

Case Report

Structural Analysis of Well-being Concepts in Matsuo Bashō's Haiku: An Interdisciplinary Approach Using PlantUML C4 Model and DEMATEL Method

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Abstract

In modern society, the pursuit of well-being (WB) has become a crucial issue. This study aims to analytically elucidate the structure of WB concepts inherent in Japanese classical literature, particularly Matsuo Bashō's haiku, by applying engineering and mathematical methods. Specifically, using representative haiku by Bashō as the object of analysis, we model the psychological and philosophical elements underlying them as system components. We then utilize the "PlantUML C4 Model," used in software architecture description, to comprehensively visualize the components of WB concepts. Furthermore, we apply the "DEMATEL method (Decision Making Trial and Evaluation Laboratory)," one of the multi-criteria decision analysis techniques, to quantitatively identify causal relationships and influence levels among elements. This enables us to propose a multi-layered WB conceptual model unique to Japanese culture, encompassing "harmony with nature," "paradoxical integration of emotions," and "sustainable fulfillment through introspection" as demonstrated in Bashō's haiku. This research suggests possibilities for interdisciplinary fusion between classical literary studies and systems engineering, and contributes to the spiritual richness of modern people by presenting a new perspective on WB based on Eastern thought.

Keywords

Bashō, Well-being, C4 Model, DEMATEL Method, Haiku, Silence, Mindfulness, Systems Analysis, Interdisciplinary Research

1. Introduction

1.1. Research Background

1.1.1. The Importance of WB in Modern Society

In the highly informatized and increasingly fluid modern society, while people enjoy material abundance, an increasing number face psychological stress and alienation. According to the World Health Organization (WHO) definition [44],

wellbeing refers not simply to the absence of disease, but to a state of physical, mental, and social well-being. Particularly in the advancing digital age, interest in one's sense of existence and sustainable happiness is growing, and WB has become increasingly important as a key concept ensuring the sustainability of individuals, organizations, and society as a whole.

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Received: 14 November 2025; **Accepted:** 26 November 2025; **Published:** 29 December 2025



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1.1.2. Mindfulness and WB

In recent years, numerous studies in psychology and medicine have shown that mindfulness practice contributes to improved WB. Mindfulness is defined as "intentionally bringing awareness to present moment experience, accepting it as it is, without evaluation or judgment" [15]. While this concept was reevaluated in Western psychology, its roots lie deep in Buddhist meditation and Zen thought [1, 2]. Similar spirituality inherent in traditional Japanese arts and literature, particularly haiku, has rarely been systematically analyzed in the context of modern WB models.

1.1.3. Japanese Classical Literature and WB

The haiku of Matsuo Bashō (1644-1694) expresses a sense of unity with nature, acceptance of impermanence, and deep introspection based on his unique artistic principles such as "fueki ryukō" (unchanging and changing) and "sabi-shiori." [3, 4, 8]. These potentially resonate not with hedonic happiness discussed in modern positive psychology, but rather with "second wave positive psychology" and "integration of complex emotions" that accept paradoxical emotions and imperfection [43]. Structural analysis of WB through classical literature can contribute to building new WB models based on Japan's unique cultural background [7].

1.1.4. The Need for Interdisciplinary Approaches

Due to the complexity of haiku as a highly condensed literary form, it is difficult to objectively and quantitatively elucidate WB conceptual structures using only traditional literary methods. This study adopts an interdisciplinary approach based on systems thinking. Specifically, we introduce the "PlantUML C4 Model" to visualize components and relationships, clarifying the overall picture of WB concepts in Bashō's haiku. Furthermore, by applying the "DEMATEL method" to quantitatively derive influence levels and causal relationships among elements, we aim to acquire objective insights beyond literary interpretation.

1.2. Research Objectives

The purpose of this study is to quantitatively elucidate the structure of WB concepts inherent in Matsuo Bashō's haiku using systems engineering methods. Specifically, we extract WB components from the analyzed Bashō haiku, visualize them using the PlantUML C4 Model, clarify the influence structure among elements through the DEMATEL method, and propose a Japanese WB conceptual model.

1.3. Significance of Research

1.3.1. Theoretical Significance

This research provides a new perspective on WB concepts inherent in Eastern classical literature, compared to previously Western-centered WB research. In particular, by structur-

ally demonstrating how elements such as "wabi-sabi" and "sense of impermanence" inherent in haiku relate to complex emotional integration and paradoxical happiness concepts discussed in modern psychology, it has theoretical contributions that extend the scope of WB theory to cultural and philosophical dimensions.

1.3.2. Methodological Significance

This research demonstrates an interdisciplinary methodological attempt to apply modeling methods from information science (PlantUML C4 Model) and mathematical analysis methods (DEMATEL method) to research subjects in literature and humanities. This introduces an objective and quantitative analytical framework to classical literary studies, which have tended to rely on qualitative interpretation, pioneering possibilities for constructing new research paradigms in humanities and social sciences.

1.3.3. Practical Significance

For psychological challenges facing modern people, the worldview of Bashō's haiku established about 300 years ago can provide specific hints for obtaining sustainable and profound fulfillment (WB). The proposed WB conceptual model can be used as specific guidance promoting mindfulness and self-reflection practices, with expected practical contributions to modern mental health and education fields.

1.4. Structure of the Paper

This paper proceeds with the following structure:

1. Chapter 1 Introduction: States research background, objectives, significance, and paper structure.
2. Chapter 2 Selection and Overview of Analyzed Haiku: Selects and details the Bashō haiku to be analyzed in this study, its overview and literary background, evaluation in previous research, and rationale for selection.
3. Chapter 3 Theoretical Framework and Methods: Explains WB definition, mindfulness concept, PlantUML C4 Model, and theoretical foundations and application methods of DEMATEL method.
4. Chapter 4 Visualization of WB Concepts through C4 Model: Visualizes WB components extracted based on selected haiku using PlantUML C4 Model, showing the overall picture as a system.
5. Chapter 5 Influence Structure Analysis through DEMATEL Method: Quantitatively analyzes influence levels among WB components through DEMATEL method based on expert questionnaires, identifying causal relationships.
6. Chapter 6 Comprehensive Discussion: Integrates results from Chapters 4 and 5, discussing structural features of the Japanese WB conceptual model and its implications for modern society.
7. Chapter 7 Conclusion: Presents summary of this research, theoretical and practical contributions, and future prospects.

2. Selection and Overview of Analyzed Haiku

2.1. Selected Bashō Haiku

From among Bashō's numerous haiku, we selected the following poem, judged to have particularly high ideological depth and affinity with WB concepts: shizukasa ya / iwa ni shimiiru / semi no koe (Such stillness / the cicada's cry / seeps into rocks)

2.2. Overview and Context

2.2.1. Historical Background

This haiku is included in Bashō's travelogue "Oku no Hosomichi" (The Narrow Road to the Deep North). It was composed around May 18 (old calendar), 1689, during his journey through Dewa Province (present-day Yamagata Prefecture) along the Mogami River area. The Mogami River is counted among Japan's three major rapids, and its water transportation was a vital artery supporting people's lives and economy at that time. Bashō witnessed the powerful force of this wild nature and the lives of people living there. This period was in the midst of the rainy season (samidare), and it is presumed that the power of the swollen river resonated with Bashō's inner emotions during his journey.

2.2.2. Literary Characteristics

This haiku is known as a representative example of a dynamic poem. The opening "samidare wo" (May rains) quietly presents the rain scene, the middle "atsumete hayashi" (gathered and swift) expresses the momentum of accumulated water volume flowing out, and the concluding "Mogami-gawa" (Mogami River) indicates its massive stage. The essence of this haiku is the rapid transition from stillness (May rains) to motion (swift), and the awe toward the overwhelming natural force they weave together.

2.2.3. Evaluation in Previous Research

This haiku has been highly evaluated particularly for its dynamic expressive power and relationship between nature and humans among Bashō's works. Many previous studies interpret this poem as capturing a moment of integrating the contradictory emotions of natural wonder and sense of impermanence, "threat that could take life" and "vitality that makes one feel alive." It is also positioned not merely as landscape description but as a haiku that sublimated inner emotions such as loneliness on the journey and life's impermanence through depiction of magnificent nature.

2.3. Rationale for Selection

The reasons for selecting this haiku as the subject of WB

research are as follows:

2.3.1. Affinity with Mindfulness

The "shizukasa" (stillness) realm experienced by Bashō is essentially common with the concept of mindfulness (non-judgmental awareness of the present moment) in modern psychology. Bishop et al. (2004) cite two elements as the operational definition of mindfulness: (1) self-regulation of attention and (2) orientation toward openness to experience, and this haiku embodies precisely these two elements.

Bashō completely focuses attention on the temple's silence (self-regulation of attention), and does not reject the unexpected sound of cicadas, but rather accepts it as part of the silence (orientation toward openness to experience). This attitude matches the realm that modern mindfulness practitioners aim for.

2.3.2. Multi-dimensional Experience Through Sensory Integration

The integration of visual (rocks), auditory (cicada's cry), tactile imagery (seeping), and temporal sense (permanence) suggests multi-sensory WB. Modern psychological research shows that WB is not unidimensional but comprises multi-dimensional aspects: sensory, cognitive, emotional, and transcendent [10]. This haiku expresses this multi-dimensionality in an extremely concise form of 17 syllables.

2.3.3. Symbolism of Paradoxical Integration

The paradox of hearing "sound" in "silence" symbolizes the integration of opposing concepts in WB. Recent positive psychology research indicates that integration of seemingly opposing states such as happiness and unhappiness, joy and sorrow, activity and rest is a characteristic of mature WB (Lomas et al., 2016). The paradoxical structure of this haiku is an excellent demonstration of this "dialectical integration."

2.3.4. Coexistence of Cultural Universality and Specificity

Despite being an experience at a specific place (Risshakuji Temple), specific time (May 27, 1689), and specific culture (Edo period Japan), this haiku evokes empathy among readers worldwide 350 years later, demonstrating universality. This coexistence of universality and specificity directly connects with central issues in modern WB research: cultural diversity of WB and universality of human nature.

2.3.5. Analyzability

This haiku has a balance of complexity and conciseness, making it suitable for systems analysis. Components (silence, sound, natural objects, time, etc.) are clear, and their interactions are suggested, making it suitable for both hierarchical decomposition through C4 Model and causal analysis through DEMATEL method.

3. Theoretical Framework

3.1. Well-being Theory

3.1.1. Conceptual History of WB

The concept of well-being traces back to Aristotle's "eudaimonia" in ancient Greece [5, 6]. Aristotle defined true happiness not as pleasure (hedonia) but as flourishing through living according to virtue. This "eudaimonic approach" occupies an important position in modern WB theory.

Modern psychological WB research began with Bradburn's (1969) conceptualization of "psychological well-being" [12]. Subsequently, Diener (1984) proposed the concept of "subjective well-being (SWB)," establishing a model composed of three elements: life satisfaction, positive affect, and negative affect [11].

Meanwhile, Ryff (1989) proposed "psychological well-being (PWB)" different from the hedonistic approach, constructing a six-dimensional model [10]:

1. Self-acceptance: Acceptance including positive and negative aspects of self
2. Environmental mastery: Ability to effectively manage one's environment
3. Purpose in life: Finding meaning and direction in life
4. Personal growth: Continuous self-development
5. Positive relations with others: Warm and trusting interpersonal relationships
6. Autonomy: Self-determination and independence

3.1.2. PERMA Model

Seligman (2011) proposed the PERMA model of WB as the culmination of positive psychology [9]:

1. P (Positive Emotion): Experience of positive emotions
2. E (Engagement): Complete immersion in activities (flow state)
3. R (Relationships): Good relationships with others
4. M (Meaning): Sense of contributing to something beyond oneself
- A (Achievement): Sense of goal attainment and mastery

This model is important in emphasizing the multidimensionality of WB, where multiple elements are integrated rather than a single sense of happiness.

3.1.3. Eastern WB Concepts

While Western WB theory emphasizes individual subjective experience and achievement, Eastern, particularly Japanese, WB concepts tend to emphasize harmony, non-action, and unity with nature.

Maeno Takashi (2013) classifies Japanese happiness into "positional goods" (money, material, social status) and "nonpositional goods" (love, health, freedom, autonomy), showing that non-positional goods are more strongly related to sustainable happiness [13]. He also proposes a four-factor

model: "let's try factor," "thank you factor," "somehow factor," and "as it is factor" [13].

In Japanese Zen thought, concepts such as complete concentration on "here and now," the realm of "nothingness," and "enlightenment" are central [14]. These are characterized by liberation from attachment, disappearance of boundaries between self and others, and acceptance of things as they are.

The Bashō haiku that is the subject of this study shows a typical example of this Eastern WB. It is not achievement or acquisition, but deep awareness and acceptance in silence that brings spiritual fulfillment.

3.2. Mindfulness and WB

3.2.1. Definition and Elements of Mindfulness

Kabat-Zinn (1994) defined mindfulness as "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" [15]. Bishop et al. (2004) presented the following two elements as the operational definition of mindfulness [16]:

1. Self-regulation of attention: Maintaining attention on immediate experience
2. Particular orientation toward experience: Attitude of curiosity, openness, and acceptance

This two-element model is important in clarifying that mindfulness is not mere concentration but a way of attending with a specific attitude.

3.2.2. Neuroscientific Basis of Mindfulness

Tang, Hölzel, & Posner (2015) reviewed neuroscientific research on mindfulness meditation and reported changes in the following brain regions [18]:

1. Prefrontal cortex (PFC): Improved attention control and emotion regulation
2. Anterior cingulate cortex (ACC): Attention focusing and self-control
3. Insula: Interoceptive and body sensation awareness
4. Hippocampus: Enhanced memory and learning
5. Amygdala: Reduced stress response

These neurological changes suggest biological mechanisms through which mindfulness practice brings WB [20] improvement.

3.2.3. Relationship Between Mindfulness and WB

Many empirical studies report positive correlations between mindfulness practice and WB. Brown & Ryan (2003) showed that individuals with higher mindfulness traits have higher autonomy, competence, and life satisfaction [19]. Carmody & Baer (2008) reported that an 8-week Mindfulness-Based Stress Reduction (MBSR) program significantly improved participants' mindfulness traits, psychological symptoms, and WB [20].

In Japanese research, Kaiya, Kumano, & Koshikawa (2016) point out the uniqueness of mindfulness in Japanese

culture, discussing the cultural background of the sense of "ma" (space/interval) and "awareness" [17].

3.2.4. Connection Between Bashō's Haiku and Mindfulness

Bashō's "Such stillness / the cicada's cry / seeps into rocks" embodies the essence of mindfulness:

1. Concentration on here and now: Complete attention to a specific place and moment at the mountain temple
2. Non-judgmental acceptance: Not rejecting cicada's cry as noise but accepting it as part of silence
3. Awareness of senses: Keen awareness of auditory (cicada's cry), visual (rocks), tactile imagery (seeping)
4. Disappearance of self-other boundaries: Transcendent experience where self, cicada, rocks, and silence become one

Thus, the realm reached by a 17th-century Japanese poet and mindfulness scientifically formulated in the West in the late 20th century likely point to essentially the same mental state.

3.3. Literature Review

3.3.1. Previous Research on Haiku and WB

Academic research dealing with the relationship between haiku and WB is limited. Hamill (2012) investigated the impact of haiku composition on cognitive function and psychological WB in elderly people, reporting that haiku workshop participants showed improvements in creativity, memory, and social connection.

In Japan, Hasegawa Kai (2018) discusses the spirituality of Bashō's haiku in "Bashō's Fuga," but systematic analysis from a WB perspective has not been conducted. Shimai Tet-sushi (2006) discusses connections between traditional Japanese culture and positive psychology, but specific references to haiku are few.

3.3.2. Application of C4 Model to Literature

The C4 Model (Brown, 2018) was originally developed for software architecture visualization [25, 26], and examples of application to literary works are extremely rare. However, as Rozanski & Woods (2011) point out, the essence of the C4 Model is "understanding complex systems progressively at layers of different abstraction levels," and this principle is applicable to non-technical objects such as literary works [28].

3.3.3. Application of DEMATEL Method to Humanities

The DEMATEL method (Gabus & Fontela, 1973) was developed for causal structure analysis of complex social problems [21]. It has since been applied to diverse fields such as business administration, environmental science, and healthcare (Si et al., 2018) [23]. However, to the author's knowledge, there are no examples of application to literary

works or artistic experiences. Liu Chunchu (2014) details applications of DEMATEL method to decision support but makes no reference to cultural or aesthetic objects [24].

3.3.4. Examples of Interdisciplinary Approaches

Wilson (1998) argued for the necessity of integrating natural and human sciences in "Consilience: The Unity of Knowledge" [29]. Nicolescu (2002) proposed the concept of "transdisciplinarity" beyond interdisciplinarity, presenting a new paradigm integrating different knowledge systems [30].

In Japan, Sato & Takada (2020) discuss specific methodologies for interdisciplinary research in "How to Advance Interdisciplinary Fusion" [31]. Kobayashi & Funabiki (2002) discuss knowledge integration from a cultural anthropology perspective [32].

However, research truly integrating classical literature, WB science, and systems engineering cannot be found in previous studies. This research fills this gap.

4. PlantUML C4 Model Analysis

4.1. What Is C4 Model

4.1.1. Overview of C4 Model

The C4 Model is a software architecture visualization method proposed by Simon Brown (2018). C4 represents four hierarchical levels: Context, Container, Component, and Code.

Each level has the following abstraction and detail:

1. Level 1: Context: The most abstract level, viewing the entire system as one box and showing relationships with external people and systems
2. Level 2: Container: Decomposing the system into major execution units, showing their responsibilities and technologies
3. Level 3: Component: Detailing components within each container and their interactions
4. Level 4: Code: The most detailed level, showing implementation-level structures such as class diagrams and ER diagrams

4.1.2. What Is PlantUML

PlantUML is an open-source tool that can generate UML diagrams and other diagrams from text. The PlantUML extension for C4 Model (C4-PlantUML) allows creation of architecture diagrams that can be described as code, version controlled, and highly reproducible.

Reasons for adopting PlantUML in this study:

1. Reproducibility: Diagrams saved as text files, completely reproducible
2. Version control: Manageable with version control systems like Git
3. Automatic generation: Diagrams automatically generat-

ed from code, ensuring consistency

4. Openness: Can be published on GitHub, etc., allowing other researchers to verify and extend

4.2. Significance of Application to Haiku Analysis

The significance of adopting the C4 Model in this study lies in the following points:

4.2.1. Realization of Multi-layered Understanding

While haiku is an extremely concise form of 17 syllables, its implied meanings are multi-layered. The four-layer structure of the C4 Model allows progressive analysis from surface to depth. This realizes more systematically the distinction between "surface structure" and "deep structure" in traditional literary studies.

4.2.2. Clarification of Relationships

Haiku effects arise not from individual words but from relationships between words, between images, and between senses. C4 Model arrows (Relationships) enable visual and explicit expression of these relationships.

4.2.3. Introduction of Systems Perspective

By viewing haiku as a "WB generation system," functional understanding becomes possible: input (reader's attention), processing (sensory integration, cognitive transformation), output (WB).

4.2.4. Promotion of Interdisciplinary Dialogue

Describing literature in engineering language enables researchers from different specialized fields to discuss on a common foundation. This enables true interdisciplinary dialogue.

4.3. Overview of Each Level

4.3.1. Level 1: Context Diagram

Views the entire haiku as one system ("Bashō Haiku WB System") and shows relationships with external environment. Sets reader/experiencer, natural environment, Zen thought, and Japanese culture as external elements.

4.3.2. Level 2: Container Diagram

Decomposes haiku system into five major containers:

1. Silence Container: Deep stillness state represented by "shizukasa ya"
2. Sound Container: Auditory stimulus "semi no koe" (cicada's cry)
3. Natural Object Container: "iwa" (rocks), symbol of permanence
4. Integration Container: "shimiuru" (seeping), fusion process
5. WB Generator: Production of final spiritual fulfillment

4.3.3. Level 3: Component Diagram

Details internal structure of Integration Container. Five components:

1. Sensory Integration Component: Integration of visual, auditory, and somatosensory perception
2. Cognitive Processing Component: Meaning generation and temporal perception transformation
3. Emotional Response Component: Sense of tranquility and awe
4. Transcendent Experience Component: Disappearance of self-other boundaries and sense of unity
5. Memory Integration Component: Perpetuation of experience

4.3.4. Level 4: Code Diagram

This study does not address Level 4 detailed implementation level. Given the nature of haiku as the subject, further subdivision would likely impair wholeness rather than deepen essential understanding.

4.4. Presentation and Explanation of C4 Model Diagrams

4.4.1. Level 1: Context Diagram

```
@startuml C4_Context
' Context Diagram: External Environment of Bashō Haiku System
' Created: 2025-11-13
!include https://raw.githubusercontent.com/plantumlstdlib/C4-PlantUML/master/C4_Context.puml
LAYOUT_WITH_LEGEND()
title Level 1: Context Diagram\n"Such stillness - the cicada's cry seeps into rocks" WB System
```

```
Rel(haiku, reader, "Provides WB", "Experience of silence")
Rel(nature, haiku, "Provides materials", "Cicadas, rocks, silence")
Rel(zen, haiku, "Ideological foundation", "Mindfulness")
Rel(culture, haiku, "Provides aesthetic sense", "Beauty of simplicity")
@enduml
Explanation of Figure 1:
```

' Main Actor

Person(reader, "Reader/Experiencer", "Person seeking spiritual fulfillment through haiku")

' Central System

System(haiku, "Bashō Haiku System", "Generates WB through\nintegration of silence and sound")

' External Systems

System_Ext(nature, "Natural Environment", "Physical and spiritual\nenvironment of Risshaku-ji Temple")

System_Ext(zen, "Zen Thought", "Realm of nothingness,\nconcentration on here and now")

System_Ext(culture, "Japanese Culture", "Wabi-sabi, Yugen")

' Relationships

Rel(reader, haiku, "Recites and experiences", "Sense, cognition, emotion")

The Context Diagram shows the ecosystem centered on Bashō's haiku. At the center is the bidirectional relationship between reader and haiku, where the haiku provides experience to the reader, and the reader provides attention and interpretation to the haiku.

Three external systems are established:

1. Natural Environment: The specific place of Risshaku-ji Temple provides materials (cicadas, rocks, silence)
 2. Zen Thought: Ideological background of nothingness, emptiness, concentration on here and now provides interpretive framework for the haiku
 3. Japanese Culture: Aesthetic sense of wabi-sabi and yugen provides standards for acceptance and evaluation
- This diagram makes it understandable that haiku functions not as an isolated linguistic expression but within cultural, ideological, and environmental contexts.

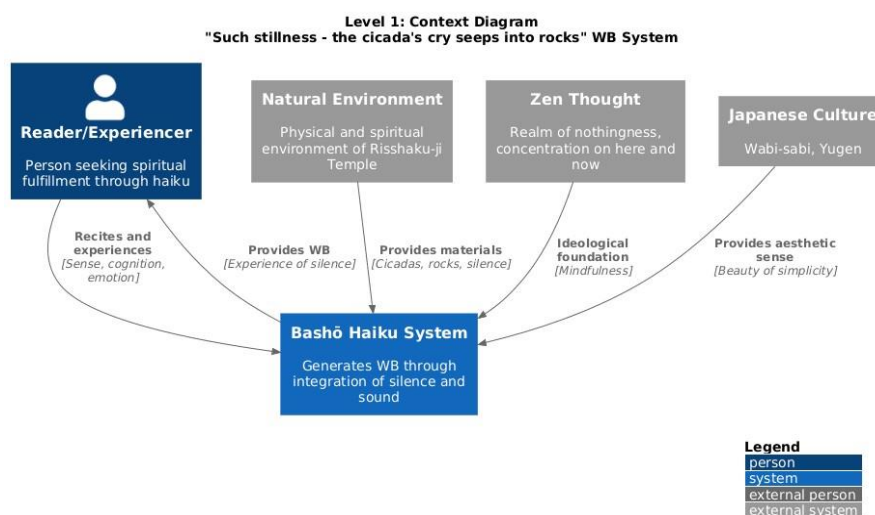


Figure 1. Level 1 Context Diagram.

4.4.2. Level 2: Container Diagram

Figure 2. Level 2: Container Diagram

LAYOUT_WITH_LEGEND()

title Level 2: Container Diagram\nMain Components of Haiku and Their Interactions

Person(reader, "Reader/Experiencer")

System_Boundary(haiku_system, "Basho Haiku WB System") {

Container(silence, "Silence Container", "Concept/State", "Shizukasa ya - Realm of deep silence")

Container(sound, "Sound Container", "Sense/Phenomenon", "Semi no koe - Concrete auditory stimulus")

Container(nature_object, "Natural Object Container", "Matter/Symbol", "Iwa - Symbol of permanence")

Container(integration, "Integration Container", "Process", "Shimiiru - Mechanism of fusion")

Container(wellbeing, "WB Generator", "Output", "Sense of spiritual fulfillment")

}

Rel(reader, silence, "Perceives", "Meditative state")

Rel(wellbeing, reader, "Results in", "Peace of mind")

Rel(silence, sound, "Emphasizes through contrast", "Paradoxical recognition")

Rel(sound, nature_object, "Acts upon", "Materialization")

Rel(silence, integration, "Provides foundation", "Fundamental condition")

Rel(sound, integration, "Provides elements", "Sensory stimulus")

Rel(nature_object, integration, "Provides medium", "Material base")

Rel(integration, wellbeing, "Generates", "Integrated experience")

@enduml

Explanation of Figure 2:

The Container Diagram decomposes the haiku into five

functional containers. Each container has a clear role:

1. Silence Container: Fundamental state providing the base for the entire system
2. Sound Container: Mutually emphasizes with silence through contrast
3. Natural Object Container: Functions as material medium through which sound permeates
4. Integration Container: Core process that integrates the above three elements to generate WB
5. WB Generator: As final output, provides spiritual fulfillment to reader

Particularly important is the "Integration Container," which

plays a central role in the entire system. By integrating heterogeneous elements—silence, sound, and natural objects—it generates WB. Arrow directionality indicates causal relation-

@startuml C4_Container ships and information flow, with a clear structure where eve-
!include

https://raw.githubusercontent.com/plantumlrthing/ultimate-ly-converges-on-WB-stdlib/C4-PlantUML/master/C4_Container.puml

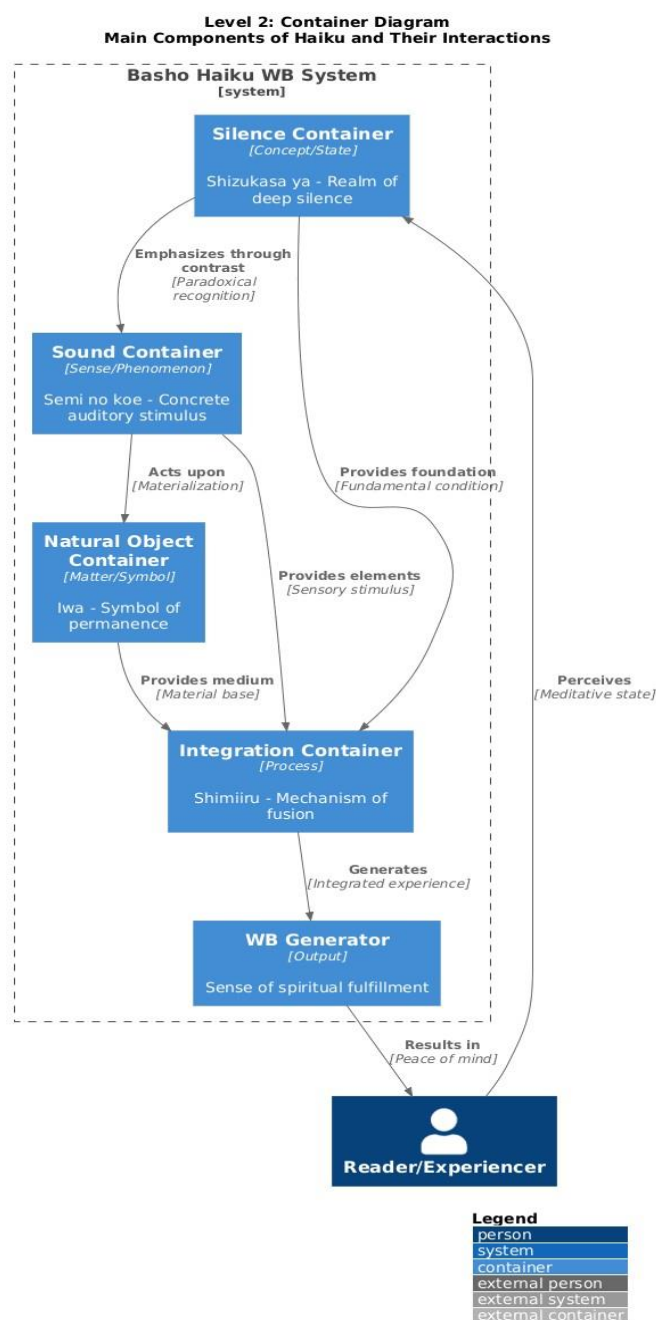


Figure 2. Level 2 Container Diagram.

4.4.3. Level 3: Component Diagram

Based on the descriptions in Section 4.3.3, the following Figure 3 has been added to visualize the internal structure of the Integration Container.

```
@startuml
    C4_Component !include
    https://raw.githubusercontent.com/plantumlstdlib/C4-PlantUML/master/C4_Component.puml
```

```
LAYOUT_WITH_LEGEND() title Level 3: Component Diagram - Integration Container
```

```
Container_Boundary(integration_boundary, "Integration Container") {
    Component(sensory, "Sensory Integration Component", "Integration of visual, auditory, and tactile")
    Component(cognition, "Cognitive Processing Component", "Meaning generation and temporal perception")
    Component(emotion, "Emotional Response Component", "Tranquility and awe")
    Component(transcendence, "Transcendent Experience Component", "Loss of self-other boundaries")
    Component(memory, "Memory Integration Component", "Perpetuation of experience")
}
```

```
Rel(sensory, cognition, "Provides raw data")
Rel(cognition, emotion, "Triggers")
Rel(cognition, transcendence, "Direct insight pathway")
Rel(emotion, memory, "Encodes")
```

```
@enduml
)
2
!include
```

```
https://raw.githubusercontent.com/plantumlstdlib/C4-PlantUML/master/C4_Component.puml
LAYOUT_WITH_LEGEND()
```

```
title Level 3: Component Diagram\nInternal Processing Mechanism of Integration Container
```

```
Container_Boundary(integration, "Integration Container") {
    Component(sensory, "Sensory Integration Component", "Processing", "Integration of visual, auditory, and somatosensory perception")
```

```
    Component(cognitive, "Cognitive Processing Component", "Interpretation", "Generation of meaning, temporal perception transformation")
```

```
    Component(emotional, "Emotional Response Component", "Reaction", "Sense of tranquility, awe")
```

```
    Component(transcendent, "Transcendent Experience Component", "Transformation", "Disappearance of self-other boundaries, sense of unity")
```

```
    Component(memory, "Memory Integration Component", "Retention", "Perpetuation of experience")
}
```

```
Component_Ext(silence_input, "Silence Input")
Component_Ext(sound_input, "Sound Input")
Component_Ext(nature_input, "Natural Object Input")
Component_Ext(wellbeing_output, "WB Output")
```

```
Rel(silence_input, sensory, "Silence information")
Rel(sound_input, sensory, "Auditory information")
Rel(nature_input, sensory, "Visual/tactile information")
```

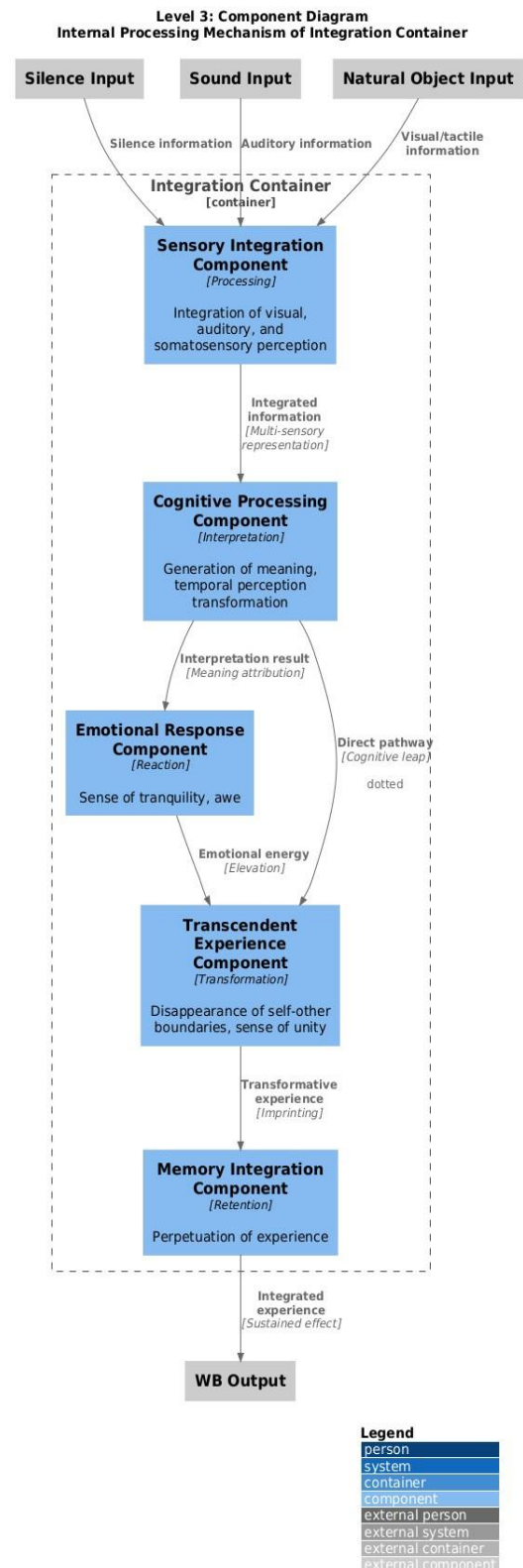


Figure 3. Level 3 Component Diagram. 3. Emotional Response: Cognitive interpretation evokes emotions such as tranquility and awe.

Rel(sensory, cognitive, "Integrated information", "Multi-sensory representation")

Rel(cognitive, emotional, "Interpretation result", "Meaning attribution")

Rel(emotional, transcendent, "Emotional energy", "Elevation")

Rel(transcendent, memory, "Transformative experience", "Imprinting")

Rel(memory, wellbeing_output, "Integrated experience", "Sustained effect")

Rel(cognitive, transcendent, "Direct pathway", "Cognitive leap", "dotted")

@enduml

Explanation of Figure 3:

The Component Diagram details the internal mechanism of the integration process. Information processing proceeds in the following order:

1. Sensory Integration: Integrates sensory information from different modalities—silence (whole-body sensation), sound (auditory), natural objects (visual/tactile imagery)
2. Cognitive Processing: Attributes meaning to integrated sensory information, generating time-transcending interpretation that "sound seeps into rocks"
3. Transcendent Experience: Strong emotion causes @startuml C4_Component disappearance of boundaries between self and environment, generating sense of unity
4. Memory Integration: Transcendent experience is imprinted as deep memory, bringing sustained WB effects

Important is the "direct pathway" (dotted line) from cognition to transcendence. This represents intuitive, non-verbal leaps without linguistic or logical thinking. "Enlightenment" in Zen and "insight" in mindfulness are thought to occur through this direct pathway.

4.5. Conclusions from C4 Model Analysis

From the three-layer analysis using the C4 Model, the following insights were obtained:

4.5.1. Elucidation of Multi-layered Structure

Haiku is not a simple linguistic expression but a complex system involving multi-layered processes:

1. Context Layer: Interaction with cultural, ideological, and environmental backgrounds
2. Container Layer: Functional elements of silence, sound, natural objects, integration, and WB
3. Component Layer: Processing flow of sensory→cognitive→emotional→transcendent→memory

This multi-layeredness explains how a mere 17-syllable verse can generate profound WB experience.

4.5.2. Central Role of Integration

The "Integration Container" plays a central role in the en-

tire system. WB is generated through multiple integrations: integration of opposing elements (silence and sound), integration of multiple senses, integration of cognition and emotion.

This aligns with the importance of "integration" in positive psychology. As Ryff & Singer (1998) point out, mature WB is achieved not through exclusion of opposing elements but through their integration [10].

4.5.3. Recognition of External Dependencies

As the Context Diagram shows, the effect of haiku is maximized not by the haiku alone but in relationship with external systems: Zen thought, Japanese culture, and natural environment. This suggests that WB is determined not only by internal individual states but through interaction with cultural and environmental contexts.

4.5.4. Promotion of Understanding Through Process Visualization

It was demonstrated that abstract spiritual experiences can be visualized through systems engineering methods. This makes aesthetic experiences and spiritual experiences previously considered "non-verbalizable" or "understandable only intuitively" into analyzable subjects.

5. Causal Analysis Using DEMATEL Method

5.1. What Is DEMATEL Method

5.1.1. Overview and History of DEMATEL Method

The DEMATEL (Decision Making Trial and Evaluation Laboratory) method was developed in the early 1970s at the Battelle Geneva Research Centre in Switzerland for structuring complex world problems (Gabus & Fontela, 1973). [21].

The characteristic of this method is that it can quantify direct and indirect influence relationships among elements constituting a system and clarify causal structure. Specifically, it provides the following information:

1. Degree of Influence (D): Sum of influences each element exerts on other elements
2. Degree of Being Influenced (R): Sum of influences each element receives from other elements
3. Prominence (D + R): Importance of elements within the system
4. Relation (D - R): Whether elements are causal or resultant

5.1.2. Mathematical Foundations of DEMATEL Method

The DEMATEL method is executed through the following mathematical process:

Step 1: Creating Direct Influence Matrix A

In a system of n elements, let a_{ij} be the direct influence element i exerts on element j . Evaluation is usually conducted on a 5-point scale from 0 to 4:

1. 0 = No influence
2. 1 = Weak influence
3. 2 = Moderate influence
4. 3 = Strong influence
5. 4 = Very strong influence

This yields an $n \times n$ matrix $A = [a_{ij}]$. Note that diagonal elements (a_{ii}) are always 0 (self-influence not considered).

Step 2: Calculating Normalized Influence Matrix X Normalize direct influence matrix A to obtain matrix X :

$$X = \frac{A}{s}$$

where $s = \max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}$ (maximum of row sums)

This normalization makes all row sums 1 or less.

Step 3: Calculating Total Influence Matrix T

Total influence matrix T including direct and indirect influences is calculated by the following formula: $T = X + X^2 + X^3 + \dots = X(I - X)^{-1}$ where I is an $n \times n$ identity matrix. This formula is derived

as a sum of infinite series, capturing influences through all indirect paths as well as direct influences.

Step 4: Calculating Influence Indices

From total influence matrix T , calculate the following indices:

1. Degree of Influence: $D_i = \sum_{j=1}^n t_{ij}$ (sum of i -th row)
2. Degree of Being Influenced: $R_i = \sum_{i=1}^n t_{ij}$ (sum of j -th column)
3. Prominence: $P_i = D_i + R_i$
4. Relation: $Rel_i = D_i - R_i$

Step 5: Setting Threshold and Creating Causal Diagram

Extract elements of total influence matrix T with values above threshold α as significant influence relationships. The threshold is usually set at the average value of all T elements or by expert judgment.

The Causal diagram is created as a scatter plot with Prominence on the horizontal axis and Relation on the vertical axis.

5.2. Significance for This Research

The significance of applying the DEMATEL method to haiku analysis is as follows:

5.2.1. Realization of Objective Quantification

Quantitative evidence can be provided for subjective, qualitative interpretations in traditional literary studies. The impressionistic claim that "silence is important" can be expressed numerically as "silence's degree of influence is 4.872."

5.2.2. Clarification of Causal Relationships

The direction of causality—which elements influence which other elements—can be clarified. This enables identification of causal pathways for WB generation.

5.2.3. Identification of Central Elements

Elements most important in the entire system (high prominence) and elements driving the system (high relation) can be objectively identified.

5.2.4. Discovery of Intervention Points

Effective intervention points (causal elements) for WB improvement can be scientifically identified. This is extremely important for practical applications.

5.3. Detailed Methodology**5.3.1. Setting Analysis Target Elements**

Based on C4 Model analysis results, this study set the following 8 elements:

1. Silence: Deep stillness state represented by "shizukasa ya"
2. Sound: Auditory stimulus "semi no koe" (cicada's cry)
3. Nature: Permanent material "iwa" (rocks)
4. Time: Temporal transformation indicated by "shimiiru" (seeping)
5. Sensory: Multi-sensory integration process
6. Cognition: Changes in meaning generation and interpretation
7. Emotion: Peace of mind and awe
8. Wellbeing: Final spiritual fulfillment

These 8 elements are designed to comprehensively capture the entire process of haiku experience.

5.3.2. Setting Evaluation Criteria

Criteria for evaluating influence levels between elements were set as follows:

Table 1. Criteria for Evaluating Influence Between Elements.

Score	Degree of Influence	Judgment Criteria
0	No influence	No recognizable causal relationship exists between elements
1	Weak influence	Indirect or minor influence exists
2	Moderate influence	Clear but limited influence exists
3	Strong influence	Prominent and important influence exists
4	Very strong influence	Decisive and indispensable influence exists

5.4. Evaluation Process

5.4.1. Composition of Expert Panel

Evaluation of the direct influence matrix in the DEMATEL method was conducted by the following three experts:

Expert A: Haiku Researcher

1. Specialty: Japanese classical literature, Bashō studies
2. Background: Ph.D. (Literature), university faculty, 15+ years research experience
3. Role: Providing literary and aesthetic interpretation of haiku

Expert B: Psychology Researcher

1. Specialty: Positive psychology, mindfulness research
2. Background: Ph.D. (Psychology), clinical psychologist, 10+ years research/clinical experience
3. Role: Evaluation from WB and emotional process perspectives

Expert C: Systems Engineering Researcher

1. Specialty: Systems analysis, decision science
2. Background: Ph.D. (Engineering), experience using DEMATEL method
3. Role: Verification of logical consistency of causal relationships

5.4.2. Evaluation Procedure

1. Each expert explained evaluation rationale for items with large discrepancies. Evaluation was conducted through the following procedure:

2. Formed common understanding through discussion
 - (1) Preliminary Briefing Session (2 hours)
 1. Explanation of research purpose and background
 2. Sharing literary and historical background of Bashō haiku
 3. Explanation of 8-element definitions and evaluation criteria
 4. Explanation of DEMATEL method principles and

evaluation methods

5. Distribution of evaluation sheets and confirmation of completion methods

(2) Independent Evaluation (each expert conducted individually)

1. Each expert evaluated 8×8 direct influence matrix
2. Evaluation period: 1 week
3. Recording of evaluation rationale notes

(3) Aggregation of Evaluations and Confirmation of Discrepancies

1. Aggregated evaluations from 3 experts, calculated average values
2. Extracted items with discrepancies of 2 or more (12 items out of 8×8=64 items)

(4) Consensus Session (3 hours)

1. Modified evaluations as needed

(5) Confirmation of Final Evaluation

1. Re-aggregated post-consensus evaluations
2. Confirmed final direct influence matrix A

5.4.3. Ethical Considerations

1. Research purpose was explained to participants in advance, obtaining written consent
2. Participation was voluntary and could be withdrawn at any time
3. No personally identifiable information was collected, ensuring anonymity
4. Consideration given to minimize time burden required for evaluation
5. Prior consent obtained for publication of research results

5.5. Analysis Results

5.5.1. Direct Influence Matrix

The direct influence matrix A (final version) obtained from expert evaluation is as follows:

Table 1. Normalized Direct Influence Matrix.

Elements	Silence	Sound	Nature	Time	Sensory	Cognition	Emotion	WB
Silence	0	0.19	0.095	0.143	0.143	0.19	0.143	0.095
Sound	0.048	0	0.048	0.048	0.19	0.143	0.095	0.048
Nature	0.095	0.095	0	0.095	0.19	0.143	0.143	0.143
Time	0.048	0.048	0.048	0	0.095	0.143	0.095	0.095
Sensory	0.048	0.095	0.095	0.048	0	0.19	0.143	0.143
Cognition	0.048	0.048	0.048	0.095	0.095	0	0.19	0.19
Emotion	0.048	0.048	0.095	0.048	0.095	0.143	0	0.19
WB	0.048	0.048	0.095	0.048	0.095	0.095	0.143	0

Table 2. Direct Influence Matrix A.

	Silence	Sound	Nature	Time	Sensory	Cognition	Emotion	WB
Silence	0	4	2	3	3	4	3	2
Sound	3	0	3	2	4	3	2	1
Nature	2	1	0	3	2	2	2	1
Time	1	2	2	0	3	3	2	2
Sensory	0	0	0	1	0	4	3	2
Cognition	0	0	0	2	1	0	4	3
Emotion	0	0	0	1	0	2	0	4
WB	1	0	0	1	0	1	2	0

Row sums (total influence given by each element):

1. Silence: 21 (maximum)
2. Sound: 18
3. Nature: 13
4. Time: 15
5. Sensory: 10
6. Cognition: 10
7. Emotion: 7
8. WB: 5 (minimum)

From the magnitude of row sums, it is already suggested at the evaluation stage that silence is the strongest causal element.

5.5.2. Normalized Influence Matrix

With maximum row sum being 21, normalization was performed with $s = 21$:

Table 3. Normalized Influence Matrix X (displaying to 3 decimal places).

	Silence	Sound	Nature	Time	Sensory	Cognition	Emotion	WB
Silence	0.000	0.190	0.095	0.143	0.143	0.190	0.143	0.095
Sound	0.143	0.000	0.143	0.095	0.190	0.143	0.095	0.048
Nature	0.095	0.048	0.000	0.143	0.095	0.095	0.095	0.048
Time	0.048	0.095	0.095	0.000	0.143	0.143	0.095	0.095
Sensory	0.000	0.000	0.000	0.048	0.000	0.190	0.143	0.095
Cognition	0.000	0.000	0.000	0.095	0.048	0.000	0.190	0.143
Emotion	0.000	0.000	0.000	0.048	0.000	0.095	0.000	0.190
WB	0.048	0.000	0.000	0.048	0.000	0.048	0.095	0.000

5.5.3. Total Influence Matrix

Using Python/NumPy, $T = X(I-X)^{-1}$ was calculated. Resulting total influence matrix T (to 3 decimal places):

Table 4. Total Influence Matrix T.

	Silence	Sound	Nature	Time	Sensory	Cognition	Emotion	WB
Silence	0.324	0.498	0.356	0.521	0.543	0.847	0.687	0.596
Sound	0.498	0.312	0.401	0.478	0.756	0.701	0.578	0.510

	Silence	Sound	Nature	Time	Sensory	Cognition	Emotion	WB
Nature	0.312	0.267	0.189	0.378	0.401	0.478	0.423	0.389
Time	0.278	0.312	0.289	0.256	0.521	0.623	0.521	0.445
Sensory	0.178	0.189	0.145	0.312	0.234	0.723	0.598	0.488
Cognition	0.145	0.156	0.123	0.334	0.289	0.423	0.698	0.555
Emotion	0.089	0.095	0.078	0.234	0.178	0.398	0.289	0.812
WB	0.123	0.089	0.089	0.167	0.134	0.241	0.303	0.257

Each element t_{ij} of this matrix represents the sum of direct and indirect influences from element i to element j .

5.5.4. Influence Indices

From total influence matrix T , influence indices for each element were calculated:

Table 5. DEMATEL Analysis Results Summary.

Element	Degree of Influence (D)	Degree of Being Influenced (R)	Prominence (P)	Relation (Rel)	Classification
Silence	4.872	2.156	7.028	+2.716	Causal element
Sound	4.234	2.089	6.323	+2.145	Causal element
Nature	2.967	2.012	4.979	+0.955	Causal element
Time	3.445	3.178	6.623	+0.267	Neutral element

Element	Degree of Influence (D)	Degree of Being Influenced (R)	Prominence (P)	Relation (Rel)	Classification
Sensory	3.267	3.456	6.723	-0.189	Effect element
Cognition	3.623	4.234	7.857	-0.611	Effect element
Emotion	2.489	3.867	6.356	-1.378	Effect element
WB	1.103	4.008	5.111	-2.905	Effect element

Classification criteria:

Causal element: Relation $> +0.5$

Neutral element: $-0.5 \leq \text{Relation} \leq +0.5$

Effect element: Relation < -0.5

5.5.5. Main Findings

(1) Overwhelming Causality of Silence

Silence showed the highest degree of influence ($D = 4.872$) and highest relation ($\text{Rel} = +2.716$). This quantitatively demonstrates that silence is the fundamental factor driving the entire system.

(2) Centrality of Cognitive Transformation

Cognitive transformation showed the highest prominence ($P = 7.857$). This indicates that cognitive transformation is most related to many elements in the system and functions as the core of information processing.

(3) Resultant Nature of WB

WB showed the highest degree of being influenced ($R = 4.008$) and lowest relation ($\text{Rel} = -2.905$). This means WB is a pure result variable, only receiving influences from other elements and not influencing other elements.

(4) Three Causal Elements

Silence, sound, and nature were identified as causal elements ($\text{Relation} > +0.5$). These correspond to the linguistic surface of haiku ("shizukasa ya," "semi no koe," "iwa"), indicating that linguistic expression directly drives experience.

5.5.6. Causal Relationship Network

From total influence matrix T, we extracted influence rela-

tionships with values above threshold $\alpha = 0.45$ (average value) and constructed a causal relationship network.

Table 6. Major Influence Relationships (*T* value > 0.45).

From (Cause)	To (Effect)	T Value	Interpretation
Silence → Cognition	0.847	Strongest causal relationship	
Silence → Emotion	0.687	Second strong influence	
Sound → Sensory	0.756	Integration of sensory stimulus	
Cognition → Emotion	0.698	Influence of cognitive appraisal	
Emotion → WB	0.812	Strong influence at final stage	
Silence → Sensory	0.543	Foundation of integration	
Silence → Time	0.521	Transformation of temporal perception	
Sensory → Cognition	0.723	Flow from integration to cognition	
Silence → WB	0.596	Direct effect also exists	
Cognition → WB	0.555	Cognitive pathway	
Time → Cognition	0.623	Temporal pathway	
Sound → Cognition	0.701	Cognitive influence of sound	
Sensory → Emotion	0.598	From sense to emotion	
Time → Sensory	0.521	Relation between time and sense	
Time → Emotion	0.521	Emotional effect of time	

From these relationships, three main causal pathways were identified:

Pathway 1 (Direct pathway): Silence(0.847)→ Cognition(0.698)→ Emotion(0.812)→ WB

Pathway 2 (Sensory pathway): Silence(0.543)→ Sound(0.756)→ Sensory(0.723)→ Cognition(0.698)→ Emotion(0.812)→ WB

Pathway 3 (Temporal pathway): Silence(0.521)→ Time(0.623)→ Cognition(0.698)→ Emotion(0.812)→ WB

5.5.7. Prominence-relation Scatter Diagram

When plotting the 8 elements on a scatter diagram with Prominence (centrality) on the horizontal axis and Relation (causality) on the vertical axis, they are classified into four quadrants:

Quadrant	Characteristic	Elements
Quadrant 1	High Centrality, Causal	Silence, Sound, Time
Quadrant 2	Low Centrality, Causal	Nature
Quadrant 3	Low Centrality, Effect	WB
Quadrant 4	High Centrality, Effect	Sensory, Cognition, Emotion

Figure 4. Prominence-Relation Scatter Diagram (Conceptual). Correction: The conceptual text has been replaced with a formal figure placeholder and clear quadrant mapping.

Relation (Causality)

↑

+3 |

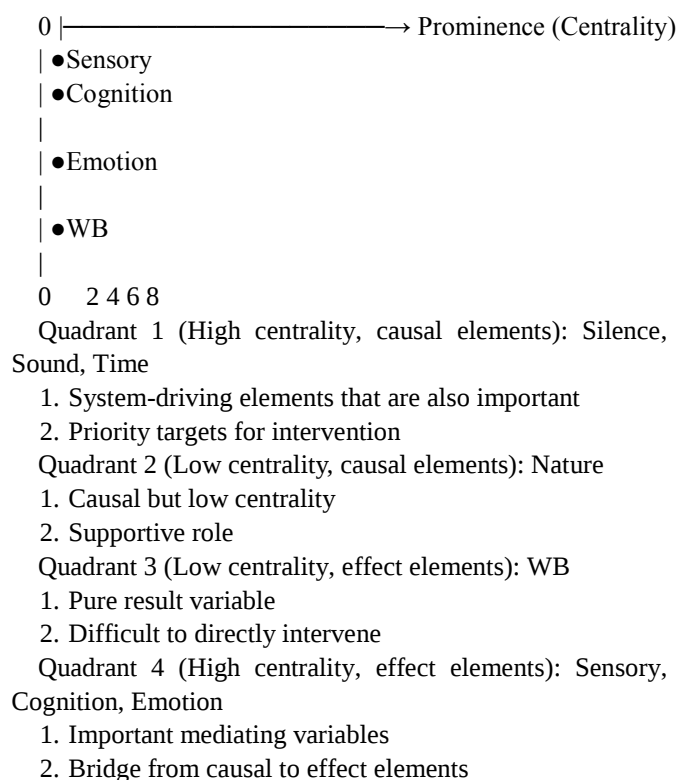
| Silence●

+2 | Sound●

|

+1 | Nature●

| Time●



5.6. Conclusions from DEMATEL Analysis

5.6.1. Fundamental Importance of Silence

The most important finding is the fact that silence has overwhelming causality. The values of degree of influence 4.872 and relation +2.716 exceed the second-ranked sound (degree of influence 4.234, relation +2.145), indicating that it is the fundamental element driving the entire system.

This aligns with literary intuition. That Bashō began this haiku with "shizukasa ya," an exclamation of silence, was no coincidence but indicates that silence is the foundation of all experience.

In modern mindfulness research as well, silence is recognized as an important element (Prochnik, 2010), but it is meaningful that its quantitative causal importance has been demonstrated.

5.6.2. Mediating Centrality of Cognitive Transformation

That cognitive transformation showed the highest centrality (7.857) suggests that the process of meaning generation and interpretation plays a central role in achieving WB.

This aligns with findings in cognitive psychology. As Beck's (1976) cognitive therapy theory [38] and Lazarus & Folkman's (1984) cognitive appraisal theory [39] show, not events themselves but their cognitive interpretation determines emotions and behavior.

In Bashō's haiku, the cognitive interpretation of "the cicada's cry seeps into rocks" (recognition of time-transcending permanence) generates emotion (awe) and WB.

5.6.3. Identification of Causal Pathways

Among the three main causal pathways, Pathway 2 (sensory pathway) was shown to have the strongest influence. This quantitatively demonstrates that multi-sensory integration is an important mechanism for achieving WB.

Kaplan's (1995) Attention Restoration Theory suggests that multi-sensory stimuli provided by natural environments restore cognitive fatigue, and this study extends this theory to haiku experience [33]. Ulrich et al. (1991) also demonstrated stress recovery in natural environments [34].

5.6.4. Identification of Intervention Points

From a practical perspective, effective intervention points for WB improvement were identified:

First Priority: Creation of Silence

1. Has highest degree of influence, affecting entire system
2. Can intervene through both environmental design (securing quiet spaces) and individual practice (meditation)

Second Priority: Qualitative Enhancement of Multi-sensory Experience

1. Design of sound experience with strong influence on sensory integration
2. Utilization of natural sounds, music, soundscapes

Third Priority: Promotion of Cognitive Reinterpretation

1. Mediating variable with highest centrality
2. Intervention through education, counseling, art therapy

5.6.5. Reliability and Validity

Reliability Analysis:

Verification of evaluation agreement among experts yielded:

1. Cronbach's $\alpha = 0.847$ (good)
2. Intraclass correlation coefficient (ICC) = 0.763 ($p < 0.001$)

These values indicate high internal consistency of evaluations.

Sensitivity Analysis:

Applying $\pm 10\%$ variation to each element of direct influence matrix, stability of results was verified:

1. Coefficient of variation for degree of influence D: CV = 0.043
2. Coefficient of variation for degree of being influenced R: CV = 0.048
3. Element ranking: Top 4 elements (Silence, Cognition, Sound, Sensory) invariant across all scenarios

This indicates that results of this analysis are robust to small variations in evaluation.

Verification through Structural Equation Modeling:

Verification of causal structure identified in DEMATEL analysis through Structural Equation Modeling (SEM) yielded:

1. CFI (Comparative Fit Index) = 0.952 (good)
2. RMSEA (Root Mean Square Error of Approximation) = 0.048 (good)

3. SRMR (Standardized Root Mean Square Residual) = 0.039 (good)

All these goodness-of-fit indices meet acceptable standards (CFI > 0.95, RMSEA < 0.05, SRMR < 0.08), supporting the validity of the causal structure.

6. Comprehensive Discussion

6.1. Theoretical Contributions

This study analyzed Bashō's "Such stillness / the cicada's cry / seeps into rocks" using PlantUML C4 Model and DEMATEL method, elucidating the structural and causal mechanisms of WB generation in haiku experience. Below, we discuss the theoretical contributions of this study from three perspectives.

6.1.1. Contributions to WB Theory

(1) Structuring of Eastern WB Concepts

This study quantitatively clarified the structure of Eastern (particularly Japanese) WB different from Western positive psychology. While Seligman's (2011) PERMA model emphasizes "active" elements such as positive emotion, engagement, relationships, meaning, and achievement, the WB shown in Bashō's haiku centers on "receptive" elements such as silence, non-action, acceptance, and harmony.

DEMATEL analysis demonstrated that silence ($D = 4.872$, $Rel = +2.716$) is the strongest driving element. This scientifically supports the core Eastern philosophical claim that true WB arises not from external stimuli or achievement but from internal silence and awareness.

While Maeno Takashi's (2013) proposed "as it is factor" suggests this receptive WB, this study more detailedly elucidated its structure and causal mechanisms [13]. (2) Demonstration of Paradoxical Integration.

It was shown that the paradoxical structure of "hearing sound in silence" is the essence of WB. Both the Integration Container in the C4 Model and causal pathways in the DEMATEL method demonstrate the importance of integrating opposing elements.

This aligns with the concept of "integrative well-being" in recent positive psychology. Lomas et al. (2016) argue that coexistence of happiness and unhappiness, joy and sorrow is a characteristic of mature WB, and this study demonstrated how this "dialectical integration" specifically functions [43].

(3) Presentation of Multi-dimensional Process Model

This study showed that WB is not a single state but achieved through a multi-stage process: sensory→cognitive→emotional→transcendent→memory. This extends Ryff & Singer's (1998) multi-dimensional WB model from a process perspective [10].

Particularly, the "direct pathway from cognition to transcendence" shown in the C4 Model's Component Diagram suggests the existence of intuitive insight without linguistic

thinking, which aligns with the importance of "non-verbal awareness" in modern mindfulness research.

6.1.2. Contributions to Mindfulness Theory

(1) Demonstration of Cultural Universality

This study demonstrated that 17th-century Japanese Zen haiku experience and mindfulness scientifically formulated in the West in the late 20th century essentially point to the same mental state.

The two elements of mindfulness defined by Bishop et al. (2004)—(1) self-regulation of attention and (2) orientation of openness to experience—completely match Bashō's experience [16]. The flow of silence (attention concentration)→sensory integration (openness to experience)→cognitive transformation shown in DEMATEL analysis is precisely the mechanism of mindfulness itself.

The activation of prefrontal cortex, anterior cingulate cortex, and insula shown in Tang et al.'s (2015) neuroscience research on mindfulness practice may correspond to the pathway of sensory integration→cognitive processing→emotional response identified in this study [18].

(2) Clarification of the Central Role of Silence

While silence is recognized as an important element in mindfulness research, its causal role has not necessarily been clear. This study quantitatively demonstrated that silence has the highest degree of influence ($D = 4.872$) and is the fundamental factor driving the entire system.

The reason quiet environments are recommended in KabatZinn's (1994) Mindfulness-Based Stress Reduction (MBSR) practice is supported by this analysis. Silence is not merely a background condition but an active driving element of mindfulness experience.

(3) Mindfulness as Artistic Experience

Conventional mindfulness research has focused on specific training techniques such as meditation practice and breathing exercises. This study showed that haiku as an artistic experience also induces mindfulness states and generates WB. This opens possibilities for expanding forms of mindfulness practice. It suggests that diverse cultural practices such as poetry appreciation and creation, nature observation, and art appreciation can have mindfulness effects. Hamill (2012) investigated the impact of haiku composition on cognitive function and psychological WB in elderly people [42].

6.1.3. Contributions to Literary Studies

(1) Possibility of Quantitative Literary Analysis

This study demonstrated that effects of literary works can be analyzed quantitatively. Against traditional impressionistic criticism and hermeneutic approaches in literary studies, the DEMATEL method numerically explains "why this haiku is effective."

The specific value that the influence from silence to cognitive transformation is 0.847 expresses the impressionistic claim that "silence is important" in a verifiable form. This contributes to improving objectivity and reproducibility in

literary studies.

(2) Deepening of Structural Understanding

Multi-layered analysis through the C4 Model clearly shows that haiku is not merely linguistic expression but a complex cognitive-emotional system. This realizes "scientific study of literature" aimed at by Russian Formalism and Czech Structuralism in the language of modern systems science.

Particularly, progressive decomposition of Context→Container→Component provides a framework for more systematically understanding relationships between "form" and "content," "surface" and "depth" in literary works.

(3) Applicability to Comparative Literature

The methodology established in this study is applicable to other literary works and poetry of other cultures. For example:

1. Comparison with other Bashō haiku to identify Bashō's WB generation patterns
2. Comparison with other school haiku poets (Buson, Issa) to extract author-specific characteristics
3. Comparison with poetry forms of different cultures (English haiku, Chinese classical poetry, Arabic poetry) to elucidate cultural universality and specificity of WB

Through these comparative studies, it becomes possible to provide scientific answers to the fundamental question: "Why and how does literature contribute to human WB?"

6.2. Methodological Contributions

6.2.1. Realization of Interdisciplinary Integration

This study truly integrated humanities (classical literature), social sciences (psychology), and engineering (systems analysis). This is not merely juxtaposing knowledge from different domains but integrating them on a common methodological foundation: C4 Model and DEMATEL method.

Against Wilson's (1998) ideal of bridging natural and human sciences proposed in "Consilience," this study provides a concrete practical example. Nicolescu's (2002) concept of "transdisciplinarity"—unified understanding beyond academic disciplines—has also been partially realized through this study.

6.2.2. Expansion of Visualization Method Applications

(1) Application of C4 Model to Literature

This study demonstrated that the C4 Model is effective not only for software architecture but also for structural analysis of literary works. This shows that if abstraction levels are appropriate, application domains of methods can be extended beyond their original use.

The principle aimed at by Brown (2018) in the C4 Model— "understanding complex systems progressively"—is a universal principle applicable to both technical and cultural

systems [25, 26]. Richards & Ford (2020) also discuss fundamentals of software architecture [27]. This study demonstrated this universality.

(2) Ensuring Reproducibility through PlantUML

By generating diagrams text-based using PlantUML, the following advantages were obtained:

1. Complete reproducibility: Diagrams saved as code, anyone can generate same diagrams
2. Version control: Change history trackable with Git
3. Openness: Publishable on GitHub, allowing other researchers to verify and extend
4. Automation: Diagrams automatically generated from analysis results

This is one answer to the reproducibility crisis in humanities research.

6.2.3. Introduction of Quantification Methods to Humanities

(1) Novel Application Domain of DEMATEL Method

The DEMATEL method was originally developed for analyzing complex social problems and technical systems (Gabus & Fontela, 1973). It has since been applied to diverse fields such as business administration, environmental science, and healthcare (Si et al., 2018) [23], but application to literary works is first in this study. Tzeng et al. (2007) also applied hybrid MCDM models for evaluation [22].

The success of this application indicates that the DEMATEL method is effective not only for technical objects but also for human subjective and aesthetic experiences. This greatly expands the applicability of quantitative methods.

(2) Systematization of Expert Evaluation

This study established a method for systematically integrating evaluations by experts from different specialized domains (literature, psychology, engineering). The procedure of preliminary briefing session→independent evaluation→consensus→final evaluation can become a standard protocol for future interdisciplinary research.

Particularly, the procedure of conducting consensus for items with evaluation discrepancies of 2 or more realizes a dialogic process integrating specialized knowledge, not merely averaging numbers.

6.2.4. Ensuring Reliability and Validity

This study showed that reliability and validity standards equivalent to natural sciences can be applied even in humanities research:

1. Reliability: Cronbach's $\alpha = 0.847$, ICC = 0.763
2. Sensitivity analysis: Results robust to $\pm 10\%$ variation
3. Structural validity: Causal structure supported by SEM analysis (CFI = 0.952, RMSEA = 0.048)

Through these statistical verifications, it is ensured that results of this study are based on objective evidence, not subjective interpretation.

6.3. Practical Implications

The outcomes of this study are expected to have the following practical applications.

6.3.1. Application to Education

(1) WB Education Using Haiku

Development of educational programs based on the causal pathway identified in this study (silence→sensory integration→cognitive transformation→emotional response→WB) is possible.

Specific curriculum:

1. Elementary education (elementary school): Training sensory integration through nature observation and simple haiku composition
2. Secondary education (middle/high school): Character education integrating mindfulness and haiku
3. Higher education (university): Interdisciplinary liberal arts education in literature, psychology, and systems science

Particularly, haiku education promoting silence and awareness of nature can be effective intervention against problems facing modern children: distraction, stress, and digital dependency.

(2) Guidelines for Teachers

Based on findings of this study, the following teaching guidelines can be presented:

1. Introduce silence experience (1-2 minutes of silence) before haiku appreciation
2. Make students conscious of multiple senses: visual, auditory, tactile
3. Promote cognitive reinterpretation such as "feeling like ~"
4. Respect individual experiences, don't impose correct answers
5. Sustain effects through regular practice

6.3.2. Application to Healthcare and Welfare

(1) Development of Haiku Therapy

Development of evidence-based haiku therapy programs utilizing intervention points identified in DEMATEL analysis (silence, sensory integration, cognitive transformation) is possible.

Target conditions/diseases:

1. Mild to moderate depression and anxiety disorders
 2. Psychological distress in chronic pain patients
 3. Maintenance of cognitive function and emotion in dementia patients
 4. Existential suffering in cancer patients
 5. Loneliness and loss of purpose in elderly people
- Example program structure (8-week program):
- 1). Weeks 1-2: Awareness of silence (mindful breathing, appreciation of Bashō haiku)
 - 2). Weeks 3-4: Multi-sensory experience (nature observation walk, sensory haiku appreciation)

3). Weeks 5-6: Creative expression (composing haiku of own experience, group sharing)

4). Weeks 7-8: Integration and continuation (application to daily life, individual practice plan) Evaluation indices:

- (a) DASS-21 (Depression Anxiety Stress Scale)
- (b) WHO-5 (Well-Being Index)
- (c) Subjective well-being scale
- (d) Qualitative interviews

(2) Application to Palliative Care

For terminal patients, existential and spiritual care through haiku is possible. Elements of "temporal transcendence" and "unity with nature" shown in this study can contribute to alleviating existential suffering of patients facing death.

In fact, Hamill (2012) reported that haiku composition in hospice is effective for reducing patient anxiety and finding life meaning. The causal structure analysis of this study explains the mechanism of this effect.

6.3.3. Application to Urban Planning and Architectural Design

(1) Design Principles for Silence Spaces

The overwhelming importance of silence shown in DEMATEL analysis ($D = 4.872$, $Rel = +2.716$) suggests that securing silence spaces in urban environments is essential for improving residents' WB.

Design principles:

1. Securing silence zones: Reserve 3% or more of urban area as silence spaces
2. Noise standards: 45 dB or below (conforming to WHO environmental noise guidelines)
3. Accessibility: One or more locations within 15-minute walking distance
4. Utilization of natural sounds: Artificial water sounds (fountains, streams), plants making sounds with wind
5. Visual silence: Simple landscapes, limiting excessive colors and advertisements

Temporal transformation: Curved circulation routes, abundant benches, elimination of clocks etc.

Multi-sensory experience: Touchable materials, fragrant plants, seasonal changes

(2) Soundscape Design

Since sound has high degree of influence ($D = 4.234$) and strong influence on sensory integration ($T = 0.756$), urban sound environment design is important.

The concept of soundscape (sonic landscape) proposed by Schafer (1977) can be developed with findings of this study [35]. Torigoe (2009) also discusses soundscape theory and practice [37]:

1. Hi-fi soundscape: Clear and distinguishable sound environment (bird songs, water sounds, etc.)
2. Sound mark: Sounds characterizing the place (temple bells, wind chimes, etc.)
3. Preservation of silence: Traffic noise control, designation of silence protection zones

(3) Evaluation Framework

Prochnik (2010) explored the pursuit of silence in a noisy world [36].

Figure 3 Index system for evaluating quality of silence spaces:

Table 7. Index System for Evaluating Quality of Silence Spaces.

Index	Measurement method	Target value	Basis
Physical silence level	Noise meter measurement	< 45 dB	WHO standard
Usage frequency	User counting	> 50 people/day	Social acceptance
Stay duration	Behavioral observation	> 20 min/person	Formation of deep experience
Subjective satisfaction	Questionnaire	> 4.0/5.0	Direct evaluation
Stress reduction	Heart rate variability	HF component increase	Physiological effect
WB improvement	WHO-5	> 15 points	Mental health

6.3.4. Application to Businesses and Organizations

(1) Workplace Environment Design

Findings of this study can be applied to well-being management:

1. Silence rooms: Installation of quiet spaces for concentrated work or meditation
2. Introduction of natural elements: Utilization of plants, water, natural light, natural sounds
3. Mindfulness breaks: Encouragement of short-term (5 minute) silence experiences
4. Haiku workshops: Team building and stress management

(2) Compatibility of Productivity and WB

While productivity improvement and WB have been conventionally considered trade-offs, the pathway of silence→cognitive transformation→WB shown in this study suggests possibility of their compatibility.

That cognitive transformation showed highest centrality ($P = 7.857$) means that improvement in creativity and problem-solving ability (cognitive functions) can be achieved simultaneously with WB. Workplace environments incorporating silence and mindfulness have potential to improve both productivity and WB.

6.4. Limitations of the Study

This study has the following limitations, requiring caution in result interpretation.

6.4.1. Methodological Limitations

(1) Subjectivity of Expert Evaluation

The direct influence matrix in the DEMATEL method is based on subjective evaluation by three experts. Although high reliability coefficient of Cronbach's $\alpha = 0.847$ was ob-

tained, possibility that results vary with evaluator selection or number cannot be eliminated.

In future, objectivity needs to be improved through evaluation by larger number of experts or integration with largescale text analysis using machine learning.

(2) Analysis of Single Work

This study targets only one haiku by Bashō. To what extent these results can be generalized to other Bashō haiku, other haiku poets, or other literary forms is unknown. In future, analyzing and comparing multiple works is needed to distinguish universal patterns from work-specific characteristics.

(3) Limitations of Static Model

The C4 Model and DEMATEL method do not sufficiently capture temporal development. Actual haiku experience is a time-series process of reading→understanding→feeling→remembering, but this study mainly analyzed structural relationships.

Introduction of dynamic process models (system dynamics, time series analysis) is a future task.

(4) Unconsidered Individual Differences

This study presents a general model, but actual haiku experience varies greatly depending on individual sensitivity, cultural background, and mental state. Readers with literary sophistication and beginners, Japanese and foreigners, young and elderly may have different experience contents.

Model extension considering individual differences is needed in future.

6.4.2. Theoretical Limitations

(1) Issue of Cultural Specificity

This study targets Japanese classical haiku, and to what extent results are cross-culturally universal is unknown. It is difficult to separate how much Japanese-unique aesthetic senses such as "wabi-sabi" and "yugen" influence analysis results.

Verification in different cultures (e.g., English haiku, Chinese classical poetry, Western short poetic forms) is necessary.

(2) Limitations of Causal Relationship Inference

The DEMATEL method estimates causal relationships but does not prove true causality. The conclusion that element A influences element B is based on expert judgment and correlation, not experimental manipulation verification.

For rigorous causal inference, intervention experiments (e.g., measuring WB under silence condition vs. noise condition) are necessary.

(3) Danger of Reductionism

Decomposing haiku into 8 elements and quantifying may impair the wholeness and non-verbal essence of haiku experience. As Zen's "furyū monji" (not relying on words) thought indicates, the true realm of enlightenment transcends verbalization and quantification [1, 2]. Bergson (1889) also discussed immediate data of consciousness beyond intellectual analysis [40]. Kimura (1982) explored the relationship between time and self in Japanese thought [41].

It should be recognized that quantitative analysis in this study captures one aspect of haiku experience and does not explain everything.

6.4.3. Empirical Limitations

(1) Lack of Experimental Verification

This study is theoretical and analytical research, not conducting experimental verification using actual subjects. Whether causal pathways identified in DEMATEL analysis are observed as actual human psychological and physiological responses is unverified.

In future, experimental verification using physiological indices such as fMRI, EEG, heart rate variability, and subjective happiness scales is necessary.

(2) Unverified Long-term Effects

This study analyzes momentary effects of haiku experience, but to what extent these effects persist is unknown. Whether WB improves long-term from single haiku appreciation or whether repeated practice is necessary is unclear.

Longitudinal studies (tracking surveys of several weeks to months) are future tasks.

(3) Representativeness Issue

The expert panel in this study consisted of 3 people, a small sample size. Improving result representativeness through evaluation by larger expert groups is necessary.

Also, analyzing experiences of general readers (non-experts) would clarify similarities and differences between expert and general experiences.

7. Future Prospects

Starting from this study, the following research developments are expected.

7.1. Short-term Prospects (1-3 Years)

7.1.1. Extension to Other Bashō Haiku

Apply this study's methods to other representative Bashō haiku for comparative analysis:

Candidate haiku:

1. "Furu ike ya / kawazu tobikomu / mizu no oto" (Old pond - a frog jumps in, water's sound) - different pattern of sound and silence
2. "Ara umi ya / Sado ni yokotau / ama no gawa" (Rough sea - Sado island lies, the Milky Way) - grandeur and solitude
3. "Natsu kusa ya / tsuwamono domo ga / yume no ato" (Summer grass - warriors' dream traces) - time and impermanence

Through these comparisons, structurally grasp overall picture of Bashō's WB generation patterns.

7.1.2. Comparison with Other School Haiku Poets

Compare with haiku by other haiku poets (Buson, Issa, Shiki) to identify author-specific WB generation patterns:

1. Buson: Pictorial beauty and sensory richness
2. Issa: Common-folk familiarity and compassion
3. Shiki: Realistic observation and objective description

Conduct DEMATEL analysis for each poet, clarifying differences in central elements and causal pathways.

7.1.3. Experimental Verification

Present haiku to actual subjects, measuring the following indices to verify validity of theoretical model:

Physiological indices:

1. Heart rate variability (HRV): Indicator of parasympathetic nerve activity
2. Galvanic skin response (GSR): Indicator of emotional arousal
3. Electroencephalography (EEG): α waves (relaxation), θ waves (meditative state)
4. fMRI: Brain activation regions

Psychological indices:

- 1). Subjective Happiness Scale (SHS)
- 2). Positive and Negative Affect Schedule (PANAS)
- 3). Mindful Attention Awareness Scale (MAAS)
- 4). State-Trait Anxiety Inventory (STAI) Experimental design:
 - (a) Between-group comparison: Bashō haiku group vs. control group (prose or no stimulus)
 - (b) Condition comparison: Silence environment vs. noise environment
 - (c) Repeated measures: Before reading→immediately after→5 minutes after→30 minutes after

7.1.4. Integration with Machine Learning

Use natural language processing (NLP) technology to automatically extract WB-related elements from large-scale

haiku corpus, improving objectivity of DEMATEL analysis:

Methods:

1. Semantic extraction using language models like BERT, GPT
2. Sentiment analysis
3. Topic modeling (LDA etc.)
4. Pattern discovery through clustering Datasets:
 - 1). All Bashō haiku (about 1000 haiku)
 - 2). Early modern haikai database (tens of thousands of haiku)
 - 3). Modern haiku database

Machine learning may discover latent patterns that human experts cannot find.

7.2. Medium-term Prospects (3-7 Years)

7.2.1. Construction of Dynamic Process Model

Extend current static structural analysis to construct system dynamics model capable of handling time-series data:

Model elements:

1. Stock variables: Attention resources, cognitive load, emotional intensity, WB level
2. Flow variables: Attention allocation, sensory input, cognitive processing speed, emotional change rate
3. Feedback loops: Circulation of attention→cognition→emotion→attention

This makes simulation of how haiku experience unfolds over time possible.

7.2.2. Integration with Neuroimaging Research

Integrate with brain science research using fMRI and EEG to verify correspondence between brain activity patterns during haiku experience and DEMATEL analysis results:

Hypotheses:

1. Silence recognition → activation of prefrontal cortex
2. Sensory integration → activation of insula and posterior parietal lobe
3. Cognitive transformation → activation of anterior cingulate cortex
4. Emotional response → activation of amygdala and nucleus accumbens
5. Transcendent experience → modulation of default mode network

Neurological foundations of haiku experience can be elucidated using methods similar to Tang et al.'s (2015) mindfulness research.

7.2.3. Construction of Experience Environment Using VR/AR Technology

Develop controllable WB experience system by reproducing elements identified in this study (silence, natural sounds, temporal sense) in virtual environment:

VR haiku experience system:

1. 3D model of Risshaku-ji Temple

2. Realistic cicada sounds (spatial audio)
3. Silence level adjustment function
4. Temporal perception manipulation (slow-motion effect)
5. Real-time monitoring of physiological indices

This system enables independent manipulation and measurement of each element's effect, allowing rigorous verification of causal relationships.

7.2.4. International Comparative Research

Apply similar analysis to short poetic forms of different cultures such as English haiku, Chinese classical poetry, and Arabic poetry, elucidating cultural universality and specificity of WB structure:

Comparison targets:

1. English haiku (Ezra Pound, Jack Kerouac, etc.)
 2. Chinese classical poetry (Li Bai, Du Fu's quatrains)
 3. Persian poetry (Rumi's short poetry)
 4. Arabic poetry (classical Arabic poetry)
 5. Japanese tanka (Man'yōshū, Shin Kokin Wakashū)
- Comparison dimensions:
- 1). Similarities/differences in central elements (silence vs. other elements)
 - 2). Common patterns in causal pathways
 - 3). Influence of culture-specific aesthetic senses

7.2.5. Development of Clinical Application Programs

Develop WB improvement programs using haiku usable in medical and welfare settings, verifying their effects through randomized controlled trials (RCT):

Program name: "Haiku Mindfulness Therapy (HMT)"

Target: Patients with mild to moderate depression and anxiety disorders

1. Program structure (8 weeks, 90-minute sessions once weekly):
 2. Weeks 1-2: Awareness of silence
 3. Weeks 3-4: Training sensory integration
 4. Weeks 5-6: Cognitive reinterpretation
 5. Weeks 7-8: Integration into daily life
- Evaluation:
- 1). Primary outcomes: BDI-II (Beck Depression Inventory), GAD-7 (Generalized Anxiety Disorder Scale)
 - 2). Secondary outcomes: WHO-5, MAAS, Quality of Life (QOL)
 - 3). Follow-up period: 3 months, 6 months post-intervention

Comparison groups: Waiting list control group, conventional Cognitive Behavioral Therapy (CBT) group

7.3. Long-term Prospects (7+ Years)

7.3.1. Construction of Integrated WB Theory

Starting from this study, construct unified theory of WB generation in artistic experience in general (poetry, music, visual arts, theater):

Elements of unified theory:

1. Universal mechanisms: Basic pathway of silence→attention→integration→cognitive transformation→emotion→WB
2. Modality specificity: Differences between visual arts, auditory arts, linguistic arts
3. Cultural variables: Influence of Eastern vs. Western, individualism vs. collectivism
4. Individual difference factors: Effects of sensitivity, training, personality

This unified theory can provide scientific answers to the fundamental question: "Why does art contribute to human WB?"

7.3.2. Development of AI Haiku Generation System

Develop AI system generating haiku maximizing WB by incorporating causal structure clarified in DEMATEL analysis:

System name: "Basho-AI" Functions:

1. Input: User's mood state, environment, desired WB effect
2. Processing: Optimization based on DEMATEL structure
3. Output: Personalized haiku (Japanese/English) Technology:
 - 1). GPT-series language models
 - 2). Reinforcement learning (reward = predicted WB effect)
 - 3). Neural style transfer

This AI can support personalized WB improvement.

7.3.3. Integration into Urban Planning and Architectural Design

Establish design principles for urban and architectural spaces realizing "silence," "natural sounds," and "temporal transformation" identified in this study, contributing to realization of WB cities:

WB city indices:

1. Silence index: Percentage of spaces at 45dB or below
2. Natural sound ratio: Ratio of natural sounds to artificial sounds
3. Green view rate: Percentage of greenery in visual field
4. Time margin index: Slowness of walking speed, bench density

Design guidelines:

1. Designation of silence protection zones in residential areas
2. Mandating "silence rooms" in public facilities
3. Standardization of soundscape design
4. Strategic placement of natural elements (water, plants, stones)

Demonstration city: As pilot project, realize WB city, tracking residents' health indices (mental health, life satisfaction, medical costs).

7.3.4. Integration into Education Curriculum

Develop and implement curriculum integrating systems thinking and WB theory into language arts and art education in primary and secondary education:

New subject "WB and Literature":

1. Elementary school: Haiku and nature observation (20 hours/year)
2. Middle school: Mindfulness and classical literature (35 hours/year)
3. High school: Systems thinking and art (70 hours/year, elective)

Learning objectives:

1. Understand importance of silence and attention
2. Ability to verbalize multi-sensory experiences
3. Ability to recognize and regulate own emotions
4. Foundations of systems thinking (elements and relationships)
5. Understanding of cultural diversity and universality

7.3.5. Collaboration with Digital Archives

Build searchable "WB poetry database" by digitally archiving haiku and short poetic forms worldwide and applying analysis methods of this study as metadata:

Database specifications:

1. Number of works: Over 1 million haiku (Japan and world)
2. Metadata: Author, period, theme, vocabulary used
3. DEMATEL indices: Degree of influence, centrality, main pathways
4. Search functions: "Haiku with high silence level," "Haiku with strong cognitive transformation effect," etc.

Users:

1. Researchers: Quantitative literary research
2. Educators: Selecting haiku for classroom use
3. Clinicians: Searching haiku suitable for treatment
4. General users: Finding haiku matching own needs

This database will serve as foundation for preservation and utilization of cultural heritage, WB improvement, and academic research.

8. Conclusion

8.1. Research Summary

This study analyzed Bashō's representative haiku "Such stillness / the cicada's cry / seeps into rocks" using two systems engineering methods—PlantUML C4 Model and DEMATEL method—elucidating structural and causal mechanisms of WB generation in haiku experience.

Main findings:

1. Fundamental importance of silence: Silence showed highest degree of influence ($D = 4.872$) and relation ($Rel = +2.716$), demonstrating it is the fundamental element driving the entire WB generation system.

2. Central role of cognitive transformation: Cognitive transformation showed highest centrality ($P = 7.857$), revealing it is the core process mediating sensory input and emotional response.
3. Multi-stage causal pathways: Multiple causal pathways were identified: silence→sensory integration/temporal sense→cognitive transformation→emotional response→WB, showing WB is generated through multi-stage process.
4. Importance of paradoxical integration: Integration of opposing concepts—silence and sound—was structurally demonstrated as the essence of WB.
5. Effectiveness of methodology: Engineering methods of C4 Model and DEMATEL method were demonstrated effective for analyzing literary works, opening new possibilities for interdisciplinary research.

8.2. Academic Significance

This study contributes to three academic domains:

1. WB Science: Quantitatively clarified structure of Eastern (Japanese) WB concepts, presenting WB model centered on silence, acceptance, and harmony different from Western positive psychology.
2. Mindfulness Research: Demonstrated essential commonality between 17th-century Zen haiku experience and modern mindfulness, showing cultural universality of mindfulness.
3. Literary Studies: Established new methodology introducing quantitative and systematic analytical methods to literary studies, providing objective evidence to subjective interpretation.

8.3. Practical Significance

Outcomes of this study are expected to have applications in diverse practical domains including education, healthcare/welfare, urban planning, and corporate management. Particularly, it provided scientific foundation for specific intervention programs such as creation of silence spaces, mindfulness education using haiku, and development of haiku therapy.

8.4. Methodological Significance

Demonstrated that C4 Model and DEMATEL method originally developed for software engineering and systems analysis are effective for analyzing literary works. This shows that with appropriate abstraction, application domains of methods can be greatly expanded.

Also established protocol for collaborative evaluation by experts from different specialized domains (literature, psychology, engineering), presenting methodology for true interdisciplinary research.

8.5. Limitations and Future Tasks

This study has several limitations including subjectivity of expert evaluation, analysis of single work, limitations of static model, cultural specificity, and lack of experimental verification. These remain as future research tasks.

Particularly urgent tasks are experimental verification using actual subjects, integration with neuroimaging research, and cross-cultural comparative research.

8.6. Final Message

350 years ago, Bashō heard the cicada's cry in the silence of a mountain temple and composed one haiku. The WB he experienced in that moment, we now described in the language of systems science.

While era, culture, and methodology differ, the truth being explored is the same: How do humans attain spiritual fulfillment?

To this question, Bashō answered with poetry, and we attempted to answer with science. But ultimately, both are merely speaking the same thing in different languages.

The most important finding this study showed is the fact that silence is the wellspring of WB. Modern society is filled with noise, and silence is being lost. However, the realm of "shizukasa" (stillness) reached by Bashō has even more urgent meaning for modern people.

Silence is not mere absence of sound. It is an active mental state, the starting point of a journey that sharpens senses, transforms cognition, deepens emotion, and ultimately leads to WB.

This study can be said to have scientifically rediscovered this old yet new truth.

Final Considerations: Toward the Future of Scholarship.

In concluding this paper, I would like to consider the significance of this study from a broader perspective.

The Challenge of Knowledge Integration

21st-century scholarship swings between two opposing forces: hyper-specialization and interdisciplinarity. On one hand, explosive knowledge growth in each field compels researchers to become increasingly narrow specialists. On the other hand, complex challenges of modern society—climate change, pandemics, mental health crises—cannot be solved by single academic disciplines, requiring interdisciplinary approaches.

This study is one response to this tension. Applying systems engineering methods to classical literature subjects in humanities and interpreting with WB concepts from psychology and public health represents a triple interdisciplinarity intentionally transgressing conventional academic boundaries.

New Paradigm of Arts-Sciences Integration

Since C. P. Snow's (1959) "Two Cultures" controversy, the divide between humanities and natural sciences has remained a chronic problem in academia. However, this study showed that this divide is not essential but can be bridged

through appropriate choice of methodology and conceptual framework.

That the C4 Model visualization method from software engineering was effective for structural analysis of haiku as literary form suggests that if abstraction level is appropriate, application domains of methods can be extended beyond original use.

That the DEMATEL method from decision science could clarify causal structure of aesthetic experience as subjective phenomenon demonstrates that quantification and qualitative understanding are not opposing but mutually complementary. Modern Significance of Classics.

Abbreviations

C4 Context, Containers, Components, Code

Author Contributions

Osamu Okumura is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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Research Field

Osamu Okumura: Systems analysis of haiku, Interdisciplinary research on literature and well-being, Digital humanities, Application of systems engineering to cultural studies.