

## Research Paper

# Dynamic Interplay of Analytical Problem-Solving and Interpretative Exploration in Design Innovation

Toofan Sharifi <sup>1</sup>, Ahad Shahhoseini <sup>1\*</sup>, Seyed Ali Faregh <sup>1</sup>, Saeed Sadigh-Eteghad <sup>2</sup>,  
Alberto Del Bimbo <sup>3</sup>

<sup>1</sup> Faculty of Design, Tabriz Islamic Art University, Tabriz, Iran

<sup>2</sup> Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

<sup>3</sup> Media Integration and Communication Center, University of Florence, Italy

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### Abstract

*The study is an exploratory research based on a systematic review conducted qualitatively. It examines recent studies on the growing trends towards design participation in innovation management processes, specifically focusing on one of the main streams of research: design-driven innovation and the innovation of meaning. This research aims to define and introduce the infrastructure of this field. Therefore, the elements of analytical innovation and interpretive innovation are extracted from sources and compared across several parameters. Analytical innovation is characterized by structured and logical approaches, while interpretive innovation involves subjectivity and context. After defining hermeneutics as the science of interpretation, hermeneutic concepts are analyzed and extracted in relation to interpretive innovation in a design workshop. Concepts such as the hermeneutics of discourse, horizon of expectation, fusion of horizons, hermeneutic dialogue, metaphor, and narrative are discussed. To determine the complex relationship between hermeneutic concepts and visual representation design concepts, a bibliographic network of studies in this field was conducted. This included topics like interpretation, communication, phenomenology, design thinking, and human-centered design practice. Looking ahead, hermeneutics is poised to influence cultural inclusiveness, sustainability, ethical considerations, and interdisciplinary collaboration in design. It will also play a fundamental role in shaping digital experiences and fostering responsible innovation. Embracing these possibilities leads to a more holistic and ethically informed approach to design-driven innovation in our evolving world.*

**Keywords:** Innovation, Creativity, Hermeneutics, Design, Analytical Problem-Solving, Interpretative Exploration, Design-Driven Innovation.

## INTRODUCTION

In the ever-evolving landscape of design innovation, two paradigms, analytical problem-solving and interpretative exploration, engage in a dynamic interplay that shapes the way designers approach challenges and create novel solutions. Analytical problem-solving, deeply rooted in historical foundations and rationalist thought, embodies a structured and data-driven approach to design innovation [1]. It emphasizes precision, clarity, and

well-defined problem statements. On the other hand, interpretative exploration embraces a contrasting philosophy, drawing inspiration from hermeneutics, phenomenology, and postmodernism [2]. It perceives design and innovation as context-dependent, subjective, and dynamic processes, acknowledging that meanings and interpretations are multifaceted and cannot be reduced to deterministic algorithms. The coexistence of these paradigms presents both challenges and opportunities in the realm of design innovation. This article explores the essence of analytical problem-solving and interpretative exploration, delving into their

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\* Corresponding author: [ahad.shahhoseini@tabriziau.ac.ir](mailto:ahad.shahhoseini@tabriziau.ac.ir)  
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historical foundations, characteristics, and real-world applications [3]. We investigate how these paradigms influence the innovation process, the tensions that arise when they intertwine, and the potential for a harmonious interplay between them. Analytical problem-solving finds applications in fields demanding precision and efficiency, such as aerospace engineering and healthcare [4]. In contrast, interpretative exploration thrives in human-centered design and complex, multifaceted challenges, exemplified by user experience design and urban planning [3]. The interplay between these paradigms illuminates a fascinating synergy. Designers adept at navigating their convergence points are better equipped to tackle multifaceted challenges and craft innovative solutions that transcend the boundaries of rigid paradigms [5]. However, this convergence is not devoid of challenges, including the tension between precision and ambiguity and the need for cultural adaptation within design innovation teams [6]. To facilitate a nuanced understanding of this interplay, we propose a framework that appreciates the richness of both paradigms and encourages their symbiotic coexistence [7]. This framework recognizes that innovation is multifaceted, demanding adaptability in approach and interdisciplinary collaboration [5]. In the following sections, we delve into the research methods employed to investigate this interplay, provide insights into design-driven innovation [3], explore the role of product meaning [8], and introduce the relevance of hermeneutics in understanding and shaping innovation and creativity [2]. We conclude by envisioning the future implications of hermeneutics in design innovation and addressing potential advantages, disadvantages, and areas for future research.

## **RESEARCH METHODS**

This study is an exploratory research based on a qualitative systematic review. After examining the general relationship between the two variables of innovation management and design in recent studies, the main research trends were identified, and the focus shifted to an in-depth analysis of an emerging trend relevant to the research topic. The goal is to identify and introduce the infrastructure of this trend.

The data collection for this research follows the traditional method of systematic review, and the analysis employs content analysis and comparative analysis. Content analysis involves an in-depth examination of the collected data to determine the relationship between variables and the communication network, uncovering hidden elements as an interpretation of the data. This method examines communication patterns in a repeatable manner [89].

To follow the systematic approach, English research articles related to the research keywords from 2010 to 2024 were extracted and analyzed from three databases: ScienceDirect, Google Scholar, and JSTOR. In the first stage, with an open approach, more than 568 articles related to the role of design in innovation management were collected as primary and available sources. The criteria for including studies at this stage were the presence of the keyword "innovation management" and at least one of the words: "design-based," "design-oriented," "design-driven," or "design-inspired" in the texts.

These studies show that many tendencies have emerged regarding how design can participate in business management processes, leading to discussions about the role of design in innovation. The analysis of these studies reveals two parallel research streams. The first stream is related to design thinking, indicating that responses to crises depend on management research where innovation needs formulation. Parallel to this, in fields such as public management for innovation, many debates about the participation of design in innovation have occurred. The most significant and frequent discussions fall under the title of design-driven innovation, which includes debates related to the innovation of meaning.

In the second step, 307 sources were selected based on the keyword "design-driven innovation" (Figure 1).

In the third step, 53 articles were selected from among these researches based on the presence of analytical signs. In the fourth step, 15 articles were screened through full-text reading, focusing on characteristics such as the degree of direct relationship between the study and the research variables, the method adopted in the study, and the credibility of the authors and the publisher. These articles were selected and reviewed to discover meaningful concepts and patterns. In this step, elements of analytical innovation and interpretive innovation were extracted from sources and compared across several parameters, including distinctions in the framework, process, knowledge drivers, levers, strategic factors, and cognitive factors.

In the fifth step, after identifying hermeneutics as a science of interpretation, hermeneutic concepts related to interpretive innovation were analyzed and extracted in the "Design Direction" workshop. The authors chose this workshop for the case study due to its universal method in presenting hermeneutic concepts and its introduction by Professor Verganti, a highly regarded researcher in the field of design-driven innovation. Verganti has participated in writing 386 articles, books, and dissertations and is the author of the most cited book on design-driven innovation [3], with 2663 references, making this workshop particularly relevant.

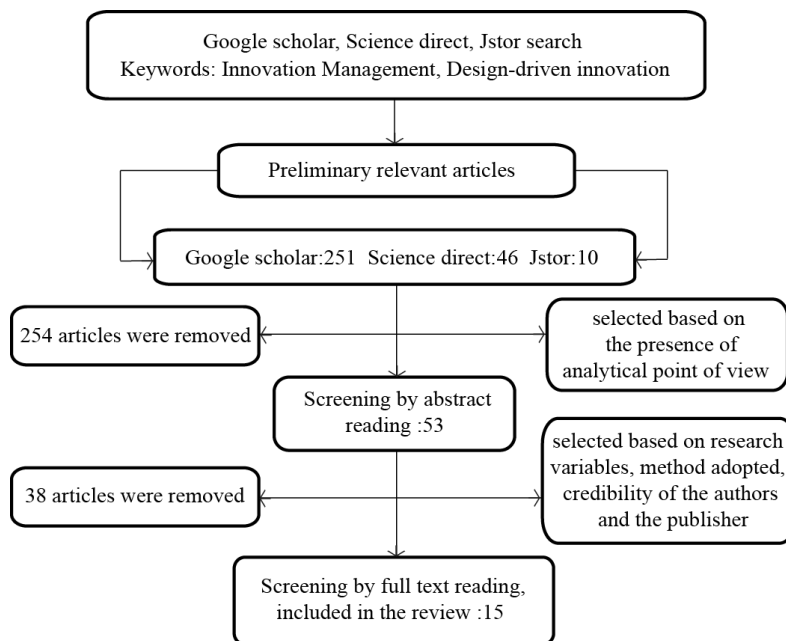


Fig 1. The papers’ screening hierarchy

In the sixth step, to determine the complex relationship between hermeneutic concepts and design concepts and to explore how this relationship could be the subject of future research, the visual representation of the bibliographic network of studies in this field was carried out using "VOS viewer" software. This was done with the keywords "hermeneutics" and "design" in research databases, conducted in two stages. In the first stage, 261 articles related to studies and research in the field of design that utilized concepts, methods, and topics related to hermeneutics were extracted. In the second stage, focusing on the identification of design studies that used hermeneutics as a method for innovation and creativity, 30 related studies were obtained. The main nodes, clusters, and their interrelationships in the network were analyzed.

At this stage, the advantages and disadvantages of the research were highlighted, and an evolving perspective on the use of hermeneutics in design was drawn. Current research topics were introduced alongside examples, and several persuasive ways for future research and studies to advance the hermeneutic discourse in design were suggested. The hermeneutic concepts obtained from our research can be effective in advancing these studies.

## LITERATURE REVIEW AND THEORETICAL FOUNDATIONS

### Defining Design-Driven Innovation

To accurately understand design-driven innovation, it is essential to refer to the relevant

definition of design. Krippendorff offers a profound definition: "When something makes sense, meaning arises, and the task of the product is to establish that meaning" [28, 17]. Verganti [27] founded design-driven innovation based on this definition. It should be noted that there is no clear description of the meaning of the product. However, the meaning of the product can be interpreted in terms of the product's values, which encompass both tangible and intangible aspects [29-31]. Intangible values are primarily related to emotional and socio-cultural needs. These interpretations can be made by users [32-36].

Nevertheless, the design-driven innovation process begins before product development and is not easily understood at various stages [34]. Design-driven innovation is not just about a new approach but also about a new goal and reason that redefines well-defined problems. The shift is from asking "what" a product is (its characteristics) to asking "why" [37]. Design makes sense because it is a language, and due to its material nature, it possesses characteristics beyond simple linguistic acts. Therefore, it creates new meanings through the translation process [38].

Designers act as intermediaries because of their access to knowledge, language, and product meanings, allowing them to translate and interpret product languages for different cultures. Moreover, by understanding customer meanings, they can generate significant competitive advantages and even catalyze the creation of disruptive new markets [39, 40]. Innovation in service design has also been driven by technological pressure and market demand [41-43], but design-driven innovation in service design is also continuously evolving [31].

### *The Role of Product Meaning*

Central to design-driven innovation is the concept of product meaning. Despite the complexity involved in interpreting product meanings [44], Gasparin and Green [45], using Actor-Network Theory, consider meaning as the outcome of the translation process. In this process, designers, design managers, and managers actively strive to design new items, communicate with customers, and encourage customer acceptance. Companies developing design-driven innovations need to collaborate with various groups of commentators to explore new scenarios [46]. The search for the hidden dynamics of socio-cultural models enables the discovery of entirely new meanings [47].

Users can rarely predict fundamental changes in the meaning of a product. Product meanings are complex and dynamic, often evolving with changing societal norms and values. Understanding these meanings becomes crucial for design-driven innovation. Designers, in their role as intermediaries, bridge the gap between products and users. They translate and interpret product languages across diverse cultures. This translation process encompasses not only language but also involves conveying cultural and emotional nuances, infusing products with deeper significance [38].

### *The Application of Hermeneutics in Design*

In this context, hermeneutics emerges as a powerful framework for interpreting and understanding the intricate web of product meanings. Gadamer's notion of the "fusion of horizons" becomes particularly relevant. It calls for the synthesis of temporal and spatial horizons between the reader and the historical subject or text. In design-driven innovation, this fusion encompasses the historical, cultural, and contextual backgrounds of both the product and its users, giving birth to new and enriched meanings [48].

Hermeneutics is not just a theoretical construct but a practical tool in the hands of designers. It helps them unearth hidden meanings, delve into historical contexts, and embrace diverse cultural perspectives. It fosters a deeper understanding of user needs and societal values, thereby guiding the creation of products and services that resonate on a profound level.

### *Unpacking Hermeneutics in Human Experience*

The meaning of human experience can be distinguished into two dimensions. The first

dimension is the bodily aspect of sensory perception, while the second dimension consists of a framework within which sensory perception becomes meaningful and can be conceived as 'interpreted perception' [49]. If we consider interpretation as an explanation or opinion of what something means (according to the Cambridge Dictionary), hermeneutics is the study of interpretation. Initially applied to the interpretation, or exegesis, of scripture, hermeneutics has since been broadened to encompass questions of general interpretation [50].

There are many disciplines whose subjects require interpretative approaches, and hermeneutics is involved in them because the subjects of these disciplines are related to the meaning of human intentions, beliefs, actions, or the meaning of human experience [51].

### *Key Concepts in Hermeneutics*

To navigate the realm of hermeneutics effectively, it is essential to acquaint ourselves with its key concepts, each contributing to our understanding of how meaning unfolds in human experience:

**The Hermeneutic Circle:** Central to hermeneutics is the notion of the "hermeneutic circle," where novel insights emerge from the continual reevaluation of possible meanings. This dynamic interaction between the whole and its constituent parts is exemplified in the relationship between words and sentences [51-54].

**The Hermeneutic Spiral:** Building upon the hermeneutic circle, Paul Ricoeur [55] introduces the concept of the "hermeneutic spiral." It posits that not only do different interpretations exist, but they can also be progressively refined. This notion embraces a multiplicity of meanings, intricately woven with diverse concepts of truth.

**Hermeneutics of "Discourse":** Ricoeur's perspective defines "discourse" as a linguistic event, emphasizing its temporal and spatial dimensions. Discourse manifests as spoken communication and written text, both representing distinctive modes of interaction with language [56,57].

**Horizon of Expectation:** Within the hermeneutic framework, the "horizon of expectation" stands as a contextual frame that shapes initial perceptions. It aligns these perceptions with cultural codes, potentially leading to varying interpretations across different generations [58-60].

**Fusion of Horizons:** Gadamer's concept of the "fusion of horizons" amalgamates the temporal and spatial horizons of both the reader and the historical subject or text. This synthesis yields a new horizon that encapsulates the previous ones while

accommodating diverse historical, cultural, linguistic, and contextual backgrounds [48,58].

**Hermeneutical Conversation:** Gadamer's philosophical hermeneutics asserts that language serves as a medium for conveying the meaningful existence of the world. The term "hermeneutic conversation" extends to dialogues between interpreters and works, encompassing shared concepts embedded in a particular time or society [41].

**Hermeneutics of Metaphor and Narrative:** Ricoeur [61, 62] underscores that metaphor and narrative serve as vehicles for semantic innovation. They create new meanings by imitating reality, invoking creative imagination to generate insights beyond the confines of everyday language. Narratives, in particular, offer avenues for representing human affairs, relationships, and events, illuminating their meanings and contributing to a new communication horizon.

## **FINDINGS AND DISCUSSION**

### *Analytical Problem-Solving in Design Innovation*

Analytical problem solving constitutes one of the foundational paradigms underpinning the dynamic interplay in design innovation [9]. This section addresses the essence of analytical problem solving, examining its historical foundations, characteristics, and real-world applications within the realm of design innovation.

**Foundations:** The roots of analytical problem solving can be traced back to a rich historical collection of problem-solving methodologies and philosophical influences [10]. At its core, this paradigm draws inspiration from rationalist thought, where solutions are perceived as objective entities waiting to be discovered. Figures such as René Descartes and Immanuel Kant established the philosophical groundwork for structured inquiry and systematic problem deconstruction [1, 10]. Descartes' emphasis on methodical doubt and Kant's categorical imperative resonate with the analytical approach to design innovation.

Analytical problem solving in design encompasses two primary discourses that share similar foundations [6]:

1. Creativity and innovation in design as the creation of artifacts.
2. Creativity and innovation in design as a problem-solving activity.

As the creation of artifacts: Simon [9] distinguishes design from natural sciences, social sciences, and humanities because, from his point of view, design is

related to creation, whereas other sciences deal with what already exists. Therefore, he considers design as conscious activities to create artifacts. An example of investigating creativity from the point of view of rationality can be done based on three ideal models: algorithmic, judgmental, and reflective, which have been investigated in the field of the philosophy of science [11]. Creativity in algorithmic rationality is limited to changes in data values. Data serve as input to algorithmic procedures, the type of which is already determined by rules. In addition to changes in data values, creativity in judgmental rationality also accepts new types of data that can provide new solutions. Creativity in reflective rationality is provided by creating enough space for novelty. When applied to rules, it can reaffirm, clarify, modify, or abandon them in favor of an entirely new one.

As the problem-solving activity: From Buchanan's [6] point of view, building on Rittel and Webber's [12] wicked problem approach, the professional thinking of designers is a matter of dealing with wicked problems, a class of social system problems with fundamental uncertainty without a single solution and where a lot of creativity is needed to find solutions. The design process in this view consists of two distinct phases: an analytical phase of problem definition, followed by a combined sequence of problem-solving. In the field of cognitive science, wicked problems or ill-structured problems are problems that do not have a well-defined space [13]. These problems are called insight problems because these problems must be seen in a new way. An insight is a distinct and sometimes seemingly sudden understanding of a problem or a strategy that helps solve the problem. Often, an insight involves reconceptualizing a problem or a strategy in an entirely new way [14]. Insight often involves identifying and combining old and new relevant information to gain a new perspective on a problem or its solution.

The practical applications of analytical problem-solving in design innovation are evident in countless fields and industries [4]. Notably, its structured approach has catalyzed transformative progress in areas that demand precision and efficiency. One illustrative example is the field of aerospace engineering, where analytical problem-solving methodologies have revolutionized aircraft design and performance. Engineers meticulously analyze aerodynamic principles and conduct stress tests to optimize aircraft structures, reducing fuel consumption and enhancing safety. In the realm of healthcare, analytical problem-solving approaches have been effective in the development of medical devices. The design and manufacturing of intricate instruments like surgical robots demand rigorous analysis to ensure precision and reliability during delicate procedures.

### *Interpretative Exploration in Design Innovation*

Interpretative exploration, the second paradigm in the dynamic interplay of design innovation, embodies a contrasting philosophy to analytical problem-solving [2]. In this section, we delve into the theoretical foundations, core characteristics, and practical applications that define interpretative exploration within the context of design innovation.

**Foundations:** The origins of interpretative exploration can be traced to diverse intellectual currents, including hermeneutics, phenomenology, and postmodernism [2]. At its core, this paradigm embraces the belief that design and innovation are context-dependent, subjective, and dynamic endeavors. This philosophical stance finds resonance in the works of thinkers such as Martin Heidegger [15] and Hans-Georg Gadamer [2], who emphasized the role of interpretation in understanding human experiences and meaning. Interpretative exploration has evolved over time, influenced by interdisciplinary interactions between design, social sciences, and the humanities. It has been nurtured by the recognition that human intentions and meanings are multifaceted and cannot be reduced to deterministic algorithms.

**Characteristics and Philosophies:** Interpretative Exploration in design seems close to these two discourses that have the same foundation:

1. Creativity and innovation in design as a Reflexive Practice.

2. Creativity and innovation in design as creating meaning instead of artifacts.

**As a Reflexive Practice:** Simon [9] was close to positivism with his analytical reasoning in the division between positivism and hermeneutics, while Schön [16] was close to hermeneutics with his philosophical pragmatism. Unlike Simon, through a practice-based focus on the relationship between creation and reflection on creation, Schön developed an image of design that allows for the continuous improvement of competence and recreation [17]. Schön's idea of reflection on "seeing-as" represents a direction for research into processes that are sometimes overlooked by the terms "intuition" or "creativity," and it shows how these processes can be put into the framework of reflection [12, 7]. From the point of view of classical pragmatists, creativity is a deep idea of the continuity of experience that was given attention and expression from a scientific or epistemological point of view. Experience in this view is a very complex pattern that is always evolving, so experience is really an experience of change. And creativity is a specific kind of change that occurs in this changing experience. Because creativity is associated with something new, it by definition breaks continuity.

As creating meaning instead of artifacts: Krippendorff [13] defined design as a matter of creating meaning, contrasting with Simon [4], who viewed the artifact as central and meaning as an attribute. For Krippendorff, meaning is at the core of the design process, with the artifact serving as a medium for conveying these meanings. Creativity in the innovation of meaning can be traced to literary hermeneutic thinkers like Ricoeur, who introduces metaphor as an exemplary model for human creativity. Through his works on metaphorical imagination [18] and narrative [19], Ricoeur reopens the discussion of creativity. Metaphor and narrative are considered integral to the broader reconstruction of the poetic use of language [20]. From the structuralism of language, two points are notable: firstly, we do not create the language but must learn it initially; secondly, living metaphors are not found in the linguistic system or dictionaries but are staged by voluntary semantic conflicts that produce new meanings [18].

**Practical Applications:** Interpretative exploration's practical applications in design innovation are evident across various domains, particularly those dealing with human-centered design and complex, multifaceted challenges [6]. This paradigm thrives in scenarios where the recognition of context, subjectivity, and dynamism is paramount. In user experience design, for instance, interpretative exploration guides designers to delve deep into the subjective experiences and expectations of users. It promotes iterative design processes that involve ongoing user feedback and adaptation, resulting in digital products and interfaces that resonate with users on a personal level. In urban planning and architecture, interpretative exploration informs designs that are contextually relevant and culturally sensitive. Architects engage with the historical, cultural, and social contexts of a site, interpreting the meanings embedded within the environment to create structures that harmonize with their surroundings.

### *Interplay between Analytical Problem-Solving and Interpretative Exploration*

**Navigating the Contrasts:** The interpretive process is fundamentally at odds with the analytical perspective. Problem-solving, as an analytical method, seeks clarity and closure with a well-defined beginning and end. In contrast, interpretation is an ongoing process with no natural endpoint [17]. Problem-solving asserts that there is an optimal solution to the problem that exists "out there," and we must find it. In contrast, interpretive methods use ambiguity as a resource from which discoveries and insights emerge. In problem-solving, the market is the main source of innovation, and new

product development is a direct result of clear consumer needs. The basic premise of this approach is that user needs are explicit elements that can be identified, absorbed, and translated into new products that meet these needs [21]. In problem-solving projects, communication involves exchanging well-defined chunks of information; communication in interpretive processes is open-ended and context-dependent. If innovation, as problem-solving relates to an object, facts, (bounded)-rationality, and optimization, innovation as interpretation will be influenced by a much more subjective, intuitive, and emotional attitude [22]. The different stages of development of design-driven innovation are characterized by varying degrees of uncertainty [23]. Nevertheless, analytical methods attempt to reduce uncertainty. Table 1 is based on a comparison of the structure of interpretive and analytical frameworks of innovation. This table has attempted to determine the innovation of meaning infrastructure in product and service design through this comparison.

Verganti and Öberg [24] characterize innovation as a multifaceted process that involves interpreting and envisioning. They propose three approaches to innovation: problem-solving, idea generation, and envisioning. According to their perspective, envisioning goes beyond merely interpreting existing opportunities and ideas within their context. It also entails exploring entirely new meanings and possibilities. This forward-looking approach is facilitated by fostering debates, developing critical capabilities, and envisioning and designing scenarios that explore new dimensions of meaning.

Rampino [25] identifies three levers and three starting points for creative processes in design-driven

innovation: form, mode of use, and technology. He categorizes innovation into four types: beauty innovation and mode of use innovation (additive types), and semantic innovation and typological innovation (radical types). These distinctions are crucial in understanding how innovation manifests in both product and service development. Eroğlu [26] distinguishes between radical and incremental innovation activities based on their timing in the product or service life cycle. Radical innovation occurs early in the life cycle and tends to redefine product identity significantly, introducing cognitive factors that distance it from existing solutions. Incremental innovation, occurring later, focuses on refining existing solutions based on market orientation and evaluation. Verganti [27] researches the process of design-driven innovation and considers its position in relation to other stages of innovation in three stages: design-driven innovation, user-centered design, and traditional industrial design. He introduces the focus of user-centered design on the production of a concept that reflects the analysis of specific target users' needs and traditional industrial design's focus on product development, which includes the definition of product style, user interface, and ergonomics. He considers these three stages as three levels of consolidation of position, expectations, and mandatory elements. He introduces the driver of knowledge in market-pull innovation, product development, and in-depth analysis of user needs; the driver of knowledge in technology push, technology identification, and the development of new technologies; and the driver of knowledge in design-driven innovation, specifically focusing on the semantic dimension within the linguistic approach.

**Table 1.** Comparative Analysis of Innovation Frameworks

Innovation Frame	Analysis	Interpretation
Moving from	What	Why
Communication	Exchange of well-defined chunks of information	Open-ended and Context-dependent
Process	Problem Solving and Ideation	Interpreting and Envisioning
Innovation Term	Incremental Innovation	Radical innovation
Phases	User-Center Design/ Traditional Industrial design	Design-driven Innovation
Focus	Concept Generation/ Product and Service Development	Design-driven Research
Implication	Analysis of Needs of specifically targeted users/ Definition of Product Style, Interface, and Ergonomics	Definition of Radical New Meanings
Knowledge drivers	Needs, Technology	Language, Technology
Levers	Form, Mode of Use, Technology	Form, Mode of Use, Technology
Strategic Factors	Operating closer to the puberty level of product life-cycle	Operating at the initiation of product life-cycle
Cognitive Factors	Evaluation of current solutions/ market orientation	Far away from Current solutions/ forgetting
Levels	Expectation/ Mandatory Elements	Positioning

**Harmonizing Duality:** In the realm of design innovation, the coexistence of analytical problem-solving and interpretative exploration may seem like a juxtaposition of opposites. However, their interplay reveals a fascinating synergy. Analytical problem-solving, known for its structured, data-driven approach, excels in navigating complex challenges. When faced with intricate problems that defy easy categorization, designers often resort to interpretative exploration. This lens allows them to decipher elusive patterns and generate creative insights within the analytical framework. Conversely, interpretative exploration occasionally benefits from analytical rigor to distill meaningful findings from qualitative data. Designers use analytical tools to sift through diverse narratives, enhancing the depth and precision of their interpretations. The convergence of analytical problem-solving and interpretative exploration highlights that innovation thrives on their synergistic interplay. Designers adept at navigating this convergence are well-equipped to tackle multifaceted challenges and develop innovative solutions that transcend rigid paradigms.

**Challenges and Tensions:** While the convergence of analytical problem solving and interpretative exploration holds promise, it is not without challenges and tensions. A prominent challenge arises from the tension between precision and ambiguity. Analytical problem solving is driven by a pursuit of exactness, favoring well-defined problem statements. In contrast, interpretative exploration thrives in the presence of ambiguity and subjectivity, often eschewing rigid boundaries. Designers navigating this tension must discern when to employ analytical precision and when to embrace ambiguity as a wellspring of innovation. Moreover, organizational structures and cultural inclinations within institutions can predispose them toward one paradigm over the other. Organizations rooted in analytical thinking may resist the infusion of interpretative methods, viewing them as unpredictable or esoteric. Bridging these cultural chasms demands strategic navigation and cultural adaptation within design innovation teams. The astute designer recognizes that the interplay between these paradigms necessitates a delicate balance. Achieving this equilibrium involves acknowledging the strengths and limitations of both analytical problem-solving and interpretative exploration, which is essential for crafting a harmonious approach to innovation.

**A Nuanced Framework for Interplay:** As the landscape of design innovation evolves, frameworks and methodologies must also evolve. Envisioning a nuanced framework that accommodates the interplay between analytical problem solving and interpretative exploration emerges as a priority. This framework

recognizes innovation as a multifaceted endeavor, requiring adaptability in approach depending on the problem's nature, contextual considerations, and desired outcomes. Designers thus have the flexibility to employ analytical precision, interpretative creativity, or seamlessly traverse between the two ends of the spectrum.

Interdisciplinary collaboration is central to this framework, recognizing that analytical problem solving and interpretative exploration thrive when diverse perspectives converge. By assembling teams comprising experts in quantitative analysis, qualitative research, cultural studies, and other domains, this framework harnesses the synergistic potential of multidisciplinary collaboration.

Acknowledging their convergence points, addressing inherent tensions, and embracing this nuanced approach, the design community is poised to navigate the complexities of modern innovation. Interpretative exploration sometimes benefits from analytical rigor to distill meaningful findings from qualitative data, enhancing depth and precision. This convergence underscores that innovation flourishes through the synergy between seemingly disparate approaches. Designers adept at navigating these convergence points are better equipped to tackle multifaceted challenges and craft innovative solutions that transcend rigid paradigms.

### *Hermeneutics' Relevance to Innovation and Creativity*

Understanding these foundational concepts of hermeneutics is crucial for recognizing its profound relevance to innovation and creativity. In the context of innovation, hermeneutics serves as a guiding framework for interpreting user needs, cultural nuances, and the dynamic landscape of human intentions and meanings. It facilitates a deeper connection between innovators and the complex tapestry of human experience, enabling the development of solutions that resonate deeply with users.

Hermeneutics also plays a pivotal role in fostering creativity. By encouraging the exploration of multiple meanings and interpretations, it liberates creative thinking from conventional constraints. Metaphors and narratives, viewed through a hermeneutical lens, empower individuals to envision novel possibilities and engage with reality in innovative ways.

To illustrate the profound impact of hermeneutics on shaping innovative design outcomes, we examine a compelling case study. Barilla's R&D management undertook design-driven research aimed at uncovering people's unfulfilled aspirations in preparing and consuming food at home. This initiative began with



workshops involving 15 managers from R&D, marketing, and Food and Packaging Services. Insights gleaned from these workshops were then synthesized into a scenario depicting the food preparation and consumption experience, which was subsequently shared with external interpreters, including a chef, a journalist, and managers from other industries. Finally, a prototype was developed and presented during a strategic meeting with internal stakeholders to determine the product strategy [3].

In the 'Design Direction' workshop, after gathering the knowledge gained from the design discourse, there are five stages: 'Envision,' 'Share,' 'Connect,' 'Select,' and 'Embody,' respectively (Figure 2). Tables 2 and 3 indicate key points, hermeneutic concepts, and examples for each one. The result of these steps is to attain new perspectives. In this section, we explain these key points and concepts.

**Envision:** In the "Envision" phase of innovation, companies rely on key interpreters deeply embedded in design discourse [3]. These interpreters, often principal researchers, play a crucial role in uncovering groundbreaking insights through their focus on knowledge, relationships, and personal perspectives [3]. They engage in radical experiments to discover new languages and translate them into applications with specific objectives. Key interpreters operate at the intersection of diverse domains, forging connections and facilitating communication between different fields. Unlike conventional technological knowledge development, this dynamic design discourse emphasizes cultural influences over industrial norms. For instance, architects involved in projects like Alessi's Tea and Coffee Piazza apply architectural insights to the design of kitchenware products [3]. Key interpreters act as bridges, facilitating access to unfamiliar domains crucial for successful innovation [63].

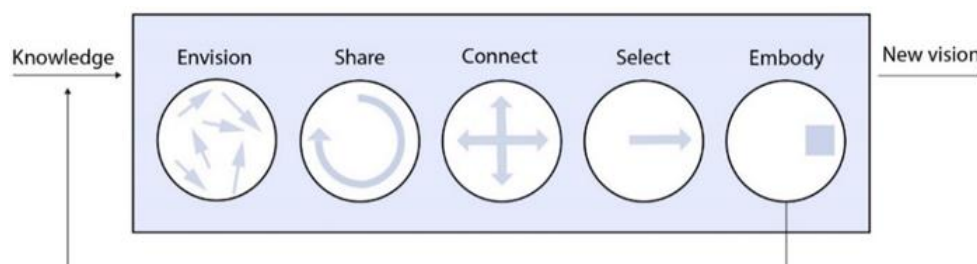
Central to the approach of key interpreters are concepts like the "Hermeneutic Circle" and the "Hermeneutic Spiral." These frameworks enable them to generate fresh perspectives by challenging

established beliefs and critically examining their environment [64]. Beginning with vague hypotheses, they delve deeper to uncover robust interpretations. The "Hermeneutic Spiral" strives not only for different but enhanced understandings of phenomena.

Within the realm of "Discourse," key interpreters immerse themselves in a comprehensive dialogue encompassing spoken and written components [56]. This includes lectures, conferences, interviews, and textual analyses. In this liberated discourse, the intentions of designers and manufacturers transcend mere functionality to become symbols of potential worlds. For instance, movements like slow design communicate values beyond their immediate contexts, revealing broader implications through symbolic representation. This discourse harnesses the interconnected elements of language to reshape the relationship between language and reality, thereby fostering innovation [3].

Concepts such as the "Horizon of Expectation" and the "Fusion of Horizons" are essential for key interpreters. They decode and evaluate designs based on cultural codes and historical conventions, embracing flexibility and adaptation [65]. This fusion occurs when insights from design discourse converge, requiring internal reflection and experimental validation. For example, merging technical expertise with lighting design knowledge enhances innovation in theater stage productions.

Finally, techniques like "Metaphor and Narrative" are employed by key interpreters to shape insights. Through linguistic imagination, they unite disparate meanings to generate new interpretations. Metaphors, such as comparing book volumes to raindrops, transcend conventional language barriers, offering novel perspectives [66]. Narratives organize and clarify temporal experiences, reshaping communication horizons. For instance, constructing a narrative around a family journey can illuminate the significance of human experiences and redefine the interpretation of a journey.



**Fig 2.** The Design direction workshop [3]

**Table 2.** Hermeneutical Concepts in Design-Driven Innovation Activities.

Activity	Hermeneutical Concepts
Envision	Hermeneutic Circle & Spiral, Hermeneutic of Discourse, Horizon of Expectation, Fusion of Horizons, Hermeneutic Conversation
Share	Hermeneutic conversation
Connect	Connection, Metaphor, Narrative,
Select	Hermeneutic Concepts of Interpretation
Embody	Hermeneutic conversation, Hermeneutic of Discourse, Hermeneutic Circle & spiral, Metaphor, Narrative

**Table 3.** Hermeneutical Concepts in Design-Driven Innovation: Insights and Examples

Hermeneutical Concept	Description	Example
Hermeneutic Circle & spiral	The process of interpretation that starts with a hypothesis and evolves through critical examination.	The key interpreter uses the hermeneutic circle to challenge established beliefs and create something new.
Horizon of Expectation	The structure of expectations based on the interpreter's position in the cultural context and historical time.	Understanding and decoding a product's meaning can vary over time due to changes in cultural codes and conventions.
Fusion of Horizons	The merging of the interpreter's horizon of expectations with the historical horizon of the text or object.	Retro design is an example of how products are interpreted differently across generations, merging horizons.
Metaphor	Bringing together words or concepts that are usually distant to create new meanings.	The Glid sofa combines the chair form with a glider, creating a metaphorical connection to flying.
Narrative	Connecting multiple events, causalities, and possibilities to produce a new meaning in a storytelling format	The Butterfly closet connects events like taking clothes out and putting them on to create a new narrative.
Hermeneutic Conversation	A dialogue among interpreters that uses speech and written language to represent, communicate, or comment	In design workshops, key interpreters engage in hermeneutic conversations to share insights and discuss topics.

**Share:** In the "Share" phase of the design process, insights generated earlier are consolidated and discussed during team meetings to refine interpretations, encourage debates, and explore ambiguities (Table 1) [3]. This phase emphasizes ongoing dialogue, iteration, and the generation of new insights rather than aiming solely for consensus or finality. In the context of design, "sharing" can be likened to a "hermeneutic conversation," where the language of design serves as a medium for expressing and organizing the complexities of the design world [3]. Key interpreters actively participate in these dialogues, contributing their interpretive experiences and insights. For instance, during the Barilla design workshop, interpreters from diverse disciplines convene to discuss various aspects of the workshop's theme, thereby enriching the overall discourse.

**Connect:** In the "Connect" phase of the design process, participants focus on creating design scenarios that highlight connections between proposed ideas. Insights stemming from contrasting perspectives contribute to the development and broadening of new interpretations [3]. For example, Arthur Bonnet, a manufacturer of kitchen furniture, explores the significance of the kitchen in homes by

examining dimensions such as the "front office" and "back office," juxtaposing traditional and modern lifestyles. This "Connection" process draws on concepts articulated by Ricoeur [57], which emphasize uncovering multiple meanings by discerning hidden implications beneath surface meanings. Metaphor plays a pivotal role in this phase by bridging seemingly disparate concepts, forging new associations and interpretations [57]. For instance, in the design of the Glid sofa (Figure 2), the designer merges the form of a chair with that of a glider, inviting users to associate sitting on it with the sensation of flying. Narrative, akin to metaphor, enriches meaning by weaving together events and causalities, certainties, and possibilities [57]. In designs such as the Butterfly closet (Figure 3) by the Bouroullec brothers, actions like retrieving clothes from the closet, dressing, and moving around are interwoven with the metaphor of clothes resembling the wings and feathers of a butterfly, creating a narrative that enhances the user's experience.

**Select:** In the "Select" phase of design-driven workshops, a dual approach integrating both analytical and interpretive methods is crucial [3]. This phase involves evaluating whether the design meets

identified needs while also uncovering new meanings or intuitions. Customer feedback plays a pivotal role, guiding optimization efforts to address critical concerns. Alessi's framework for evaluating innovation encompasses four dimensions. Initially, product performance and utility are assessed, followed by considerations of cost and pricing. The third dimension, "communication/ language," delves into the symbolic aspects of the product and the societal influences affecting consumer decisions. The fourth dimension, "feeling/ memory/ image," explores the emotional and poetic elements of the product and the motivations driving consumer purchases. Alessi typically aims for products that strike a balance across these dimensions, exemplified by highly regarded products like the Kettle 9093 [3]. However, there are occasions when Alessi chooses to market products strong in certain aspects while accepting weaknesses in others, such as performance or pricing.

**Embody:** The final activity of a design orientation workshop typically involves shaping new meanings and languages. This phase transitions spoken discourses into written forms, aiming to facilitate communication. On one hand, it serves the board of the company or team dedicated to the production and development of the concept. On the other hand, it enhances communication within the design discourse itself, utilizing its persuasive power. Books and exhibitions supported by Alessi and Artemide (Figure 4) exemplify these efforts [3]. These companies operate as collective research laboratories, engaging artists, designers, companies, and schools in

ongoing dialogues. Through artworks, studies, lectures, prototypes, and products, they explicitly and implicitly foster exchanges of insights, interpretations, opinions, and suggestions.

## **INTERCONNECTIONS, FUTURE IMPLICATIONS, AND ONGOING ADVANCEMENTS**

### *Network of Hermeneutics and Design*

It has been observed in the research bibliography network that the intricate relationship between hermeneutics and design is a promising area for future research, as depicted in Figure 5. This network highlights key concepts and methodologies such as interpretation, communication, phenomenology, and their intersection with design studies including design thinking, human-centered design, and design practice.

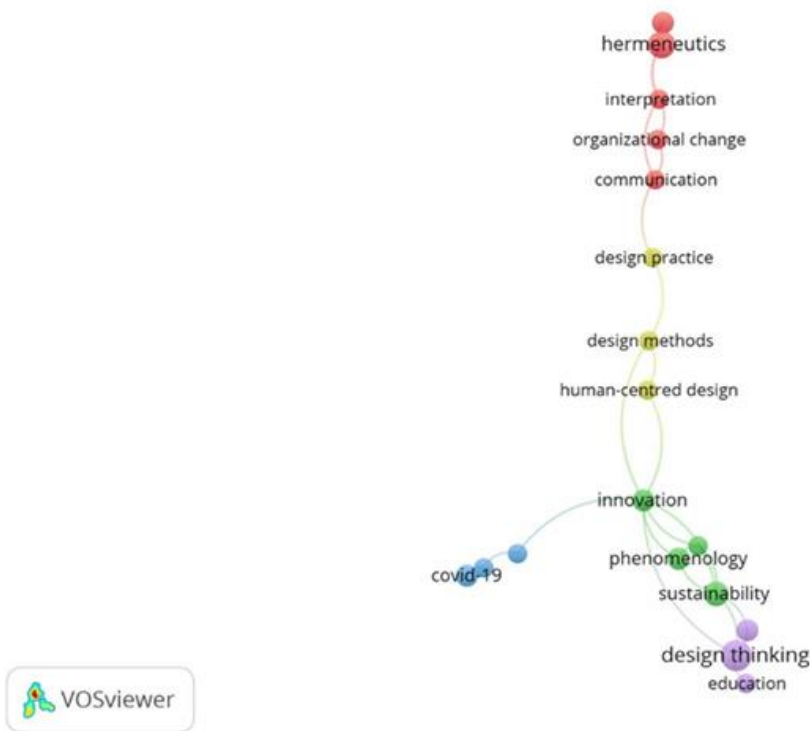
Figure 6 illustrates the research network that utilizes hermeneutics as a method for fostering innovation and creativity. At its core, "Culture" serves as a central node, emphasizing its pivotal role as a connector within this dynamic ecosystem. Surrounding clusters depict the interconnectedness of nodes representing hermeneutics and qualitative research, communication, sustainability, design thinking, the influence of social media, creativity, and digital humanities. These nodes illustrate their mutually beneficial relationship in driving advancements in design and innovation.



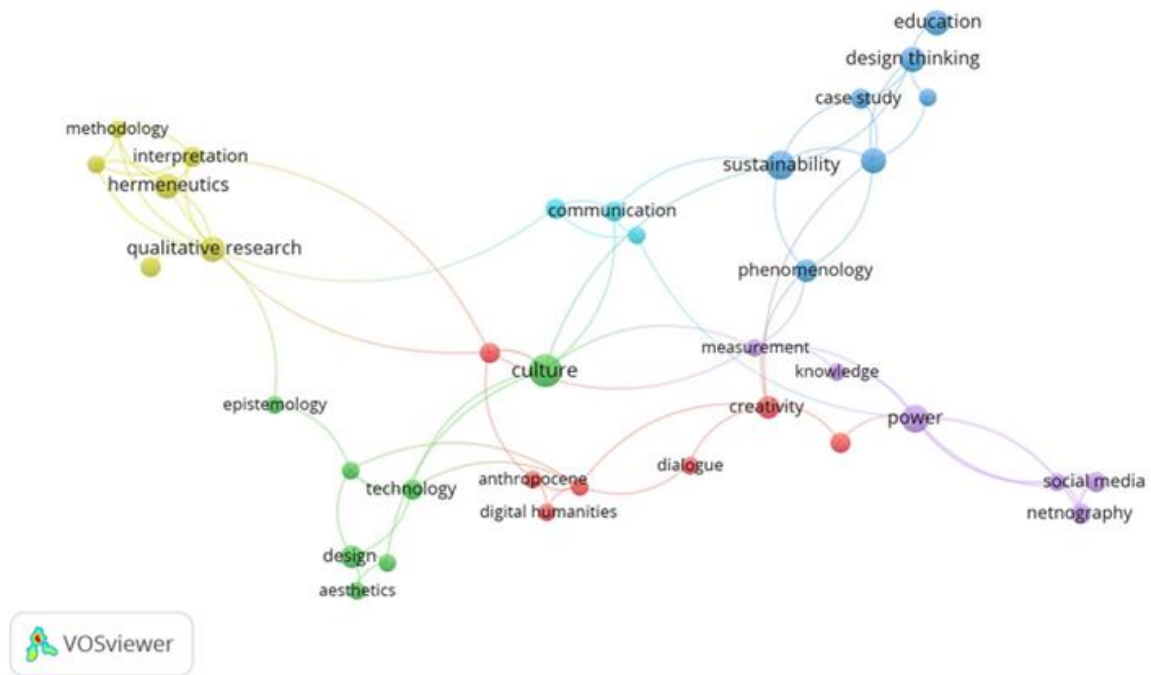
**Fig 3.** Glid sofa and Butterfly closet (bouroullec.com)



**Fig 4.** Artemide book and Alessi exhibition



**Fig 5.** Network visualization of the relationship between hermeneutics and design



**Fig 6.** The research network that has used hermeneutics as a method for innovation and creativity

*The Future of Hermeneutics in Design*

The preceding sections have elucidated the intricate relationship between hermeneutics and design innovation, highlighting both its theoretical

foundations and practical applications. As we conclude this exploration, it is crucial to look forward and consider how hermeneutics may continue to influence the world of design (Table 4). Hermeneutics, with its emphasis on interpretation and understanding,

stands poised to play a pivotal role in the future of design. Design processes are evolving towards greater complexity and multidimensionality, demanding a deeper grasp of user needs, cultural contexts, and ethical considerations.

Hermeneutics provides designers with a framework to navigate this complexity by nurturing a nuanced understanding of meaning. Looking ahead, the future of hermeneutics in design holds promise for fostering a more inclusive, ethical, and interdisciplinary approach to innovation. By prioritizing interpretation and understanding,

hermeneutics equips designers to navigate the intricate landscapes of modern design, facilitating the creation of culturally resonant and ethically sound products. It encourages effective collaboration across diverse disciplines, promoting holistic and nuanced design practices that prioritize user experience and societal impact.

Ultimately, this approach promises to cultivate meaningful, user-centric, and responsible design innovations, shaping the future of design in profound and impactful ways.

**Table 4.** The Future of Hermeneutics in Design

Concept	Description	Example
Cultural Inclusivity	Hermeneutics promotes cultural inclusivity by breaking down linguistic and cultural barriers, allowing designers to create globally resonant products and solutions.	Ricoeur [67], Sanders and Stappers [68]
Ethical Considerations	Hermeneutics aids in ethical interpretation and decision-making in design, ensuring alignment with societal values and promoting responsible innovation.	Owen, Mac-naghten, and Stilgoe [69], Buchanan [70], Bardzell et al. [71]
Digital Experiences & Interdisciplinary Collaboration	Hermeneutics ensures digital experiences are meaningful and user-centric, while fostering interdisciplinary collaboration by serving as a common language.	Cross [7]
Cross-Cultural Design Integration	Hermeneutics helps in integrating cross-cultural design principles, creating products that resonate with diverse cultural backgrounds.	Kim and Mauborgne [72], MacLeod [73]
User-Centered Design	Enhances user-centered design by deeply interpreting user needs and behaviors, creating emotionally resonant products.	Norman [74]
Design Education	Influences design education by incorporating hermeneutical methods, equipping students with tools for interpretation and understanding.	Lloyd and Bohemia [75], Cross [7]
AI-Assisted Hermeneutics	Collaborates with AI to assist in applying hermeneutical methods, interpreting extensive datasets and cultural nuances.	Dorst and Cross [76], Brynjarsdóttir et al. [77]
Longitudinal Studies	Observes the long-term impact of design-driven innovation influenced by hermeneutics, providing insights into enduring relevance and societal implications.	Sleeswijk Visser et al. [78], Casakin [79]
Responsible Innovation	Fosters interdisciplinary collaboration and explores interpretative methodologies in diverse domains to enhance responsible innovation.	Timmermans [80], van der Burg [81]
Sustainable Design	Plays a crucial role in sustainable design by understanding the environmental impact and ethical implications of design choices.	Walker and Giard [82]
AI-Driven Hermeneutics in Art & Culture	Uses AI tools to apply hermeneutical methods in art and cultural contexts, enhancing creativity.	Elgammal et al. [83]
Healthcare Design	Applies hermeneutics in healthcare design to create empathetic and responsive healthcare solutions.	Kimbell [84]
Cross-Disciplinary Applications	Investigates interpretative methodologies in various fields like education, technology, and healthcare to enhance innovation.	Fagerberg et al. [85]
Cultural Nuances in Interpretation	Examines how cultural nuances influence interpretation, aiding in culturally inclusive innovation practices.	Hekkert et al. [86]
Artifacts of the Future	Considers hermeneutics in the design of future artifacts, particularly in augmented and virtual reality.	Slater and Wilbur [88]
Cultural Adaptation of Interpretation	Investigates cultural adaptation and localization to design products that resonate with global audiences.	Zhang and Patel [87]

Advantages, Disadvantages, and Future Works

**Table 5.** Advantages, and Disadvantages of hermeneutics in design

<i>Advantages, and Disadvantages of hermeneutics in design</i>	
Advantages	<p>Holistic comprehension of two pivotal innovation paradigms: analytical problem-solving and interpretative exploration.</p> <p>Interdisciplinary nature, drawing insights from innovation, design, hermeneutics, and philosophy, enriching the analysis's depth and breadth.</p> <p>Uses network visualizations to represent complex relationships, aiding in understanding interconnections between innovation, creativity, hermeneutics, and design.</p> <p>Practical application of hermeneutics in design exemplified through the "Design Direction" workshop, bridging theoretical constructs and real-world design practices.</p> <p>Connects hermeneutics to real-world applications like cultural inclusivity, ethics, and user-centered design, demonstrating practical relevance in contemporary design innovation.</p> <p>Clear description of methodology, including literature analysis, network visualizations, and case studies, enhancing credibility and transparency.</p> <p>Forward-looking approach, envisioning the future of design innovation, adding depth and relevance to the discussion.</p> <p>Insights into the potential integration of hermeneutics into design education and pedagogical approaches, contributing to educational value.</p>
Disadvantages	<p>Assumes familiarity with discussed concepts, potentially excluding new readers.</p> <p>Specialized terminology may impede comprehension for those without prior exposure, limiting accessibility.</p> <p>Could benefit from a more extensive discussion of potential criticisms and challenges, providing a balanced perspective.</p> <p>Lengthy and extensive exploration of multiple topics may be overwhelming, requiring significant time and effort to digest fully.</p>

Looking ahead, the essay proposes several compelling paths for future research to deepen the discourse and comprehension of innovation, creativity, and hermeneutics in design. One promising trajectory involves exploring cross-disciplinary applications of hermeneutics. Investigating how interpretative methodologies can integrate into diverse fields such as healthcare, education, or technology holds potential for enhancing innovation and problem-solving across various domains. Another fruitful area for exploration lies in cultural perspectives. Examining how cultural nuances influence the interpretation of meaning across different societies could illuminate culturally inclusive innovation practices, fostering a global understanding of innovation dynamics. Ethical considerations represent a critical domain for future investigation. Research could delve into the ethical implications of design-driven innovation guided by hermeneutics, particularly in areas like artificial intelligence and sustainability. Understanding how nuanced interpretations influence responsible innovation in these contexts is crucial. The integration of hermeneutics into artificial intelligence development is an emerging frontier. Exploring how hermeneutic approaches can enhance AI systems' understanding of user needs, cultural intricacies, and ethical dimensions has the potential to shape the future of AI-driven innovation significantly. Longitudinal studies are

essential to observe the enduring impact of design-driven innovation influenced by hermeneutics. Tracking the evolution and societal implications of products and services developed through these approaches over time can provide valuable insights. In the realm of education, integrating hermeneutics into design education presents an exciting avenue for inquiry. Developing pedagogical approaches that equip students with effective hermeneutical tools can cultivate a new generation of culturally sensitive and innovative designers. Exploring AI-assisted hermeneutics remains largely uncharted. Investigating how AI tools and algorithms can support designers in applying hermeneutical methods, such as interpreting extensive datasets and cultural nuances, could revolutionize the design process. Establishing metrics and evaluation frameworks to assess the success of design-driven innovation influenced by hermeneutics is a crucial endeavor. Measuring impact on user satisfaction, cultural resonance, and sustainability can provide tangible evidence of the effectiveness of these approaches. In conclusion, these future research directions aim to advance the understanding of hermeneutics in design-driven innovation. Embracing these avenues will enable scholars and practitioners to contribute to creative problem-solving, cultural inclusivity, and ethical design practices in the dynamic landscape of innovation.

## CONCLUSIONS

The dynamic landscape of innovation necessitates an understanding of diverse methodologies to generate novel solutions. Analytical problem solving and interpretive inquiry have emerged as pivotal paradigms in this arena, each characterized by distinct philosophies yet interconnected dynamics. Through an in-depth exploration of their theoretical underpinnings, practical applications, and fundamental concepts, we have elucidated both their synergy and inherent tensions. This examination envisions an innovation framework that seamlessly integrates analytical rigor with interpretive creativity, thereby enriching our comprehension of modern innovation processes. Positioning hermeneutic concepts as foundational elements of interpretive innovation represents a significant stride towards formalizing interpretive methodologies. Concepts such as discourse hermeneutics, horizon of expectation, fusion of horizons, hermeneutic dialogue, metaphor, and narration underscore the capacity of this framework for analysis and synthesis in innovation management. These concepts, alongside related methodologies such as phenomenology, design thinking, human-centered design, and practical design applications, highlight the breadth and depth of interpretive innovation's potential impact. Looking towards the future, hermeneutics stands poised to influence diverse facets of design, including cultural inclusivity, sustainability, the leveraging of social media's power, ethical considerations, and interdisciplinary collaborations. As technological advancements continue to reshape our world, hermeneutics can guide the development of digital experiences, ensuring they remain meaningful and user-centered. From driving design-driven innovation to interpreting the meaning of products, hermeneutics exemplifies how we perceive and innovate. Its role in deciphering human intentions, beliefs, and experiences across various domains underscores its significance in fostering profound insights. Embracing these perspectives promises to shape an inclusive and ethically informed approach to design-driven innovation as we navigate the complexities of our evolving world.

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#### **AUTHOR (S) BIOSKETCHES**

**T. Sharifi.**, *Faculty of Design, Tabriz Islamic Art University, Tabriz, Iran*

Email: [toofan.sharifi@gmail.com](mailto:toofan.sharifi@gmail.com)

**A. Shahhoseini.**, *Faculty of Design, Tabriz Islamic Art University, Tabriz, Iran*

Email: [ahad.shahhoseini@tabriziau.ac.ir](mailto:ahad.shahhoseini@tabriziau.ac.ir)

**S.A. Faregh.**, *Faculty of Design, Tabriz Islamic Art University, Tabriz, Iran*

Email: [sfaregh@tabriziau.ac.ir](mailto:sfaregh@tabriziau.ac.ir)

**S. Sadigh-Eteghad.**, *Neurosciences Research Center, Tabriz University of Medical Sciences, Tabriz, Iran*

Email: [Sadighs@tbzmed.ac.ir](mailto:Sadighs@tbzmed.ac.ir)

**A. Del Bimbo.**, *Media Integration and Communication Center, University of Florence, Italy*

Email: [Alberto.delbimbo@unifi.it](mailto:Alberto.delbimbo@unifi.it)

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