

BEYOND HUMAN INCLUSION: AI AND THE EXPANSION OF CREATIVE PARTICIPATION IN DESIGN

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ABSTRACT

Artificial Intelligence (AI) is increasingly embedded in designers' creative workflows, reshaping not only how design is produced but how participation in the creative process is configured. What began as computational support for ideation and efficiency is progressively transforming the distribution of agency within design practice. This paper examines how the meaning of inclusion evolves in response to AI integration for creative empowerment, reframing it as creative participation across human, artificial, and more-than-human actors. The study combines the *three waves* paradigm of human–AI creative relationships with the Inclusive Design Research Centre (IDRC) framework as complementary analytical lenses. This reading traces how the role of AI evolves from a tool augmenting human cognitive access (First Wave), to a collaborative partner enabling hybrid co-creation (Second Wave), and toward an embodied agent within distributed multi-intelligence ecosystems (Third Wave)—revealing a parallel expansion of creative participation from individual augmentation to relational negotiation and systemic coexistence. The paper introduces the concept of relational creative agency and discusses implications for design education, highlighting the need to cultivate orchestration, trust calibration, systems thinking, and ethical reasoning for emerging multi-intelligence design contexts.

Keywords: Human-AI co-creation, creative participation, inclusive design, distributed creativity, design education

1 INTRODUCTION

Artificial Intelligence (AI) is increasingly embedded in designers' creative workflows, where it is widely used to support ideation, exploration, and the generation of creative outputs. What initially emerged as a productivity aid is rapidly becoming a structural component of contemporary design practice, profoundly reshaping the relationship between designers and the creative process [1]. Recent scholarship suggests that the inclusion of AI agents in creative processes is fundamentally reshaping how designers think, act, and contribute to design activity. Research on hybrid intelligence conceptualises human–AI collaboration as a complementary system in which artificial agents generate outcomes that exceed individual human intentions [2]. Empirical studies of computational co-creativity further show that AI systems dynamically participate in creative exchanges, influencing direction, interpretation, and meaning making during interaction [3]. From a socio-technical perspective, this shift challenges the traditional view of technology as a passive tool. Theories of material and technological agency argue that artefacts actively shape human practice [4], while Giaccardi and Redström [5] describe emerging intelligent systems as “co-performers,” thereby questioning the anthropocentric assumptions that have historically underpinned design. These developments suggest that the growing inclusion of AI in creative processes is not merely a technological shift but a conceptual one. If multiple intelligences can now actively contribute to design outcomes, how might we reframe the concept of inclusiveness in the creative process? As designers increasingly adopt AI in the creative process, the traditional framework of inclusive design, primarily concerned with human diversity, requires reconsideration. The paper argues that AI integration is transforming inclusion from a human-centred accessibility paradigm toward a relational form of creative participation distributed across human, artificial, and environmental actors. The paper also discusses the implications of this shift for design education.

2 SIGNALS OF CHANGE: THE EXPANDING SCOPE OF INCLUSION IN DESIGN

Once primarily concerned with human-centred accessibility, inclusive design is increasingly being reframed through socio-political, systemic, and ecological lenses. Early formulations such as *Universal Design* [6] and capability-based *Inclusive Design frameworks* [7] focused on reducing functional exclusion in the use of products, services, and environments by accommodating diverse human abilities across the population. These approaches established inclusion as a measurable response to human variability yet largely retained an anthropocentric and product-oriented focus. Expanding this view, the *Inclusive Design Research Centre (IDRC)* reframed inclusion as an ecosystem property grounded in human uniqueness and systemic adaptability [8]. Subsequent developments, including *Design Justice* [9], reframed inclusion as a matter of redistributing power within the design processes, emphasising community leadership, intersectionality, and structural equity. More recent regenerative and more-than-human design perspectives [10] further challenge the anthropocentric assumptions underlying even progressive inclusive models by recognising ecological systems, living materials, and AI agents as legitimate participants in design. Within this expanded horizon, *Biodiversity Inclusive Design* has emerged as a critical synthesis integrating justice-oriented design with a bio-relational ontology attentive to multispecies agency and material vitality [11], reframing design as a relational practice across human-nonhuman assemblages. Parallel to these developments, the growing adoption of AI in creative practices is prompting renewed reflection on who participates in the creative act. AI systems increasingly challenge the assumption that agency resides solely with human users [5], reframing technological artefacts as co-performers within design processes. Empirical studies show that designers must now negotiate hybrid forms of agency as AI systems move beyond passive tool use toward more active participation [12]. Co-design research similarly expands inclusion beyond stakeholder diversity toward an ontological reconsideration of who - or what - counts in design [13]. These signals may inform us about a decisive transformation: inclusive design is no longer confined to accommodating human difference but is becoming processual, systemic, and post-anthropocentric - reconfigured around relational networks of human, artificial, and more-than-human agencies.

3 DEFINING THE ANALYTICAL FRAMEWORK

In this paper, we analyse how the increasing use of GenAI in the creative process is reshaping the concept of inclusion in design. The study combines the *three waves paradigms* of human-AI relationships for creative empowerment [1] with the IDRC Inclusive Design framework as complementary analytical lenses [8]. While the *three waves* model traces how roles and agency evolve across human-AI creative configurations, it remains primarily descriptive. The IDRC framework, by contrast, provides a systemic theory of inclusion but does not explicitly account for artificial agents as actors in the creative process. Their integration is therefore analytically generative: the *three waves* model reveals how creative agency shifts, while the IDRC dimensions enable a systematic assessment of how these shifts progressively redefine participation within AI-empowered creative ecosystems.

3.1 The evolving role of AI in the designers' creative process

The *three waves* paradigm addresses the evolving relationship between GenAI and the designer's creative process. These waves serve as a starting point for reflecting on how AI is introduced into the design process to support creative empowerment. From AI being a practical tool for performing tasks in the creative process (first wave), the relationship has evolved toward a collaborative process between humans and AI, where AI can be seen as an active co-creator rather than merely a tool (second wave). This relationship will further evolve, seeing AI as an isolated agent interacting with humans, machines, and the environment within a distributed creative process (third wave). Within this conceptualisation, the focus of inclusion shifts from access to designed outcomes toward creative participation in the design process. As human-AI relationships evolve, creative participation itself is redefined, reshaping who takes part, with what roles, and with what forms of agency.

3.2 The IDRC Framework as a lens on creative participation

To systematically examine how the concept of creative participation evolves across the three waves paradigm, the authors adopt the three core dimensions of Inclusive Design articulated by the Inclusive Design Research Centre (IDRC) [8]:

- **Recognise and design for human uniqueness and variability**, moving beyond “one-size-fits-all” solutions toward highly differentiated responses to individual needs.
- **Use inclusive and transparent co-design processes** involving people with diverse perspectives - particularly edge users - as active contributors throughout development.
- **Design within complex adaptive systems**, acknowledging that design decisions operate within interconnected socio-technical contexts and should transform exclusionary dynamics into system-level benefits.

The IDRC framework was selected for three reasons. First, it offers a guiding approach suited to a digitally transformed and highly interconnected society, framing inclusion as a systemic and adaptive property aligned with the distributed dynamics of AI-mediated creativity. Second, it frames diversity as an epistemic resource rather than a deviation from the norm, supporting a cognitively open view of participation. Third, its grounding in HCI, disability studies, and socio-technical systems theory provides a robust basis for analysing the shift from person-centred inclusion toward systemic forms of creative participation.

4 THE EVOLUTION OF CREATIVE PARTICIPATION ACROSS THE THREE WAVES

The analysis reveals a progressive expansion of creative participation within AI-empowered creative practice. Across the waves, AI does not simply enhance efficiency but gradually transforms who participates in creativity, how participation is structured, and toward what systemic purposes creative processes are oriented. This evolution directly affects the constellation of cognitive, motivational, and socio-technical factors that underpin creative potential in design. This structured reading reveals not only increasing technological sophistication but also a progressive redefinition of inclusion within the creative process, moving from human-centred access toward hybrid and ultimately distributed creative participation. Although analytically presented as sequential, the three waves cannot be clearly separated in practice: their boundaries are blurred, and they frequently overlap and co-evolve over time, simultaneously embodying multiple dimensions of creative participation. For detailed empirical examples illustrating each wave, readers are referred to Bruno et al. [1].

4.1 First wave - AI as a tool: augmenting cognitive access

The first dimension of the IDRC framework - recognise and design for human uniqueness - provides a critical lens for interpreting the first wave of human–AI interaction. In this phase, AI primarily operates as a computational tool that helps designers move beyond standardised “one-size-fits-all” solutions toward more differentiated and tailored responses. By enabling the analysis of large and diverse datasets, AI increases the system’s capacity to recognise human variability and support more fine-grained personalisation within the creative process. In this wave, AI augments designers’ efficiency throughout the creative process, supporting activities such as large-scale information gathering, pattern recognition, clustering, and rapid generation of alternatives from extensive datasets. Cognitive technologies can rapidly synthesise unstructured data and surface insights that would otherwise remain difficult to detect [14], thereby expanding designers’ access to creative knowledge. From a participation perspective, the designer remains the primary creative agent but increasingly operates as a meta-designer, configuring parameters and strategically leveraging computational variability. AI functions as an extension of human cognition - a prosthesis that reduces informational and cognitive barriers and enables broader access to complex creative resources. However, the interaction remains largely instrumental and unidirectional. Designers use AI to accelerate workflows and maintain creative momentum, but the system does not yet meaningfully reshape the dialogic structure of ideation. Inclusion, therefore, primarily expands at the level of **augmented cognitive access**, rather than through a redistribution of creative participation. At the level of creativity factors, this wave primarily strengthens **domain knowledge activation, memory retrieval, pattern recognition, and analogical reasoning**. By offloading repetitive analytical and generative tasks, AI reduces cognitive overload [14] and allows human attention to concentrate on higher-order interpretive and critical activities. Creative control remains predominantly human-led: designers define parameters, interpret outputs, and curate final solutions [15]. In summary, creative participation in the first wave is **infrastructural and human centred**. AI accommodates differences in human cognitive capacity and enables more finely tuned personalisation, yet it does not fundamentally

redistribute agency within the creative process. The centre of creativity remains firmly human, even as it becomes computationally amplified.

4.2 Second wave - AI as a partner: orchestrating hybrid creative participation

The second dimension of the IDRC framework - *use inclusive and transparent co-design processes* - provides a critical lens for interpreting the second wave of human–AI interaction. In this wave, AI evolves from an efficient tool into an active collaborative partner, transforming the creative process into a dialogic and bidirectional exchange. Rather than merely supporting isolated tasks, AI increasingly participates in ideation by generating suggestions, proposing analogies and metaphors, and offering real-time feedback that shapes the direction of creative exploration. From a participation perspective, this wave marks a shift from instrumental use toward negotiated agency. Human–AI interaction becomes symbiotic: both actors contribute to and influence the creative trajectory. AI systems can stimulate divergent thinking, support visualisation, and introduce alternative framings that contribute fresh perspectives and expand designers' cognitive horizons. As a result, imagination, perspective-shifting, and idea generation become progressively distributed across human and artificial actors. Conceptually, this transition strongly reinforces the IDRC dimension of inclusive co-design processes. Inclusion moves beyond accommodating individual variability toward restructuring the creative process itself as a multi-agent collaborative system. The focus shifts from equality of access to **cognitive diversity**, as non-human forms of reasoning enter the ideation space and actively challenge designer assumptions. AI's generative unpredictability plays a particularly important role in this phase. By introducing elements of surprise and reframing, AI can disrupt cognitive fixation, stimulate divergent thinking and expand imaginative exploration [16]. Creativity, therefore, becomes more explicitly relational and processual, emerging from continuous feedback loops between human and artificial agents. At the level of creativity factors, the emphasis expands toward **idea co-generation, perspective shifting, creative flow activation, and feedback negotiation**. Designers are required to actively manage the dynamics of collaboration, balancing openness to machine contributions with critical oversight. Accordingly, the designer's role evolves toward orchestrating the dialogue with AI [17], calibrating trust, and critically evaluating machine-generated outputs [18]. Agency becomes partially shared: creativity increasingly emerges from negotiated human–AI interaction loops rather than from individual cognition alone. In summary, creative participation in the second wave becomes **hybrid and co-evolving**. AI is no longer merely accommodating human cognitive differences but actively reshaping who participates in creativity and how creative authority is distributed. Inclusion thus shifts from an infrastructural condition toward a relational one, reflecting the emergence of multi-intelligence co-production within the design process.

4.3 Third wave - AI as embodied agent: enabling multi-intelligence coexistence

The third dimension of the IDRC framework - *designing in a complex adaptive system* - provides the critical lens for interpreting the speculative third wave of human–AI interaction. In this phase, AI is no longer understood primarily as a tool or even as a discrete collaborator, but as an **embodied creative agent operating within ecosystems of distributed intelligence**. Creativity is no longer located within individual minds; rather, it emerges from dynamic interactions among humans, artificial systems, and environmental actors. From a participation perspective, this wave marks a fundamental systemic shift. Intelligence becomes distributed across multi-agent ecologies, requiring designers to move beyond creating isolated artefacts toward **designing conditions that enable emergent outcomes**. Drawing on theories of distributed cognition [18] and more-than-human design [10][13], the creative process becomes relational, situated, and environmentally embedded. Conceptually, this wave most strongly amplifies the IDRC dimension of designing within a complex system to achieve a broader, beneficial impact. Inclusion expands beyond human participants to encompass biodiversity, ecological systems, and more-than-human stakeholders who are increasingly treated as legitimate "clients" of the design process. AI operates as an infrastructural mediator, integrating physical, social, and ecological data streams, rendering environmental signals perceptible in creative decision-making and supporting more-than-human design approaches oriented toward sustainability challenges. Access to creative knowledge, therefore, becomes multi-layered and context aware. Rather than drawing solely on human-generated datasets, AI systems increasingly synthesise environmental, behavioural, and systemic information. Participation correspondingly extends beyond the human–AI dyad toward complex multi-agent ecosystems, where creative outcomes are shaped by ongoing interactions among heterogeneous actors

[18][19]. At the level of creativity factors, this wave foregrounds **distributed cognition, situated and embodied intelligence, systems thinking, and relational sense-making**. Creativity evolves from an individual or hybrid capability into an emergent property of the system itself. Accordingly, **creative agencies become systemically distributed**. Designers shift from sole creators or arbiters toward orchestrators and stewards of multi-intelligence ecologies [19]. Their responsibility increasingly involves cultivating resilient relationships across human, artificial, and ecological domains and transforming potentially exclusionary dynamics into virtuous cycles of systemic co-performance. In summary, creative participation in the third wave reaches a systemic threshold. Inclusion is no longer primarily infrastructural or relational but ontological: it concerns which forms of life, intelligence, and knowledge are recognised as legitimate participants in the creative process. This shift introduces profound ethical and educational challenges, positioning designers as key actors in shaping more resilient, sustainable, and coexistent socio-technical futures. A concrete example comes from Neri Oxman's *Material Ecology* practice (MIT Media Lab), in which computational algorithms, biological organisms (silkworms, bees), and environmental data streams co-produce design outcomes that no single agent could predetermine [20]. As a designer, she acts as a steward of multi-intelligence ecology.

5 FROM AUGMENTING COGNITIVE ACCESS TO ENABLING COEXISTENCE

The trajectory traced across the *three waves* does not simply describe a technological progression; it reveals a deeper transformation in how participation, agency, and responsibility are configured within design. What begins as the augmentation of human capability progressively destabilises the anthropocentric foundations of creative practice. Inclusion, historically framed as the accommodation of human difference, becomes insufficient to account for the emerging conditions of AI-mediated creativity. Across the waves, the centre of gravity shifts markedly - from optimising the individual designer's performance, to hybrid co-performance between human and artificial agents, and ultimately toward systemic configurations in which creativity emerges from entangled relations among humans, machines, and environments. Creativity can no longer be fully understood as an attribute of an individual subject; rather, it increasingly manifests as a property of a relational field. This progression challenges the very grammar of inclusion. Traditional models presuppose a boundary, a norm, and the act of admitting the Other into an already-defined system. The configurations observed across the three waves suggest a more profound reconfiguration: not simply the expansion of participation, but the redistribution of creative agency itself. The critical question shifts **from who is included to how agency is negotiated and sustained across heterogeneous intelligences**. From this perspective, the contribution of this paper lies in reframing the discourse from inclusive design toward **relational creative agency** - a condition in which creativity is understood as co-emergent, distributed, and ethically situated within multi-intelligence ecosystems. In this emerging landscape, AI is neither a neutral tool nor a rival intelligence, but an infrastructural mediator that reshapes the conditions under which creative participation becomes possible. The implications for design education are substantial. Teaching AI merely as a productivity enhancer is no longer sufficient. Nor is it adequate to frame human-AI collaboration primarily in terms of efficiency gains. Concretely, foundational studios can introduce *reflective AI auditing* - where students document and critically evaluate the AI's role at each ideation stage - to develop critical AI literacy and reflective use of generative tools; intermediate studios can deploy adversarial *co-creation workshops* with structured peer critique to cultivate human-AI co-creation, dialogic orchestration, trust calibration, and orchestration skills; and advanced projects can adopt *more-than-human design briefs* and *speculative ethics assessments* to address the systemic, ecological, and ethical dimensions of distributed intelligence while cultivating systems thinking and ethical reasoning.

Ultimately, the integration of AI into creative practice confronts design with a pivotal choice. AI can reinforce technocentric logics of optimization and control, or it can support the emergence of a mature technosphere capable of coexisting responsibly within the biosphere. The *three waves paradigm* suggests that the future of design will depend less on computational power alone and more on cultivating relational intelligence, systemic responsibility, and the willingness to reconceptualise creativity itself as a shared, planetary condition.

6 CONCLUSIONS

This study proposes a structured interpretation of how creative participation evolves across the three waves of human-AI interaction, mobilising the IDRC dimensions as an analytical lens. Through this

comparative reading, the paper highlights a progressive shift from human-centred augmentation to hybrid co-creation and, ultimately, toward distributed multi-intelligence ecosystems. The analysis remains primarily conceptual and interpretive. Further empirical research is needed to examine how these dynamics unfold in situated design and educational contexts, and how designers and students navigate emerging multi-intelligence environments. Despite these limitations, the three waves model provides a useful scaffold for anticipating how AI may reshape creative participation and for supporting educators in preparing designers to act responsibly within increasingly complex socio-technical and ecological systems.

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