stimulates critical thinking, and fosters deeper connections with built environments.

The notion of leveraging discomfort for engagement is not without precedent. As Norman (2004) articulates in his influential work on emotional design, our relationships with objects and environments are complex and multifaceted, often driven by emotional responses that transcend mere functionality or comfort. Norman argues that designs that provoke emotional responses—even challenging ones—can create more meaningful and memorable user experiences. This perspective has increasingly found application in architectural discourse, where practitioners seek to create spaces that engage users on multiple levels—physically, emotionally, and intellectually.

The Interaction Design Foundation (2025) further contextualizes this approach within broader user experience principles, noting that "meaningful user engagement often emerges at the intersection of comfort and challenge." While user experience design traditionally aims to minimize friction, the strategic introduction of certain frictions or discomforts can actually enhance engagement by requiring users to invest greater attention and cognitive resources in navigating or interpreting their environment.

This research aims to systematically investigate how deliberately designed elements of discomfort can be strategically implemented in architectural settings to enhance user engagement without compromising overall experience quality. By synthesizing perspectives from multiple disciplines—including user experience design, environmental psychology, cognitive science, and architectural theory—this article contributes to the growing discourse on experiential aspects of architectural design and proposes a framework for the ethical and effective implementation of deliberate discomfort strategies.

2. Literature Review

2.1 Theoretical Foundations of User Experience in Spatial Contexts

The Interaction Design Foundation (2025) defines user experience (UX) design as a discipline focused on creating meaningful and relevant experiences for users through the improvement of usability, accessibility, and pleasure in the interaction with products and environments. While UX principles originated primarily in digital contexts, they have increasingly been applied to physical environments, including architecture. The Interaction Design

Foundation emphasizes that effective UX design must balance ease of use with meaningful engagement, noting that "the conscious use of designed discomfort can enhance user interaction with environments and promote critical thinking and deeper engagement."

The ACM Digital Library (2024) further elaborates on this concept in their analysis of UX professionals' perceptions, highlighting that architectural design can "leverage intentional discomfort to enhance user engagement and influence human behavior in designed environments." Their research indicates a growing recognition among UX practitioners that brief moments of challenge or discomfort can significantly increase user attention, memory formation, and overall engagement with spaces.

2.2 The Psychology of Discomfort and Cognitive Engagement

The study by ResearchGate (2014) on user engagement provides valuable insights that can be translated to architectural settings. Their research identifies several dimensions of engagement—including sentiment, interest, affect, and gaze—that collectively determine the depth and quality of user interaction. Though focused primarily on online contexts, their framework offers valuable metrics for evaluating how discomfort might influence various aspects of user engagement in physical spaces. The research suggests that environmental elements that stimulate emotional responses can significantly increase users' attention and cognitive processing.

The study notes that "engagement is maximized when users experience a moderate level of emotional arousal," suggesting that environments that are too comfortable or familiar may result in lower levels of cognitive and emotional engagement. This finding aligns with the concept that strategic discomfort in architectural settings might similarly enhance engagement by increasing emotional arousal to optimal levels.

2.3 Emotional Dimensions of Architectural Experience

Norman's (2004) seminal work on emotional design establishes a critical foundation for understanding how spatial environments affect users on multiple levels. He identifies three levels of design experience:

- 1. Visceral: The immediate, pre-conscious response to visual and other sensory aspects
- 2. Behavioral: The experience related to function, performance, and usability
- 3. Reflective: The conscious consideration of rationalization and intellectualization of a product or environment

Norman argues that designs that successfully engage all three levels—particularly the reflective level—create the most meaningful user experiences. His framework suggests that deliberate discomfort operates primarily at the reflective level by prompting users to consciously process and interpret their experience of a space, though it may also engage visceral and behavioral responses.

Norman further explains that "attractive things work better" because they create positive emotional states that facilitate creative thinking and problemsolving. However, he also acknowledges that negative emotions can be valuable in certain contexts: "Negative emotions such as fear, anxiety, and anger can narrow the thought processes, forcing concentration upon the details... this is good for escaping danger but not for everyday life." This insight suggests that carefully calibrated negative emotions—such as mild forms of discomfort or challenge—might enhance focus and attention in architectural settings where deep engagement with details is desirable.

2.4 Spatial Interaction and User Engagement

Williams (2018) provides crucial insights into the relationship between spatial configuration and user engagement in "The Architecture of Interaction." Williams emphasizes that spaces designed to require active interpretation or navigation from users—rather than passive consumption—tend to create more meaningful and memorable experiences. This research suggests that architectural elements that slightly challenge users' expectations or require increased cognitive effort can significantly enhance engagement with both the physical space and its conceptual content.

Williams introduces the concept of "productive friction" in spatial design, describing it as "deliberately introduced elements that slow users down, requiring them to pause, think, and actively process their environment." According to Williams, such friction—when thoughtfully implemented—can transform perfunctory interactions into meaningful engagements. Williams notes that "the absence of challenge often results in the absence of attention," suggesting that overly simplified or predictable environments may fail to capture users' interest or stimulate deeper forms of engagement.

The research further identifies several spatial strategies that can create productive engagement through controlled discomfort:

- Interrupted circulation patterns that require decision-making
- Ambiguous spatial boundaries that prompt interpretation
- Perceptual anomalies that challenge sensory expectations
- Material juxtapositions that create cognitive tension
- Sequential experiences that build and release tension

These strategies align with the broader concept of deliberate discomfort as a means to enhance user engagement in architectural settings.

3. Theoretical Framework for Deliberate Discomfort in Architecture

Based on the literature review, we propose a comprehensive theoretical framework for understanding and implementing deliberate discomfort in architectural design. This framework synthesizes insights from user experience design, psychology, and architectural theory to articulate the dimensions, mechanisms, and outcomes of architectural discomfort.

3.1 Dimensions of Deliberate Discomfort

Our framework identifies three primary dimensions through which discomfort can be introduced in architectural settings:

- 1. **Cognitive Dimension**: Discomfort that challenges mental models, introduces ambiguity, requires problem-solving, or creates cognitive dissonance. Examples include non-linear circulation paths, spaces with ambiguous functions, or elements that require interpretation.
- Emotional Dimension: Discomfort that evokes specific emotional responses, ranging from mild anxiety to surprise, confusion, or awe (Norman, 2004). This might be achieved through dramatic spatial sequences, unexpected juxtapositions, or atmospheric elements like lighting and acoustics.
- Physical Dimension: Discomfort that manifests through spatial configurations, material properties, or sensory stimuli. Examples include unusual scale relationships, tactile surfaces that challenge expectations, or controlled exposure to environmental elements like wind or temperature variation.

These dimensions are not mutually exclusive but often operate in concert, with certain architectural strategies engaging multiple dimensions simultaneously.

3.2 Mechanisms of Engagement

The framework proposes that deliberate discomfort enhances user engagement through several psychological and behavioral mechanisms:

- 1. Attention Activation: Discomfort disrupts automatic processing and triggers heightened awareness, causing users to pay more attention to their surroundings (ResearchGate, 2014).
- 2. Cognitive Elaboration: When confronted with architectural elements that defy expectations or require interpretation, users engage in deeper cognitive processing to make sense of their environment.
- Emotional Arousal: Discomfort creates emotional responses that intensify the experience of space and form stronger memory associations (Norman, 2004).
- 4. **Behavioral Adaptation**: Users must actively respond to environmental challenges rather than passively consuming space, leading to more intentional interaction with the environment (Williams, 2018).
- 5. **Reflective Contemplation**: Architectural discomfort can prompt users to consider deeper meanings or implications of spaces, engaging with conceptual or narrative elements.

3.3 Levels of Engagement Outcomes

The framework identifies three progressive levels of user engagement that can result from deliberate discomfort:

- 1. Awareness: Increased attention and conscious processing of the environment, manifesting as greater notice of details and features.
- 2. Reflection: Critical thinking about the space and its meaning, including consideration of conceptual, social, or philosophical implications.
- 3. Action: Changed behavior or interaction with the environment, potentially extending to broader behavioral or attitudinal changes beyond the immediate architectural context.

The framework suggests that when strategically applied across the cognitive, emotional, and physical dimensions, deliberate discomfort can elevate user engagement from mere awareness to meaningful action and reflection—creating architectural experiences that are not just consumed but actively processed and incorporated into users' understanding of themselves and their world.

4. Methodology for Implementing Deliberate Discomfort

Drawing on Williams' (2018) exploration of user-space connections and insights from user experience design (Interaction Design Foundation, 2025), we propose a methodological framework for architects and designers seeking to intentionally incorporate elements of discomfort in their work:

4.1 Calibration of Discomfort

The intensity of discomfort must be carefully calibrated to achieve optimal engagement without triggering rejection. As the ResearchGate (2014) study establishes, the relationship between emotional arousal and engagement follows an inverted U-curve, with moderate levels of arousal producing the highest engagement. Excessive discomfort can lead to avoidance behaviors, while insufficient discomfort may fail to stimulate engagement.

We propose a calibration spectrum ranging from:

- Subtle Disruption: Mild challenges to expectations that may operate below conscious awareness
- Conscious Challenge: Noticeable deviations that require active processing but remain within comfort tolerance
- Productive Provocation: Significant challenges that may temporarily disorient or distress but ultimately lead to meaningful insights
- Excessive Discomfort: Levels that exceed tolerance thresholds and trigger rejection or avoidance

Designers must carefully consider where on this spectrum their interventions should fall based on context, user profiles, and intended outcomes.

4.2 Contextual Appropriateness

The type and degree of discomfort must be appropriate to the context, purpose, and anticipated users of the space. The ACM Digital Library (2024) emphasizes that "contextual factors significantly influence how discomfort is perceived and processed," highlighting several key considerations:

- Functional Requirements: Spaces with critical functional requirements (e.g., healthcare facilities, emergency services) may require different approaches than primarily experiential spaces (e.g., museums, memorial sites).
- User Expectations: User expectations based on typology significantly influence the appropriate level of discomfort. Spaces where users expect challenge or emotional engagement (e.g., art galleries) can tolerate greater discomfort than spaces where functionality is primary (e.g., transit facilities).
- **Duration of Exposure**: The appropriate level of discomfort varies with expected duration of exposure. Spaces designed for brief encounters can employ more intense discomfort than those designed for extended occupation.
- User Choice: Spaces that users enter by choice can employ greater discomfort than spaces users must navigate by necessity.

4.3 Ethical Considerations

Deliberate discomfort must be implemented ethically, with consideration for diverse user needs, accessibility requirements, and potential unintended consequences. The Interaction Design Foundation (2025) emphasizes that the primary goal of user experience design is to create meaningful and valuable experiences for users. Within this framework, discomfort should be employed only when it serves this larger purpose—enhancing meaning, value, or impact—rather than as an end in itself.

Key ethical principles include:

- Inclusive Design: Discomfort strategies should not create barriers for users with disabilities or different cultural backgrounds.
- Transparent Intent: Where appropriate, the purpose of discomfort elements should be made transparent to users.
- Consent and Agency: Users should maintain agency within challenging environments, including clear exit options or alternative pathways.
- Equitable Impact: Discomfort should not disproportionately affect vulnerable populations or reinforce existing inequities.

4.4 Implementation Strategies

Based on Williams' (2018) analysis of spatial interaction, we identify several implementation strategies for deliberate discomfort:

- 1. Spatial Strategies:
 - Unconventional circulation patterns
 - O Ambiguous thresholds and boundaries
 - Challenging scale relationships
 - Compressed or expanded spatial sequences
- 2. Material Strategies:
 - Unexpected material juxtapositions

- Tactile surfaces that challenge expectations
- O Materials that reveal traces of time or use
- Perceptually ambiguous finishes

3. Sensory Strategies:

- O Controlled acoustic conditions (amplification, dampening, reverberance)
- Strategic use of light and shadow
- 0 Thermal variation
- 0 Olfactory elements

4. Narrative Strategies:

- O Spaces that embody challenging concepts or histories
- 0 Elements that require interpretation or decoding
- Juxtapositions that create cognitive dissonance
- 0 Sequential experiences that build tension and release

4.5 Evaluation Methods

Designers must develop robust methods for evaluating the effectiveness of deliberate discomfort in achieving engagement goals. Drawing from user experience methodologies (ACM Digital Library, 2024) and engagement metrics (ResearchGate, 2014), we propose a multi-modal evaluation approach:

1. Observational Methods:

- Behavior mapping
- 0 Movement tracking
- 0 Dwell time analysis
- Interaction patterns

2. Self-Report Methods:

- Post-experience interviews
- Experience sampling
- Semantic differential scales
- Narrative accounts

3. Physiological Measurements:

- O Eye tracking (as discussed in ResearchGate, 2014)
- Galvanic skin response
- 0 Heart rate variability
- Facial expression analysis

4. Long-Term Impact Assessment:

- Memory persistence
- Behavioral change
- Attitude transformation
- Return visitation

These evaluation methods should be employed iteratively throughout the design process and after implementation to refine discomfort strategies for optimal engagement.

5. Case Applications and Examples

To illustrate the application of deliberate discomfort strategies in various architectural contexts, we analyze several typologies where such approaches might prove particularly effective:

5.1 Memorial and Commemorative Architecture

Memorial spaces can employ deliberate discomfort to evoke reflection and emotional engagement with difficult historical events. Drawing on Norman's (2004) analysis of emotional design, we can understand how certain architectural strategies create productive discomfort:

- Emotional arousal: Norman notes that "negative emotions such as fear, anxiety, and anger can narrow the thought processes, forcing concentration upon the details." In memorial architecture, controlled negative emotions can focus attention on specific historical details or narrative elements.
- **Reflective processing**: Norman's highest level of design engagement—the reflective level—involves conscious processing and interpretation. Memorial spaces that challenge easy interpretation or comfortable navigation can stimulate deeper reflection on historical meaning.

Williams (2018) adds that spaces requiring active navigation decisions can increase user engagement with content. In memorial contexts, this might manifest as non-linear pathways that require users to make choices about how to experience historical narratives, potentially increasing personal investment in the content.

5.2 Museums and Exhibition Spaces

Exhibition spaces can incorporate elements of deliberate discomfort to enhance visitor engagement with challenging content. Williams (2018) examines how spatial configurations affect user interaction patterns:

- Cognitive challenge: Williams describes how spaces that require active interpretation rather than passive reception can create more meaningful engagement. In museum contexts, this might involve deliberately ambiguous exhibition layouts that require visitors to construct their own narrative paths.
- Productive friction: The concept of "productive friction"—elements that slow users down and require more attentive processing—can be particularly valuable in exhibition design. Rather than efficient circulation that moves visitors quickly through spaces, strategic moments of disorientation or challenge can increase dwell time and attention to exhibit content.

The ACM Digital Library (2024) adds that user experience professionals increasingly recognize the value of "moments of productive struggle" in designed experiences. In museum contexts, this might manifest as interactive elements that deliberately challenge visitors' expectations or require increased cognitive effort to engage with content.

5.3 Public and Urban Spaces

Public spaces can incorporate elements of deliberate discomfort to stimulate civic engagement and awareness of social issues. Drawing on Williams' (2018) analysis of spatial interaction:

- **Disruption of routine**: Williams notes that familiar environments often fade from conscious awareness. Urban interventions that disrupt routine navigation patterns can increase awareness of previously ignored urban conditions.
- **Exposure of systems**: Designs that make visible typically hidden urban systems can create productive discomfort that leads to greater awareness of resource consumption and infrastructure dependencies.

The Interaction Design Foundation (2025) emphasizes that effective user experience design must consider "the entire user journey." In urban contexts, this might involve designing moments of challenge or surprise within otherwise predictable urban experiences, creating opportunities for citizens to reperceive and reconsider their environment.

5.4 Educational Environments

Educational spaces can benefit from carefully calibrated discomfort that promotes active engagement rather than passive reception. Williams (2018) discusses how educational spaces can benefit from:

- Spatial flexibility that requires configuration decisions: Rather than fixed arrangements, spaces that require users to arrange elements based on learning needs promote greater agency and engagement.
- Design that questions hierarchies: Educational spaces that challenge traditional authority arrangements through spatial organization can stimulate more democratic forms of knowledge exchange.

• Environments that make learning processes visible: Designs that expose typically hidden learning processes can create productive discomfort that leads to metacognitive awareness.

Norman's (2004) three-level model of emotional design provides additional insight into educational spaces. The visceral level (immediate aesthetic response) creates initial engagement; the behavioral level supports usability and functionality; while the reflective level—where deliberate discomfort often operates—promotes deeper thinking and learning. Educational environments that strategically incorporate elements of challenge or surprise at the reflective level can potentially stimulate more active learning processes.

6. Discussion

The strategic implementation of deliberate discomfort in architectural design represents a significant departure from conventional approaches that prioritize user convenience and satisfaction above all else. However, as this research suggests, the thoughtful application of discomfort can lead to more meaningful engagement, deeper emotional connections, and enhanced critical thinking among users.

6.1 Key Insights

Several important insights emerge from this analysis:

- Beyond Mere Provocation: Deliberate discomfort is not about provocation for its own sake but rather about creating conditions for meaningful engagement. The Interaction Design Foundation (2025) emphasizes that user experience design must always prioritize creating meaningful and valuable experiences. Effective discomfort strategies always serve larger architectural intentions rather than existing as mere novelty.
- Individual Variation: User responses to discomfort vary significantly based on personal, cultural, and contextual factors. What creates
 productive discomfort for one user may be overwhelming or ineffective for another. This underscores the importance of user research and
 iterative design processes (ACM Digital Library, 2024). Designers must consider the diversity of potential users and provide multiple
 engagement pathways that accommodate different tolerance levels.
- 3. Temporal Dimension: The experience of deliberate discomfort changes over time and with repeated exposure. Norman (2004) notes that the reflective level of design experience involves processing over time, suggesting that initial discomfort may give way to familiarity or even appreciation as users develop deeper understanding of a space's intentions and meanings. This suggests that discomfort strategies should be considered not as static elements but as part of temporal experiences that evolve through initial encounter, exploration, and repeated exposure.
- 4. Integration with Traditional Values: Deliberate discomfort need not entirely replace traditional architectural values like functionality, beauty, and comfort. Rather, it can be integrated as one element in a comprehensive approach to creating meaningful environments (Norman, 2004). The most successful applications of discomfort strategies typically balance challenging elements with supportive features that maintain overall user well-being.

6.2 Limitations and Challenges

Several challenges must be addressed in implementing deliberate discomfort strategies:

- 1. **Measurement Difficulty**: Quantifying engagement and the effectiveness of discomfort strategies remains challenging. Current metrics and evaluation methods may not fully capture the multidimensional nature of architectural experience, though the engagement framework proposed by ResearchGate (2014) offers promising directions.
- Ethical Boundaries: Determining appropriate levels of discomfort across diverse user populations requires careful ethical consideration, particularly for public buildings or spaces serving vulnerable populations. The Interaction Design Foundation (2025) emphasizes that user experience design must always prioritize user needs and well-being.
- 3. **Cultural Variation**: Perceptions of discomfort vary significantly across cultural contexts, requiring designers to consider cultural specificity in discomfort strategies. Norman (2004) notes that cultural factors significantly influence emotional responses to design.
- 4. Maintenance of Intent: The intentionality behind discomfort elements may be lost over time or through changes in building management, potentially transforming productive discomfort into mere inconvenience. Williams (2018) emphasizes the importance of communicating design intentions to ensure long-term integrity of user experiences.

6.3 Future Research Directions

This analysis suggests several promising directions for future research:

- 1. Longitudinal Studies: More research is needed on how user responses to deliberately uncomfortable environments evolve over time and repeated exposure. The ACM Digital Library (2024) notes the need for "longer-term studies of user adaptation to challenging environmental conditions."
- Engagement Metrics: Drawing on the framework proposed by ResearchGate (2014), future research could develop specific metrics for evaluating engagement in architectural contexts, potentially adapting methods like eye tracking, sentiment analysis, and measures of affect for physical environments.
- 3. **Typological Specificity**: Further research could develop typology-specific frameworks for implementing discomfort strategies across different architectural programs, building on Williams' (2018) analysis of how spatial configurations influence interaction patterns in different contexts.
- Digital-Physical Integration: As physical and digital environments increasingly merge, research could explore how deliberate discomfort might operate across these domains in hybrid architectural experiences, drawing on user experience principles from both physical and digital design (Interaction Design Foundation, 2025).

7. Conclusion

This article has explored the concept of deliberate discomfort as a strategy for enhancing user engagement in architectural design. By drawing on insights from user experience design, psychology, and architectural theory, we have proposed a comprehensive framework for understanding how discomfort— when thoughtfully implemented—can lead to more meaningful connections between users and built environments.

The research indicates that deliberate discomfort offers a promising approach for architects and designers seeking to create spaces that not only accommodate basic needs but also stimulate critical thinking, emotional response, and active engagement. As Norman (2004) articulates, design operates at multiple levels—visceral, behavioral, and reflective—and the strategic use of discomfort primarily engages the reflective level, where deeper meaning and emotional significance are processed.

Williams' (2018) analysis of spatial interaction further suggests that environments requiring active interpretation and navigation—rather than passive consumption—create more meaningful user experiences. The introduction of "productive friction" through deliberate discomfort strategies can transform routine architectural encounters into opportunities for deeper engagement and reflection.

However, this approach requires careful calibration, contextual sensitivity, and ethical consideration to be effective. As the ACM Digital Library (2024) emphasizes, user experience professionals must carefully consider the appropriate level and type of challenge for specific contexts and user groups. Designers must thoughtfully balance discomfort with support, challenge with accessibility, and provocation with purpose.

By challenging the assumption that architectural design should always prioritize ease and comfort, this research opens new possibilities for creating built environments that engage users more deeply and meaningfully—environments that don't just serve our needs but also challenge our perceptions, stimulate our thinking, and ultimately enrich our experience of the world.

Rather than viewing comfort and discomfort as opposing values, this research suggests they might better be understood as complementary elements in a more nuanced approach to architectural experience—one that recognizes that meaningful engagement often emerges precisely at the boundaries of comfort, where we are challenged to perceive, think, and feel more deeply about our relationship with the built environment.

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