Function, Aesthetics, and Values: Reframing the Definition of Industrial Design

Abstract

Industrial Design (ID) is currently grappling with a profound 'ontological drift,' as its boundaries expand into intangible service systems and digital territories. While this expansion reflects adaptability, it has triggered an identity crisis, diluting the discipline's core expertise. This paper conducts a comparative analysis of canonical definitions (1959–2025) to identify critical gaps in current discourse, particularly the 'sustainability gap' and the 'technological reductionism' inherent in AI-driven design. To restore professional coherence, this study proposes a modernized, stabilized definition of ID. It introduces the 'Cybernetic Equalizer Model,' framing the designer not as a mere 'maker of forms' but as a mediator of perpetually competing forces — Function, Aesthetics, and Value — a balance rediscovered anew in every project, culture, and era. By re-anchoring the discipline as a 'Strategic Professional Service,' this framework provides an epistemological stabilizer for design education and practice in the post-disciplinary era, ensuring the profession's relevance against the challenge of generative automation. Crucially, this model operationalizes industrial design as the art and knowledge of shaping human experience through objects, grounding organizational strategy in enduring human values rather than tactical variables alone.

Keywords: Industrial Design Ontology, Ontological Drift, Strategic Harmonization, AI in Design, Professional Mandate

1. Introduction

1.1. Problem Statement

Industrial Design (ID) faces a period of deep ontological ambiguity. The field was historically rooted in shaping human experience through objects — balancing form, function, and value for mass production. However, it has expanded exponentially. It now encompasses service design, user experience (UX), strategic thinking, and complex socio-technical systems. This expansion shows adaptability, but has also triggered an 'identity crisis'. Without a stable ontology, organizations struggle to integrate industrial design into their macro-level corporate strategies. Therefore, defining the discipline is not merely an academic exercise, but a strategic necessity to empower designers within corporate innovation pipelines.

Current discourse fails to pinpoint where the boundaries of industrial design actually lie. Is it an artistic practice, an engineering sub-discipline, or a strategic business function? A critical review of literature (2000-2025) indicates a 'fragmented landscape'. This fragmentation echoes recent concerns in Design

Issues regarding the shift from traditional form-giving to a marketing-dominated logic, which risks obscuring the designer's unique agency (Secomandi, 2024). Ontological frameworks are frequently developed from scratch, leading to a flood of isolated terminologies. Without a distinct definition, the specific expertise of 'industrial design' risks becoming indistinguishable from general business strategy, making it increasingly difficult for practitioners and educators to articulate their distinct value proposition in an interdisciplinary world. Yet this distinct value lies precisely in the designer's capacity to balance Function, Aesthetics, and Value — a balance no algorithm or business strategy alone can replicate.

1.2. Research Gap

Although numerous studies have attempted to define industrial design, most existing literature reviews focus on specific sub-domains or methodological trends rather than the discipline's fundamental nature. For instance, recent systematic reviews have extensively mapped the intersection of design with sustainability, artificial intelligence, and design science research. However, these studies often analyze definitions in isolation or through a singular lens (e.g., environmental impact or technological integration).

A critical gap remains in conducting a comparative ontological and teleological analysis that benchmarks these evolving definitions against established professional standards. In particular, there is a lack of research that has clarified the nature of industrial design by comparing definitions of industrial design and providing a clear and complete definition. Furthermore, recent literature highlights a significant gap in the holistic integration of sustainability, noting that while environmental and economic dimensions are frequently addressed, social and systemic facets remain underdeveloped in current ontological models.

1.3. Research Question

To address this problem, the research poses a central question:

How do historical and contemporary definitions of Industrial Design compare regarding their ontology (nature), mandate (function), and teleology (goal)?

2. Literature Review: The Evolution of Design Epistemology

Historically, definitions of Industrial Design reflected the socio-economic conditions of their time. This section tracks the discipline from its roots in mass production to the current landscape. It uses a chronological analysis to highlight shifting ontological boundaries.

2.1. Historical Evolution: From Artifacts to Systems

Historically, definitions of Industrial Design have mirrored socio-economic shifts. In the mid-20th century, influenced by the Bauhaus and Ulm School, the discipline was defined as a "creative activity" focused on optimizing the formal qualities of mass-produced objects (Maldonado, 1969). The mandate was to blend utility and aesthetics for the mutual benefit of user and manufacturer (IDSA, 2020). However, the late 20th century marked a "strategic turn." Simon (1996) reframed design as the "science of the artificial," while

Buchanan (1992) expanded its scope to "Wicked Problems," shifting the ontology from tangible artifacts to intangible systems and integrative thinking (Heskett, 2002). Industrial design has a vast scope(Samiei et al., 2025), however, industrial designers prioritize the aesthetics of their products,and users preferences are also known as the main firms in industrial design(Jafarnejad et al., 2024).

2.2. The Contemporary Landscape: Fragmentation and Complexity (2020–2025)

Literature from 2000-2025 exposes a state of 'ontological fragmentation'. We see diverse frameworks—ranging from constructivist views to niche taxonomies (Spoladore, 2024). This variety shows adaptability. But it also creates a vacuum in foundational knowledge.

Two themes dominate, yet they remain unintegrated:

- **Sustainability**: industrial design, safety and health are associated with sustainability (Sadeghi Naeini et al., 2024), furthermore, there is a crucial reciprocal relationship between Sustainable life-cycle and design principles (Khodashenas et al., 2024). In fact, sustainability is a priority, but models mostly target environmental or economic metrics. Social and systemic facets are largely ignored. Definitions tend to list vague aspirations rather than offering operational steps (Besana et al., 2024; Horani, 2023).
- **Technological Integration**: AI brings new epistemological problems. Technology is reshaping design (especially AIGC), but we aren't using professional frameworks to manage it. Instead, ontologies are built from scratch. This results in methodologies that are experimental, not established (Wu et al., 2024; Jonuschies et al., 2025).

The review suggests that while ID has broadened, its core definition is diluted. Established models need re-examination to restore coherence.

3. Methodology: An Integrative Review Approach

This study uses a hybrid qualitative design. It merges a manual review of historical texts with an AI-assisted integrative review of modern discourse. This triangulation is deliberate. It ensures that identifying 'ontological drift' isn't based on anecdotes. Instead, it rests on a replicable, data-driven analysis of the field's evolution.

3.1. Data Collection Strategy: Semantic and Keyword Triangulation

To capture the "ontological drift" across diverse fields, this study employed a "Triangulated Search Protocol." This approach combined standard Boolean keyword searches (e.g., "Industrial Design" AND "Definition") with AI-assisted semantic discovery using the SciSpace engine to identify conceptually related works that might escape exact keyword matching.

3.2. Study Selection: Purposive Sampling Protocol

Unlike systematic reviews aiming for exhaustive statistical coverage, this integrative review utilized purposive sampling (Torraco, 2005) to identify "paradigmatic" papers. To mitigate AI opacity, the final selection was strictly human-in-the-loop. The complete multi-phase workflow—from initial retrieval to final critical selection (resulting in a core corpus of 50 papers)—is illustrated in Figure 1.

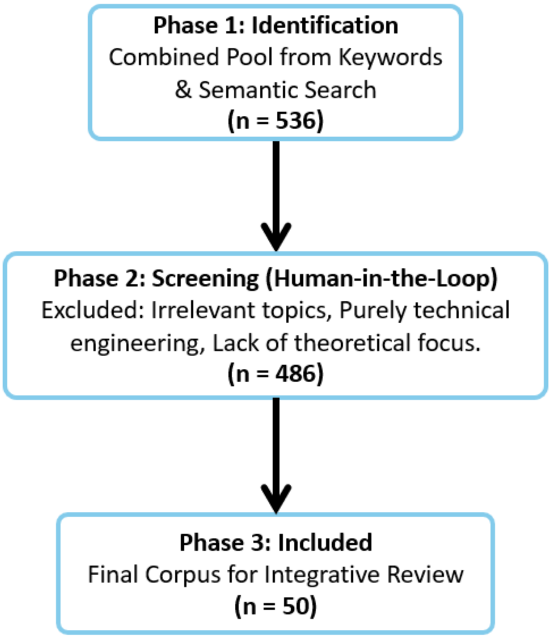

***Figure 1**: Study Selection Flowchart: Moving from broad discovery to purposive sampling.*

3.3. Analysis Method: The Directed Content Analysis

The 50 selected contemporary studies were analyzed using a Directed Qualitative Content Analysis. This process was executed manually to preserve the nuance of the arguments, juxtaposing modern texts against the manually curated "Canonical Core" (seminal definitions from 1959–2019). The AI tool was restricted to the role of data extraction (identifying key themes), while the synthesis of these themes into the tripartite theoretical framework (Ontology, Mandate, Teleology) was conducted through human interpretive analysis.

4. Theoretical Framework

For analyzing the divergence in definitions and evaluating the IDSA model, this study **adopts** a tripartite theoretical framework. It is rooted in the philosophy of design. This framework breaks down each definition into its metaphysical and practical components. This allows for a comparison across different eras and schools of thought.

4.1. The Tripartite Analytical Framework

To evaluate these definitions, this study adopts a tripartite framework:

Ontology (The Nature): Examines whether the discipline is framed as an Artistic Entity, a Scientific/Engineering Discipline, or a Professional Service.

Epistemology (The Method): Scrutinizes the procedural mode of action—specifically, whether it implies an act of "creation" or a strategic process of "optimization" and "harmonization."

Teleology (The Goal): Investigates the ultimate objective, distinguishing between singular goals (e.g., pure aesthetics) and compound goals (e.g., Mutual Benefit) that balance manufacturer profit with user welfare.

5. Results

The comparative analysis of definitions from 1959 to 2025 reveals significant shifts in the discipline's boundaries. Table 2 presents a chronological synthesis of key definitions. Instead of evaluating them against a pre-conceived model, this analysis identifies the specific ontological focuses and limitations inherent in each framework, highlighting the drift from tangible artifacts to intangible systems. The limitations identified in Table 2 are not based on subjective preference. Instead, each definition is evaluated through the Tripartite Framework (Ontology, Mandate, Teleology) to identify which dimensions are emphasized and which are marginalized in response to the socio-technical shifts of their respective eras.

Table 2. Chronological Matrix of Industrial Design Definitions: Ontology, Mandate, and Teleology (1959–2025)

Study	Ontology (Nature)	Mandate (Function)	Teleology (Goal)	Identified Limitations & Ontological Gaps
Maldonado / ICSID (1959/1969)	Creative Activity	Establish the multi-dimensional qualities of objects, processes, and services in their whole life cycle	External unity & coherence	Although it explicitly mentions 'processes and services,' the historical praxis and subsequent mid-century interpretations heavily anchored it in mass-produced physical artifacts, leaving the 'service' aspect underdeveloped until later decades.
Simon (1969/1996)	Science of the Artificial	Transform existing situations into preferred ones	Utility / Preferred state	By reducing design to a purely cognitive process, it inadvertently de-emphasizes the aesthetic dimension. By prioritizing cognitive processes, the definition de-prioritizes sensory embodiment, potentially shifting the

				discipline's jurisdiction toward Systems Engineering.
Maldonado (1969)	Creative Activity	Structural and functional synthesis	Coherent unity (Systems & Products)	Strong on "Harmonization," but fails to operationalize the "Social/Systemic Ethics" required in the post-disciplinary era.
Papanek (1971)	Primary Tool / Effort	Meaningful order imposing	Social & Ecological Responsibility	Exclusively teleological (social-centric), which creates a vacuum regarding the economic constraints and industrial feasibility necessary for mass-production environments.
Landry (1987)	Innovation Tool	Differentiating external vs internal design use	Firm innovation outcomes	Purely instrumental. It treats ID as a marketing sub-function, stripping away its ontological "Soul" (Aesthetics).
Buchanan (1992)	Liberal Art / Rhetoric	Planning and conceiving arguments (**Wicked Problems**)	Integration of signs, things, actions	However, framing it purely as a 'Liberal Art' necessitates a complementary focus on **implementation and craft** to distinguish the **professional practitioner** from the general thinker. Its perspective is great for the "strategic level", but not enough for the "practical level".
Rams (1980s/2017)	Ethos ("Less but Better")	Clarifying structure (Optimization)	Usefulness & Understandability	High aesthetic integrity, but anchored in the "Classical Era" of artifacts. Needs integration with "Data-driven" systemic ethics.
Heath et al. (2000)	Material Science Evolution	Illustrating functional/aesthetic roles via materials	Form development & material progress	Technical reductionism. It risks turning ID into **Materials Engineering** without the "Strategic Negotiation" of user/market needs.

Heskett (2002)	Human Capacity	Shape environment to satisfy needs	Utility & Significance	Correctly identifies design as a universal 'Human Capacity.' However, a professional definition must distinguish between this **general capability** (accessible to all) and **disciplinary expertise** (requiring fiduciary responsibility and technical mastery).
Krippendorff (2006)	Semantic Turn / Meaning-making	Making artifacts comprehensible and meaningful to users	Bridging the gap between human cognition and artificial systems	Highly effective for digital/service contexts, but requires careful adaptation to address the physical manufacturing constraints and material realities inherent in traditional Industrial Design.
Xiong & Zou (2004)	Linkage of design, management, & culture	Integrating technology and culture in processes	Digitalization's impact on innovation	Design is absorbed by "Management." It lacks the **Epistemological Resilience** to stand as a distinct profession.
Bushnell (2006)	Optimization Discipline	Synergy between engineering and artistic design	Innovation in technical sectors (Aerospace)	Focuses heavily on technical optimization. While functionally robust, it underrepresents the broader systemic ethics required outside of aerospace contexts.
Cheng et al. (2008)	"Product Family DNA"	Methodology for rapid product innovation	Knowledge engineering for product families	A "Black-box" view. It treats design as a mechanical code, ignoring the human-centric intent of the **Strategist**.
Gantz (2010)	Consumer Experience Component	Fulfilling aesthetics and functional roles	Shaping lifestyle innovation	Validates "Aesthetics," but falls into the "Business Viability" trap by focusing on consumerism rather than "Mutual Benefit."

Candi & Gemser (2010)	Measurable Performance Factor	Contributing to New Product Development (NPD)	Impact on company performance	Data-driven reductionism. It views ID as a "Variable" rather than a **Professional Service** that manages conflicting interests.
Zambrano & Romero (2012)	Strategic Resource for SMEs	Proposing organizational competence frameworks	R&D and Innovation Management	Full **Ontological Drift.** Design loses its "Artistic Entity" and becomes a sub-discipline of Business Administration.
Arrighi (2013/2018)	Design-Engineering Gap	Tool (CAD) limitation analysis	Cross-disciplinary tool development	Focuses on the "Hammer" (Tools) rather than the "Architect" (Designer). Risks replacement by AI if design is seen only as "tool-use."
IDSA (2020)	Professional Service	Drive innovation, build business success, and lead to a better quality of life through innovative products, systems, services, and experiences	Mutual Benefit (User & Manufacturer)	While it correctly identifies the fiduciary nature of the profession, its broad inclusion of 'systems, services, and experiences'—though an evolutionary necessity—creates an ontological drift. Without a strong anchor in tangible artifact mediation, it becomes challenging to distinguish the industrial designer's core mandate from general UX or Service Design.
WDO (2015)	Strategic Problem-Solving Process	Drive innovation & business success	Better quality of life	By framing ID primarily as a 'strategic problem-solving process,' it risks epistemological dilution. Without explicit mention of materialization or form-giving, the definition struggles to distinguish the industrial designer's specific mandate from that of a general business or product manager.

Zhao & Men (2016)	Multidisciplinary Educational Field	Fostering innovation through education	Economic & tech development via education	Defines ID by its "Teaching" rather than its "Doing." Leads to a "post-disciplinary" dilution of core skills.
Parras-Burgos et al. (2019)	Biomimicry Redesign	Highlighting visual design vs technical function	Product identity and market success	Strong return to Aesthetics, but fails to address the "Ethical Value" in complex socio-technical systems.
Vere & Fennessy (2019)	Redefinition beyond mass-manufacturing	Inclusive, speculative, and sustainable design	Social responsibility	Shifts toward **Social Activism**. By de-emphasizing "Mass Production/Profit," it abandons the "Industrial" mandate.
Solfa et al. (2021)	Evolution to Design Thinking/UX	Focusing on UX and service design functions	Organizational strategy	Reframes design as a fluid "Process." Without the "Professional Service" anchor, it loses its distinct identity.
Dutta & Dhar (2021)	User-centered Methodology (Biodesign)	Designing for sensitive healthcare innovation	Solving health tech challenges	Demonstrates domain-specific excellence but faces challenges in balancing high-tech implementation costs with broader ethical accessibility.
Rossi & Attaianese (2023)	Synergy of Systems	Integrating Sustainability & HCD	Social innovation & community development	Fails to operationalize social/systemic facets. It stays in the "Idealistic Goal" realm without "Business Viability."
Horani (2023)	Inductive Concept	Managing inconsistent "Green/Eco" definitions	Environmental sustainability	Lacks the "Social Dimension." Sustainability without **Profit** is unsustainable in a market economy.

Huang et al. (2023)	Modernization/ Nation-building Tool	Positioning design in modernization	National identity (China context)	Political instrumentalization. It shifts ID from a "Professional Service" to a "State Tool," muddying the ontological boundaries.
Wu et al. (2024)	Tech-Integrated Discipline (AI)	Integrating AIGC in design process	Innovation efficiency	Views the designer primarily as a content 'maker.' This perspective risks underestimating the designer's role as a strategic regulator who directs AI rather than being replaced by it.
Besana et al. (2024)	Sustainable Interaction Design	Expanding interaction beyond user-product	Economic & Environmental impact	Identifies a crucial 'Social Gap.' However, it lacks a clear mechanism to harmonize sensory interaction (Aesthetics) with systemic ethical responsibilities.
Barnes et al. (2024)	Complex Empathy Process	Nuanced understanding in HCD methodologies	Impact on user experience	Over-focus on psychology. If ID is only "Empathy," it loses its mandate to optimize "Business Viability" (Profit).
Oliveira et al. (2024)	Strategic link: Design-Management-Entrepreneurship	Positioning design as organizational innovation	Transforming processes via AI	Merges ID into Entrepreneurship. While strategic, it risks diluting the discipline's core competency in sensory and emotional embodiment.
Spoladore (2024)	Domain-Specific Taxonomy	Reconfiguring living environments (AAL)	Specific contextual solutions	Exhibits low ontological reuse, creating a domain-specific framework that lacks integration with the discipline's historical professional standards.
Liu & Misri (2025)	Intangible Cultural Heritage (ICH) Design	Protecting cultural sustainability/identity	Interdisciplinary & Ethical approaches	Strong on "Ethical Value," but must ensure the product is "Viable for Mass Production" (Profit) to remain Industrial Design.

5.1. Thematic Analysis of the Matrix

As detailed in Table 2, a clear ontological drift emerges: from cohesive artifact creation toward fragmented frameworks. Crucially, a "Sustainability Gap" is evident, where modern definitions fail to operationalize social and systemic aspects as effectively as earlier professional models.

6. Discussion: A Critical Synthesis of Ontological Drifts

The longitudinal analysis of industrial design (ID) definitions from 1959 to 2025 reveals a profound "ontological drift." While the discipline has gained breadth by expanding into socio-technical systems and digital domains, it has simultaneously suffered a dilution of its core professional identity. This discussion synthesizes the findings through four critical lenses to establish the necessity for a modernized, stabilized definition.

6.1. The Dilemma of Ontological Drift: From "Professional Service" to "Fluid Process"

A recurring theme in the analyzed discourse is the ambiguity surrounding ID's professional jurisdiction. The "Early Core" established by ICSID (1959) and the IDSA benchmark anchored the discipline as a fiduciary professional service. However, it is vital to distinguish between the structure of this service and its medium. While the IDSA (2020) framework correctly identifies the fiduciary nature of the profession, its broad expansion into 'systems, services, and experiences' reflects a modern ontological drift. This breadth, while necessary, risks diluting the discipline's core focus on the tangible mediation of human experience, a gap that earlier, more artifact-centric definitions implicitly guarded. In the current landscape of complex socio-technical systems, 'Appearance' is an insufficient metric that fails to capture the multi-sensory and intangible interactions required in post-disciplinary design. However, the "Strategic Turn" initiated by Simon (1996) and later adopted by the WDO (2015) reframed design as a generalized "science of the artificial" or a "strategic problem-solving process."

It is crucial to acknowledge that this expansion was an **evolutionary necessity**. As design challenges shifted from simple artifacts to complex "Wicked Problems," the discipline required a broader methodological toolkit, necessitating the move toward systems thinking and strategy. The WDO's expanded definition correctly reflects the field's increased scope and its integration into complex socio-technical systems. However, the analysis suggests that while this expansion was positive, it has inadvertently resulted in an 'over-abstraction of professional identity.'

This paper **does not argue for a regression** to the mid-century model, but for a **specialized distinction**. Just as widespread legal literacy does not replace the specialized role of a lawyer, generalized 'design thinking' capabilities in management do not replace the industrial designer's specific mandate to orchestrate complex technical and aesthetic trade-offs (embodiment). The drift becomes problematic only when the generalist approach *substitutes* the specialist expertise, rather than supporting it.

By defining design primarily as a cognitive mode of thinking detached from concrete realization (whether physical or digital), the discipline risks becoming indistinguishable from general management or organizational strategy. This "ontological drift" creates a fragmented landscape where ID loses its distinct "being." To maintain professional relevance, the discipline must not reject this strategic expansion but rather **re-anchor** it. Industrial Design must assert itself not merely as an abstract "innovation tool" (Landry, 1987), but as a concrete professional service with a specific, non-transferable mandate: the strategic harmonization of the physical and digital artifact within these complex systems.

Crucially, this critique does not oppose the democratization of design (e.g., Design Thinking). Acknowledging design as a 'human capacity' (Heskett, 2002) is vital for organizational culture. However, a distinction must be drawn between design as a universal attitude and Industrial Design as a specialized profession. The drift occurs when the specific responsibilities of the latter are subsumed by the generalizations of the former.

6.2. The Utilitarian-Systemic Equilibrium: Balancing Function and Values

The comparative matrix reveals a critical tension, not merely between profit and ethics, but between Functional Utility and Systemic Values. Historically, definitions have oscillated between these poles. The substitution of 'Function' as the primary ontological pillar in this study is deliberate. Unlike art, which thrives on ambiguity and expression, Industrial Design is tethered to the prerequisite of utility. As Louis Sullivan famously implied, form represents the solution to a functional problem. Without Function, the object dissolves into Art; without Values, it becomes an irresponsible artifact.

Therefore, the designer's first act of regulation is ensuring 'functional proficiency,' which must then be tempered by systemic responsibility. A purely functionalist approach risks creating 'efficient monsters.' For instance, a disposable plastic bottle is a triumph of function (lightweight, durable, cost-effective) but a catastrophic failure of systemic values (environmental persistence). Conversely, Papanek's (1971) critique highlights the danger of prioritizing idealism over utility, which risks relegating design to social activism. A stabilized definition must recognize that a product must first work (Function) to be relevant, but must work responsibly (Values) to be sustainable.

6.3. The Aesthetic Imperative: Resisting Technical Reductionism

While function prevents the object from collapsing into art, Aesthetics prevents it from collapsing into mere engineering. A parallel trend observed in functionalist definitions (Heath et al., 2000) is the suppression of the aesthetic dimension in favor of pure technical optimization. However, aesthetics is not a superficial 'layer' added to function; it is the interface of human experience. This aligns with Ross and Wensveen (2010), who argue that aesthetics functions as an ethical mechanism, guiding user behavior beyond mere visual appreciation. As the critiques suggest, removing "Beauty" or "Appearance" from the definition strips the discipline of its "Soul" the sensory and emotional connection that defines human-object interaction. This study argues for an ontological upgrade: elevating 'Appearance' to 'Aesthetics'. Whereas 'Appearance' as maintained in the IDSA benchmark implies a superficial, visual layer applied to a functional core, 'Aesthetics' is the sensory and semantic interface of experience. This shift allows the definition to encompass the full spectrum of embodiment, from tactile haptics in physical hardware to the cognitive clarity required in digital ecosystems.

Aesthetics is not a superficial "layer" but the core of the discipline's Semantic Integrity. This aligns with Krippendorff's (2006) foundational concept of the "Semantic Turn," which posits that design is fundamentally about making artifacts comprehensible and meaningful to users, shifting the focus from mere physical form to human-centered meaning-making. This perspective reinforces the critiques of WDO (2015) and Oliveira et al. (2024), where the sensory and emotional connection provided by "Form" is what distinguishes ID from its engineering sub-disciplines. To remove aesthetics from the definition is to remove the "Soul" of the profession. The unique expertise of the industrial designer lies in giving embodiment to abstract strategies—whether through physical hardware, digital interfaces, or service touchpoints. Without semantic integrity and a focus on form-giving, ID collapses into Engineering Management. The expertise of the designer lies in the "Strategic Negotiation" between how a product works (Function) and how it is perceived (Aesthetics). Definitions that treat design as a "mechanical code" (Shijian, 2008) or a "material science evolution" fail to account for the designer's role as the architect of experience.

6.4. The Designer as 'Equalizer': Regulation in the Age of AI

The entry of Artificial Intelligence (AI) presents the sharpest challenge to contemporary definitions. Recent studies risk reducing the designer to a mere "maker" of content—a role easily automated by generative algorithms. However, this study argues that the designer's role is not "tool-use" but high-level regulation (Wiener, 1948).

As Stoimenova and Price (2020) argue, designing for AI requires navigating complex nuances of human-machine collaboration, further reinforcing the need for a strategic regulator who harmonizes these interactions. To resolve this epistemological tension, it is critical to distinguish between two distinct paradigms of AI integration: AI as an autonomous generator of form—which risks automating tactical execution —and AI as a systemic diagnostic tool. In the latter paradigm, AI operates not as a replacement for human agency, but as a cognitive amplifier that processes complex, multidimensional data streams across the product lifecycle. This crucial distinction shifts the industrial designer's mandate from manual form-giving to high-level cybernetic regulation, wherein artificial intelligence informs and expands, rather than dictates, the strategic optimization process. This role can be conceptualized through the metaphor of an "Equalizer," grounded in General Systems Theory (Von Bertalanffy, 1968). Unlike a mathematical maximization where a single variable is optimized, the design process is a form of Decision-Based Design (Hazelrigg, 1998), utilizing Multi-Criteria Decision Making (MCDM) frameworks to navigate conflicting constraints (Triantaphyllou, 2000). The designer, acting as an 'Equalizer,' navigates these complex trade-offs to ensure a holistic product experience that balances aesthetic, emotional, and functional levels (Desmet & Hekkert, 2007). The designer acts as the regulatory agent in a feedback loop, maintaining the dynamic equilibrium of the product system.

Just as an audio engineer does not simply "maximize" all frequencies but modulates bass, treble, and gain to suit a specific genre, the industrial designer must dynamically modulate the variables of Function, Aesthetics, and Value based on contextual feedback. For example, in public furniture design, the equalizer adjusts to prioritize durability over comfort to prevent loitering, whereas in a fintech app, it must harmonize rigorous security protocols (Function) with visual clarity (Aesthetics) to ensure user trust without friction.

In this cybernetic model, the designer modulates three primary sliders: Function (utility and problem-solving), Aesthetics (form and desirability), and Values (ethics & systemic responsibility). Crucially, 'Business Viability' (Profit) is not treated as an input variable, but as the emergent outcome of successfully harmonizing these three dimensions. It is important to clarify that while *profit* is the result, *economic constraints* (such as manufacturing costs) remain a critical input variable embedded within the 'Function' slider. If the designer creates a product that functions perfectly, resonates emotionally (Aesthetics), and respects systemic constraints (Values), market success follows as a consequence. The 'Equalizer' metaphor thus redefines the designer not as a merchant seeking profit, but as a strategist creating the conditions for profit through holistic product integrity. Consequently, market success is reframed not as an extractive commercial goal, but as the realization of 'Mutual Benefit' —where the user receives heightened experiential value, and the manufacturer naturally achieves long-term economic viability and profit.

While Generative AI can visualize infinite permutations (form generation), it lacks the systemic awareness to determine these precise trade-offs. It cannot navigate the "friction" between competing stakeholder values. Therefore, the designer remains the indispensable **cybernetic strategist** who defines the parameters and evaluates the feedback loops to ensure the system's integrity. In this model, the designer is not replaced by AI but directs it, moving from a "maker of forms" to a "modulator of value."

To operationalize this 'regulation', designers must employ specific diagnostic tools. The designer's role is to synthesize these disparate data streams—turning technical data and subjective aesthetic scores into a coherent product strategy that satisfies the 'Profit' constraint mandated by the business.

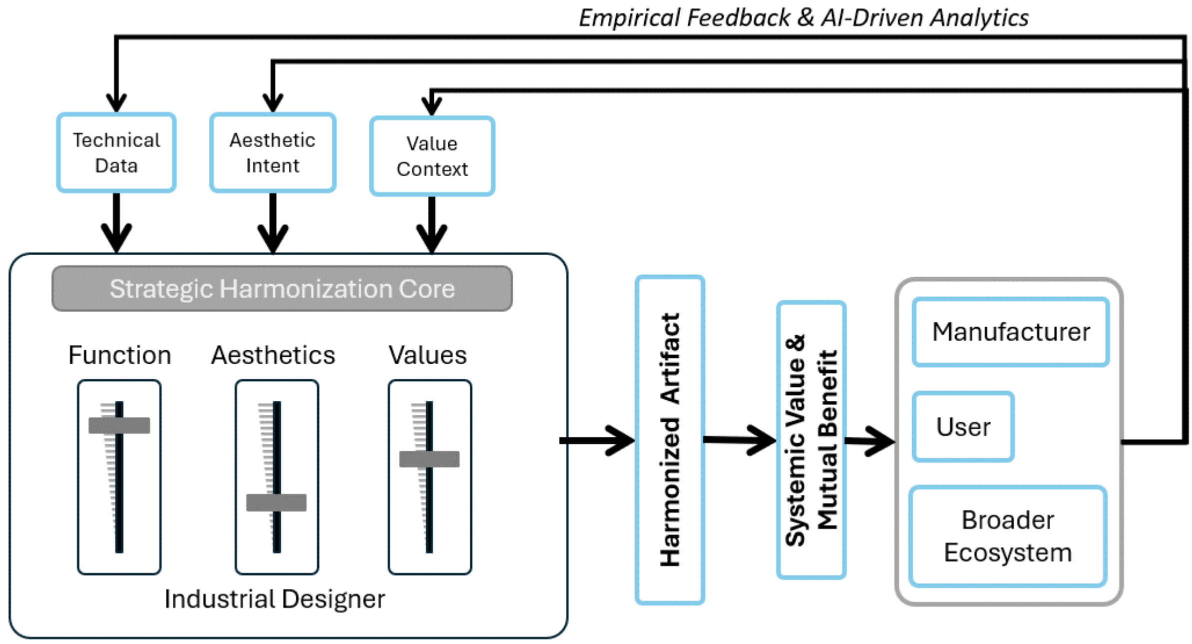

Figure 2: *The Cybernetic 'Equalizer' Model of Industrial Design: A framework for strategic harmonization. The model illustrates the designer's role as a systemic regulator, modulating functional, aesthetic, and ethical variables within a continuous, AI-enhanced feedback loop.*

6.5. Synthesis: Toward a Stabilized Definition

Seventy years of discourse expose a flaw. Analyzing of definitions shows that they are either too narrow (technical reductionism) or too broad (dilution). **This research argues** that coherence requires integration. It must mix the 'Hard Core' of professional service with the 'Soft Skills' of systemic mastery.

These findings demand a modernized framework. It harmonizes three dimensions: Economic Viability (Profit), Sensory Integrity (Aesthetics), and Systemic Responsibility (Values). Here, the designer acts as a mediator of competing human forces — balancing Function, Aesthetics, and Value across the lifecycle. This moves the discipline past its 'identity crisis'. It provides a stable base for education and practice. The inclusion of AI-driven analytics within this feedback loop (Figure 2) is a methodological necessity for 21st-century ID. While traditional feedback relied on limited user testing, modern systemic design deals with 'Wicked Problems' and vast data streams across the product lifecycle. AI serves as the designer's cognitive amplifier, processing complex environmental feedback so the designer—as the ultimate 'Equalizer'—can make informed adjustments to the system's variables.

6.6. The Equalizer Model in Organizational Strategy

Within organizational contexts, the Cybernetic Equalizer Model serves as a concrete strategic tool for innovation pipelines. Design managers and corporate strategists can utilize this framework to translate macro-level corporate goals into tangible product attributes. By systematically modulating Function, Aesthetics, and Values in response to AI-enhanced feedback, organizations can align product development directly with corporate strategies. This strategic harmonization enables companies to proactively mitigate market risks, optimize resource allocation, and drive sustained innovation.

To operationalize this definition and prevent it from remaining purely theoretical, this study proposes the FAV-Equalizer Diagnostic Rubric (FAV=Function, Aesthetics, Value) (Table 3). This compact tool allows practitioners, educators, and researchers to evaluate whether a design outcome has achieved strategic harmonization or has drifted into ontological imbalance. By answering the core diagnostic questions, designers can systematically modulate their projects to avoid the pitfalls of technical reductionism or superficial styling.

Table 3. The FAV-Equalizer Diagnostic Rubric: A tool for evaluating strategic harmonization in Industrial Design.

Dimension	Core Diagnostic Question	Indicator of Ontological Imbalance (Risk)
Function (Utility & Constraints)	Does the artifact reliably solve the core user problem within technical and economic constraints?	"**Efficient Monster**": Highly functional but ecologically/socially harmful, OR "**Unusable Art**": Aesthetically pleasing but technically flawed.
Aesthetics (Sensory & Semantic Integrity)	Does the form/interface create an intuitive, emotionally resonant, and meaningful connection with the user?	"**Technical Reductionism**": Cold, purely engineering-driven, lacking user appeal, OR "**Superficial Styling**": Visually attractive but lacking substantive utility.
Value (Ethics & Systemic Responsibility)	Does the artifact align with broader social, environmental, and cultural sustainability goals across its lifecycle?	"**Irresponsible Artifact**": Profitable but ecologically/socially damaging, OR "**Unsustainable Activism**": Ethically pure but economically unviable for mass production.

To foster broader academic and practical adoption, the FAV-Equalizer Diagnostic Rubric is proposed as an open evaluative tool. Researchers and practitioners are encouraged to adapt and apply this framework across diverse domains—such as sustainable design, AI-integrated workflows, and service design—establishing a shared, cross-disciplinary metric for strategic harmonization.

7. Conclusion

In light of the significant ontological drifts and epistemological gaps identified in this integrative study, this study concludes that a passive reliance on historical definitions is no longer sufficient to secure the discipline's future. What endures across all eras is the designer's fundamental act: striking a balance among Function, Aesthetics, and Value — a balance that must be rediscovered in every project and every cultural context. To restore coherence in a post-disciplinary era, the definition of Industrial Design must be reconstructed not as a static description, but as a stabilizing framework that addresses the specific crises of identity, value, and technology. Specifically, this reconstruction moves beyond the ocular-centric limitations of established professional standards, proposing a transition from 'visual appearance' to 'systemic aesthetics' — rooted in the enduring human act of balancing Function, Aesthetics, and Value — as the core of industrial design expertise.

Therefore, this study proposes the following comprehensive definition:

"Industrial Design is the strategic harmonization of Function, Aesthetics, and Value. It is the discipline of shaping human experience through tangible and intangible artifacts, where the designer acts as a cybernetic equalizer, dynamically balancing competing forces in every unique context."

This modernized definition offers more than a semantic update; it provides an epistemological stabilizer. By positioning the designer as a "Cybernetic Equalizer," the discipline reclaims its specific jurisdiction: the strategic harmonization of the physical and digital artifact within complex systems. This framework equips educators and practitioners with a resilient identity to thrive in the 21st century.

8. References

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