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IdeasLand: Sculpting Creativity with Constraints in Human-AI Collaboration
An AI-first approach

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Abstract

IdeasLand is a web-based co-creative application that instantiates the Constrained Collaborative Environment (CCE) model for human–AI collaboration. CCE frames collaboration as work that occurs inside a deliberately structured environment: the system defines constraints and interaction scaffolds so that the user retains authorship and can steer ideation with explicit, inspectable choices rather than accepting unconstrained AI suggestions.

This paper (1) specifies CCE as a design model for constrained, user-steered co-creation and (2) describes how IdeasLand operationalizes CCE through its interface workflow and prompting logic. We then report a formative, single-group evaluation conducted in September 2024. Five participants used IdeasLand over two weeks, after which we collected usability and perceived creativity-support measures (including SUS) and structured feedback on the experience. The observed usability level was acceptable (SUS: 72). Participants' perceived creativity support clustered in the mid-to-upper range (3.6–3.8 on Likert-style ratings), with feedback emphasizing benefits of structure for refining and organizing ideas. The same feedback also identified design and reliability gaps (notably onboarding friction, occasional tool errors, and cognitive load from complex visualizations). Given the small sample and single-condition design, findings are presented as feasibility evidence and as concrete design implications for the next iteration. The paper also reflects on the possible relevance of constraint-driven collaboration for distance education settings.

Keywords

human-AI collaboration, Constrained Collaborative Environment (CCE), creative ideation, IdeasLand, HCI design, AI-Driven creativity, usability evaluation, structured interaction, creative narration, scalable AI systems

Introduction

Human-AI Collaboration and the CCE Model

Generative AI is now routinely used for creative ideation, yet many co-creative workflows remain dominated by open-ended prompting and unstructured suggestion streams. That interaction style can be productive, but it also creates recurring problems for users who want to retain authorship and direction: intent is repeatedly re-negotiated through prompt edits, constraints are applied inconsistently across iterations, and the collaboration becomes sensitive to phrasing rather than to stable design intent. These concerns motivate work on structured and scaffolded human–AI interaction in creative settings (Stefnisson & Thue, 2018; Chen et al., 2020).

This paper adopts the position that constraints can function as a collaboration mechanism when they are expressed through interaction design rather than imposed informally by the user. We formalize this position through the Constrained Collaborative Environment (CCE) model, which frames co-creation as work conducted inside an environment with explicit rules and structured interaction sequences, supporting steerability and preserving human agency (Manias & Mavrommati, 2022).

We instantiate CCE in IdeasLand, a web application for structured ideation. The contribution of this paper is not a comparative evaluation against other collaboration models; instead, we present the model and the system and report a formative, single-group evaluation intended to surface usability and collaboration-design issues. In September 2024, five participants used IdeasLand over two weeks, after which we collected usability and perceived creativity-support measures (including SUS) alongside structured feedback on the experience. Findings are presented as feasibility evidence and as design implications for a next iteration, with limitations that follow from the sample size and the absence of a baseline condition.

Contributions:

- We specify the CCE model as a design framework for user-steered human–AI collaboration grounded in explicit constraints and interaction scaffolding (Stefnisson & Thue, 2018; Chen et al., 2020).
- We present IdeasLand, a web-based application that operationalizes CCE through structured workflows and representations for ideation (Manias & Mavrommati, 2022).
- We report findings from a two-week formative study (n = 5) including usability (SUS), perceived creativity-support measures, and structured participant feedback.
- We derive design implications for constrained co-creative systems, including onboarding, reliability, and interface complexity issues observed in this instantiation.

Although IdeasLand is presented here as a general-purpose instantiation of the Constrained Collaborative Environment (CCE), the design rationale of constraint-driven, user-steered collaboration intersects with structural challenges characteristic of online and distance education. In distributed learning contexts, learners often work asynchronously, with limited real-time instructor mediation, which increases the importance of scaffolded workflows, legible task structures, and mechanisms that preserve learner agency. A constrained collaborative environment, in which rules, prompts, and interaction sequences are explicit and inspectable, may reduce ideational drift without displacing authorship to the AI system. The present study does not evaluate IdeasLand within a formal instructional setting, nor does it claim learning outcomes; however, the model's emphasis on steerability and structured interaction makes it relevant to ongoing discussions about AI-supported design in open and distance learning environments. Section 5 revisits these implications in greater detail.

Rationale for a Constrained Collaborative Space in Distance Education

Recent research on human-AI collaboration highlights the need for a structured space where users and AI can jointly engage in creative tasks, moving beyond automation to enhance human creativity. In this space, AI should serve as a partner that amplifies users' creative potential through structured guidance, rather than replacing human agency. The Constrained Collaborative Environment (CCE) addresses this need by providing a regulated framework for human-AI partnerships, grounded in principles of structured creativity and effective interaction.

The CCE model is defined by an Environment with Predefined Purpose and Rules, which scaffolds collaboration through clear constraints, as supported by studies on AI-assisted story creation and technology integration (Chen et al., 2020; Stefnisson & Thue, 2018; Ertmer & Ottenbreit-Leftwich, 2010). Logic and Data Utilization ensure efficient processing of inputs from both users and AI, aligning with structured approaches in creative AI applications (Manovich & Arielli, 2024). User and AI Collaboration is central, with evidence from creative writing and product innovation showing the effectiveness of such partnerships (Grech et al., 2023). Within this environment, Instructions—comprising tools and prompts—guide the process, with tools like Creative Narration enhancing ideation (Manias & Mavrommati, 2022) and prompts ensuring meaningful AI responses (Stefnisson & Thue, 2018). Finally, the Interface facilitates seamless interaction, a critical factor in AI-assisted creative tools (Chen et al., 2020; Anantrasirichai & Bull, 2020).

By integrating these components, the CCE offers a structured yet flexible space for human-AI collaboration, prioritizing user agency and creative outcomes. The IdeasLand application, detailed in Chapter 3, operationalizes this vision, testing the CCE's potential to accelerate creative ideation while preserving human control (Manias & Mavrommati, 2022). The IdeasLand application, detailed in Section 3, operationalizes this vision and enables a formative evaluation focused on usability, perceived support for ideation within constraints, and practical design and reliability issues observed during use.

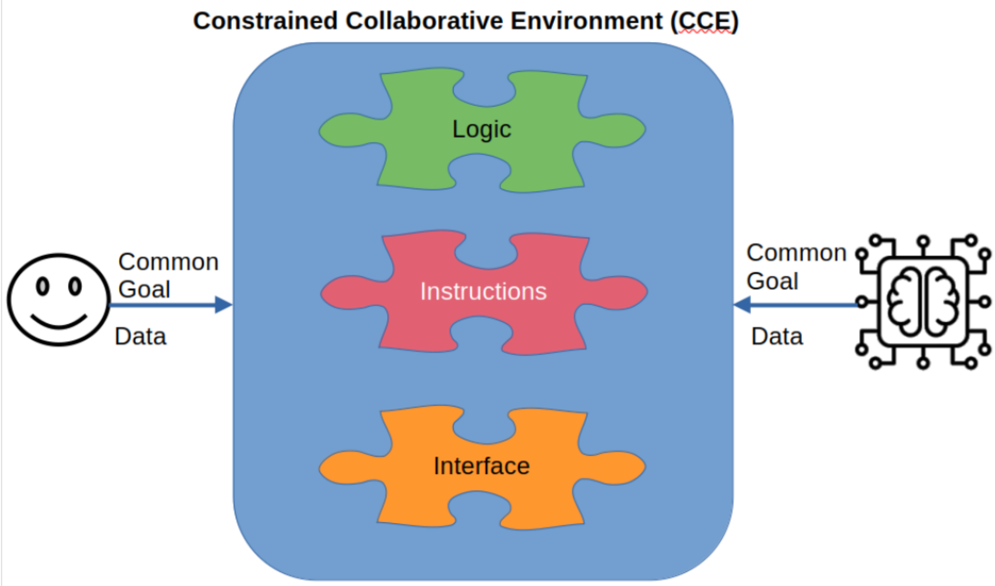

Figure 1: *Constrained Collaborative Environment*

Related Work and Conceptual Positioning

Research on human–AI collaboration and co-creativity has produced several frameworks that describe how initiative and control are distributed between the human and the system, as well as how interaction is structured to support creative work. Mixed-initiative perspectives emphasize turn-taking and adaptive support for user goals (Lin et al., 2023). Other work frames collaboration as coordinated teamwork between human and AI agents (Seeber et al., 2020) and investigates proactive agent behavior enabled by large language models (Zhang et al., 2023). HCAI-oriented approaches foreground human values, transparency, and trust as design requirements (Xu, 2019). Interaction-focused accounts address how interface-level design structures co-creative collaboration and engagement over time (Rezwana & Maher, 2023). Prior work also documents AI support in creative domains that include ideation around artifacts and design elements (Zhang et al., 2023).

CCE is conceptually compatible with these lines of work but differs in what it treats as the primary design object. Rather than focusing on initiative allocation alone, CCE treats the *environment*—its constraints, representations, and interaction sequence—as the mechanism through which collaboration becomes steerable and inspectable.

In this framing, constraints are not merely filters on output; they are interaction resources that can reduce drift, support iterative commitment, and make collaboration legible to users over time.

The aim of this paper is to articulate CCE as a design model, show how it is operationalized in IdeasLand, and evaluate the resulting system formatively. We do not claim comparative superiority over alternative frameworks; instead, related work is used to clarify the design rationale and to motivate what a constrained, user-steered co-creative workflow should make possible.

Evaluation Dimensions and Operationalization (Formative Study)

Evaluating human–AI collaboration systems typically combines complementary measures to capture usability, collaboration experience, and how the workflow supports creative work (Lin et al., 2023; Zhang et al., 2023). For constraint-driven co-creative systems, the evaluation must also account for whether constraints are understandable and usable in practice, since constraints can both support steerability and introduce additional interaction overhead.

In this paper we evaluate IdeasLand formatively using a single-group design. The purpose of the evaluation is to identify usability and collaboration-design issues, and to provide initial feasibility evidence for the IdeasLand instantiation of CCE. The study therefore emphasizes self-report measures and structured participant feedback, and it avoids comparative claims against alternative models.

To structure reporting, we use the following evaluation dimensions and operationalization:

- *Usability and learnability*. Operationalized via the System Usability Scale (SUS) and post-study questionnaire items focusing on learnability and onboarding friction.
- *Perceived creativity support.* Operationalized via Likert-style self-report items capturing perceived support for ideation and refinement.
- *Perceived steering and agency.* Operationalized via self-report items on control, decision ownership, and the perceived ability to direct the collaboration.

- *Perceived constraint usefulness and clarity.* Operationalized via questionnaire items on whether constraints were understandable and helpful for maintaining direction and reducing drift.
- *Reliability in use.* Operationalized via participant reports of tool failures or breakdowns and their perceived impact on the creative workflow.

Dimensions such as objective efficiency (e.g., time-on-task), objective assessment of output quality/novelty, comparative performance against alternative models, and long-term effects require additional instrumentation and/or study designs (e.g., logging, external ratings, baseline conditions, longitudinal deployment) and are therefore treated as future work. The evaluation framing also reflects HCAI concerns around user control and transparency as design requirements rather than post-hoc considerations (Xu, 2019), and it aligns with prior work emphasizing user-centered assessment of co-creative experiences (Rezwana & Maher, 2023).

Methodology

This paper reports a formative evaluation of *IdeasLand,* a web-based co-creative application implementing the Constrained Collaborative Environment (CCE) model. The purpose of the evaluation is to surface usability and collaboration-design issues, and to provide feasibility evidence for this specific instantiation of CCE. Accordingly, the study is not framed as a comparative evaluation against other collaboration models, nor does it aim to estimate population-level effects.

Research questions and study design

The evaluation is guided by the following research questions:

- RQ1 (Constraints / Logic): How do users engage with IdeasLand's constraint mechanisms during ideation and development?
- RQ2 (Usability): What is the perceived usability and learnability of IdeasLand's interface and workflow?
- RQ3 (Guidance / Instructions): How do users perceive the usefulness and clarity of the system's guidance features for steering the collaboration?
- RQ4 (Perceived ideation support): How do users perceive IdeasLand's support for generating and refining ideas within constraints?

We conducted a single-group formative study over two weeks in September 2024. Data were collected primarily through a post-study questionnaire comprising a standardized usability instrument and study-specific Likert items aligned with the evaluation dimensions introduced in Section 1.4, alongside structured free-text feedback. Given the small sample and the absence of a baseline condition, the study is intended to identify design opportunities and failure modes rather than to support strong causal claims.

Participants

Five participants (aged 18+) were recruited via email invitation. Participants represented varied educational and professional backgrounds and reported differing levels of familiarity with AI-based tools. To support interpretation and external validity, the paper reports (anonymized) participant attributes relevant to the target use case, including background category (creative/technical/mixed) and self-reported AI experience (e.g., low/medium/high). Where available, we also report prior experience with creative ideation tools.

Procedure and tasks

Participants first received a short walkthrough of IdeasLand focused on the intended interaction workflow and the role of constraints in steering ideation. They were then asked to use the system over a two-week period for creative ideation and development activities of their choice. The intended workflow included: (i) creating an idea entry using the structured metadata fields (e.g., name, short description, tags), (ii) iteratively developing the idea through posts in the Development Wall with optional AI assistance, (iii) using the narrative scaffolding feature (Hero's Journey tool) where relevant to structure ideation, and (iv) exploring visualization features (e.g., avatar generation) as part of idea externalization.

At the end of the two-week period, participants completed a post-study questionnaire administered via Google Forms. The questionnaire captured usability, perceived creativity support, perceived steerability and constraint usefulness, reliability issues encountered during use, and open-ended improvement suggestions.

Measures

*Usability***.** Perceived usability was measured using the *System Usability Scale (SUS)* (Brooke, 1996). In this study, SUS is interpreted as a subjective measure of usability and learnability rather than as an observation of task performance.

Perceived creativity support. Participants completed Likert-style items capturing perceived support for ideation and refinement (e.g., perceived enhancement, innovation, flow, and refinement). These items are used as early indicators of whether the system's constrained workflow is experienced as supportive or restrictive during ideation, consistent with formative evaluation practice in creativity-support tools (Brennan & Resnick, 2012). The paper reports the scale anchors explicitly (e.g., 1 = strongly disagree, 5 = strongly agree).

Perceived steerability, agency, and constraint usefulness. Study-specific items assessed perceived control, decision ownership, clarity of constraints, and whether constraints and guidance features helped participants maintain direction and reduce drift. These items operationalize the CCE intent at the level of user experience rather than objective control metrics.

Reliability in use. Participants reported breakdowns encountered (e.g., tool errors, failures, interruptions) and the perceived impact on their workflow.

Structured feedback. The questionnaire included open-ended prompts on overall experience, perceived strengths/weaknesses, and concrete improvement suggestions. In this submission, these responses are treated as structured feedback to inform iteration rather than as a formally coded qualitative dataset.

Analysis

Given the small sample size, questionnaire responses were analyzed using descriptive statistics (e.g., means and ranges) to summarize usability and perceived support patterns (Field, 2013). Free-text responses were reviewed and organized into recurring issue categories (e.g., onboarding/learnability, interface complexity, reliability, workflow fit) to guide design iteration. Because the present submission does not report a formal qualitative coding procedure, statements derived from free-text responses are presented conservatively as participant feedback rather than as themes resulting from qualitative analysis.

Ethics

Participants provided informed consent and responses were anonymized prior to analysis. Participants were informed that the system includes AI assistance and that their feedback would be used to improve the application. The study followed standard research-ethics practices for human-participant research (Israel & Hay, 2006; Flick, 2018).

Implementation: The IdeasLand Application

IdeasLand instantiates the Constrained Collaborative Environment (CCE) model as a web application for structured human-AI collaboration in creative ideation. Built with a Golang backend, NuxtJS frontend, and PostgreSQL database, it operationalizes Logic, Interface, and Instructions components [reference anonymized]. Hosted on Google Cloud with Kubernetes, Terraform, and Skaffold, it ensures scalability and robustness.

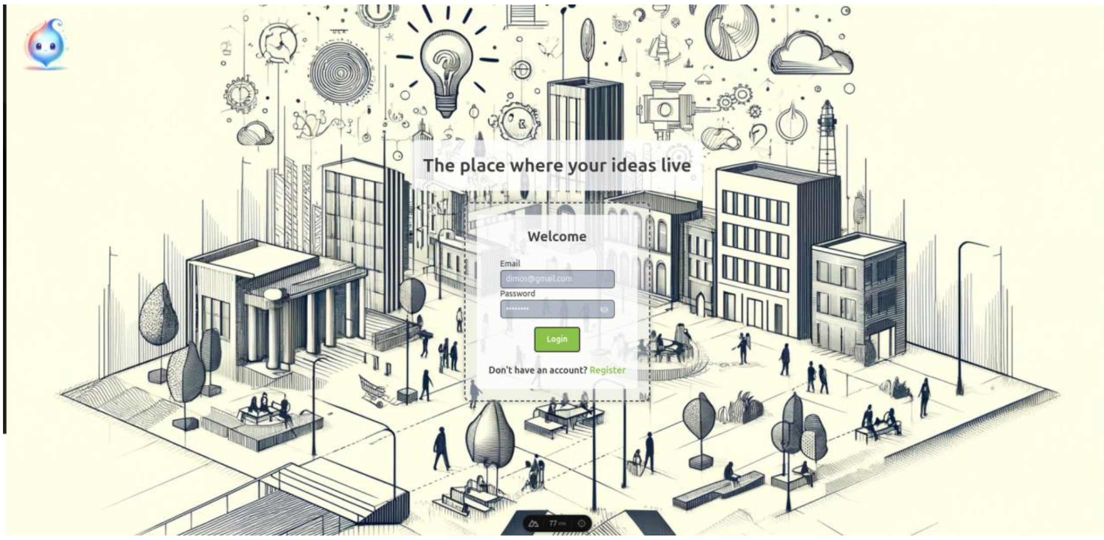

Figure 2:*Login page*

Idea Creation and Visualization

Users input structured metadata (name, description, tags) via a form constrained by Logic's rules (e.g., mandatory fields). AI generates avatars from backend prompts, enhancing visual engagement (Figure 3Figure). This Interface fosters explainability by linking inputs to outputs, accelerating ideation, though form clarity and AI speed affect usability.

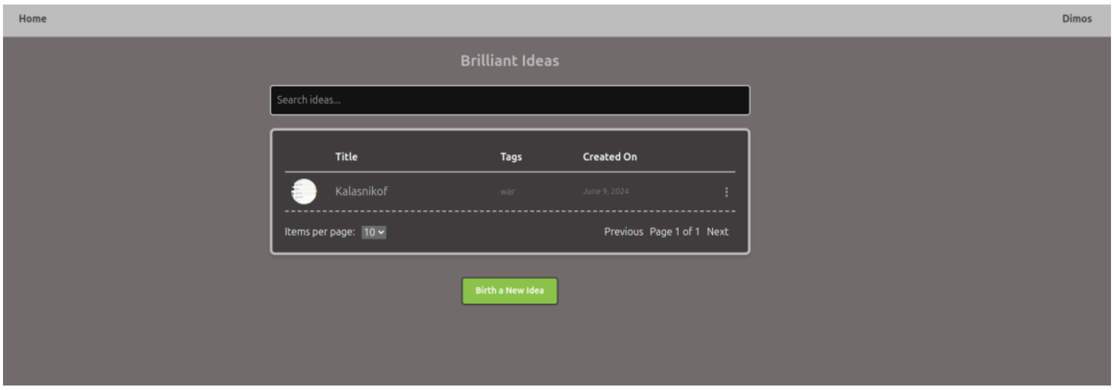

***Figure 3**: Idea Creation Interface. Screenshot of the input form (name, description, tags) and AI-generated avatar.*

Idea Profile Page

Ideas appear on profile pages with structured data (e.g., "Smart Garden"), adhering to Logic (Figure 4). The Interface prioritizes readability, with tags for categorization. Feedback suggests adding interactivity (e.g., tag filters) to boost usability.

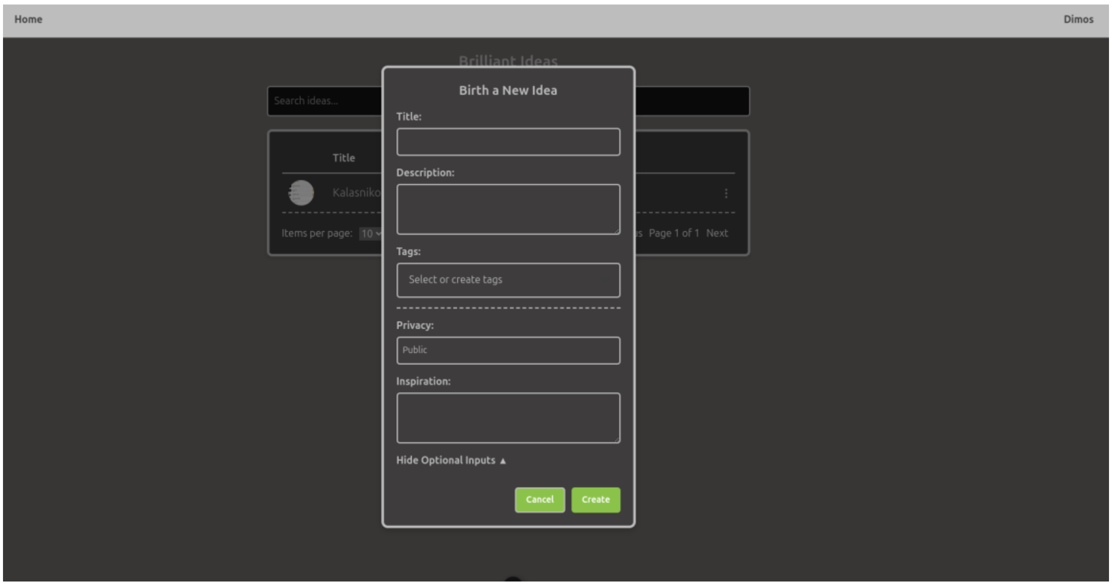

***Figure 4:** Idea Profile page displaying Logic-structured data*

Idea Development Wall

The Development Wall allows users to post updates and receive AI-generated inspiration, guided by Instructions and Logic prompts (e.g., "suggest next steps"). Figure 5 depicts this dynamic Interface, where posts (e.g., "Added sensor idea") sit alongside AI suggestions (e.g., "Consider solar power"). This fosters collaboration, with AI acting as an explainable assistant, though technical reliability (e.g., prompt delivery) impacts effectiveness.

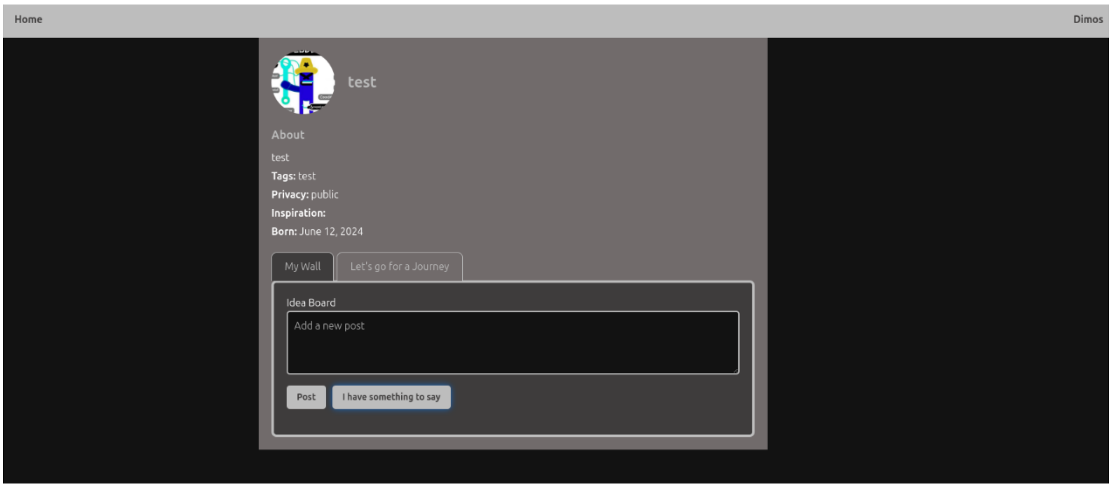

***Figure 5:** Development Wall integrating Instructions-guided AI suggestions."*

Hero's Journey Tool

Creative Narration scaffolds ideation via stages (e.g., "Call to Adventure"), with AI prompts ("Can I help you?") embodying Instructions (Figure 6). Visible reasoning aids explainability, but glitches (e.g., "Failed to fetch AI help") hinder usability (Section 4).

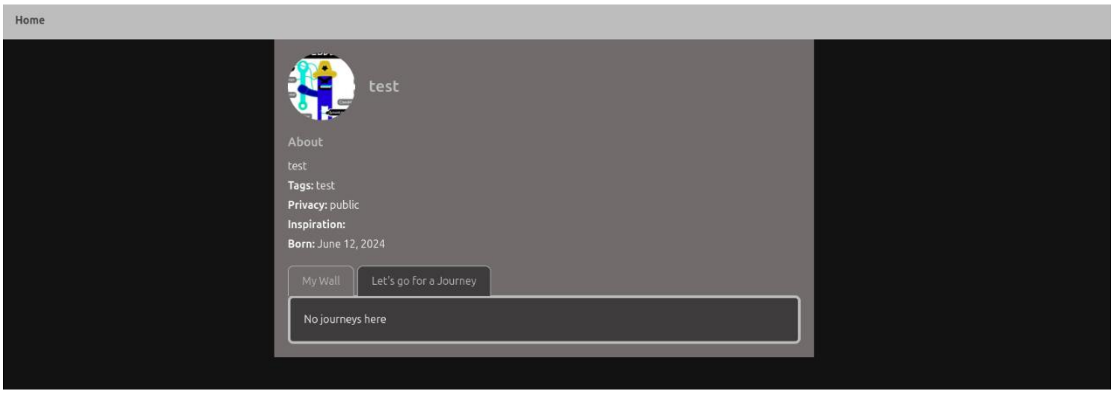

***Figure 6**: Hero's Journey Tool with Instructions-driven AI narration*

Technical Architecture

IdeasLand's client-server architecture leverages Golang for backend efficiency, NuxtJS for frontend responsiveness, and PostgreSQL for data structure (Figure 7). RESTful APIs (e.g., /api/ideas, /api/journey) manage idea creation and narration, with JWT securing user sessions. AI integration, likely via an external service, generates prompts, though latency issues persist. PostgreSQL tables (e.g., ideas, posts) enforce Logic's constraints, ensuring data integrity. Deployed on Google Kubernetes Engine

(GKE), Terraform automates GCP resources (e.g., Compute Engine, Cloud SQL), and Skaffold streamlines CI/CD, supporting scalability for larger cohorts (Section 5).

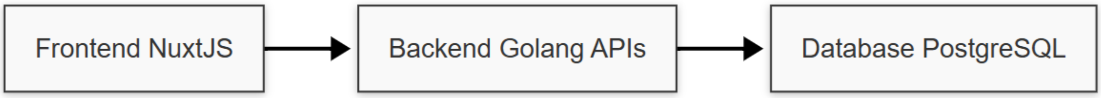

Figure 7: *System Architecture. IdeasLand's technical stack supporting CCE.*

HCI Integration

IdeasLand's interface is designed to support use across devices, with a responsive frontend (NuxtJS) and a backend implementation intended to support low-latency interactions during ideation. The system aims to improve transparency by making AI outputs visible within the workflow (Figures 3–6), so users can relate suggestions to their inputs and revise constraints explicitly. Participant feedback in the formative evaluation indicates that interface aesthetics (e.g., low-contrast palette) and intermittent bugs reduced learnability and confidence, suggesting the need for clearer onboarding, stronger interaction cues, and more robust error handling.

Advanced Features and User Interaction Dynamics

IdeasLand's implementation of the CCE model extends beyond basic functionality, incorporating advanced features to enhance user engagement and operationalize Creative Narration. The application includes an AI-driven avatar generation system for idea visualization, dynamically creating visual representations based on user-provided metadata (e.g., name, description, tags). This feature, detailed in the backend repository (dmanias/startupers), leverages AI prompts to bridge abstract ideas with tangible outputs, fostering explainability—an HCI priority emphasized at CHI Greece. IdeasLand extends CCE beyond basic idea entry by including features intended to support engagement and externalization. The application includes an AI-driven avatar generation feature that produces visual representations based on user-provided metadata (e.g., name, description, tags). In the formative evaluation, participants reported that visual outputs could help them externalize and iterate on early concepts, while also noting that feature complexity and interface clarity affect how easily such tools are adopted.

Additionally, the Hero’s Journey Tool integrates a staged narrative framework, prompting users through stages like “Call to Adventure” with AI suggestions (e.g., “Can I help you?”). This tool, supported by the /api/journey endpoint, aims to scaffold ideation within Logic’s constraints, aligning with HCI goals of structured creativity (Amershi et al., 2019). However, technical hiccups—such as latency in AI responses reported by users—disrupted flow, suggesting a need for real-time processing enhancements. These dynamics highlight the design challenge of balancing structured AI assistance with user steerability and low-friction interaction.

Results and Analysis

Participant Context and Study Baseline

Five participants (18+) took part in the two-week formative study. Participants reported varied educational and professional backgrounds and differing familiarity with AI-enabled tools. Given the small sample and single-group design, results are interpreted as feasibility evidence and as indicators of where the IdeasLand instantiation of CCE supports the workflow and where it introduces friction. Variation in perceived usability and engagement is treated as a design signal (e.g., learnability and interaction complexity) rather than as a basis for generalizable statistical claims.

Usability of the Interface Component

Perceived usability was assessed using SUS. The average SUS score was *72* (range *55–92.5, Figure 8*), indicating acceptable usability overall with substantial variation across participants. Participant feedback pointed to a learning curve and a need for clearer onboarding and in-context guidance, particularly around workflow expectations and feature discovery. Participants also reported that reliability issues in the Hero’s Journey area and aspects of visual presentation (e.g., low-contrast palette) negatively affected the experience, suggesting that usability improvements should focus on learnability, error prevention, and clearer interaction cues.

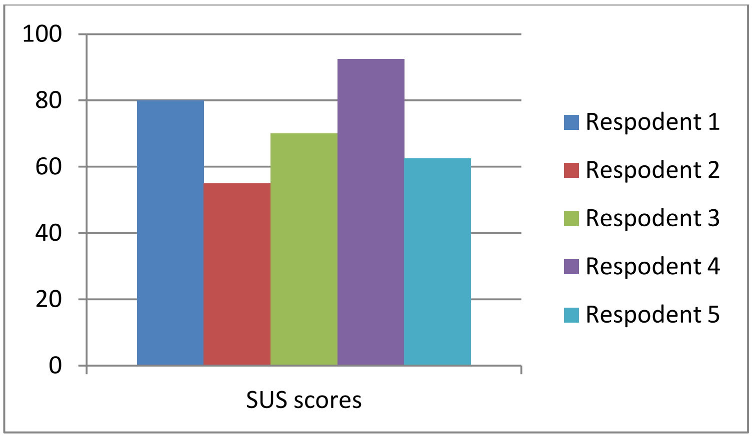

Figure 8: *SUS scores across participants*

Logic Component: Constraint-Driven Ideation Support

The Logic component operationalizes CCE through structured fields and constraint-aware prompting. On the perceived creativity-support items, ratings clustered between 3.6 and 3.8 (Figure 9), with higher scores for creative enhancement (3.8) and slightly lower scores for innovation and flow (both 3.6). In participant feedback, constraints were most often described as helpful for organizing, clarifying, and iteratively improving ideas, rather than for producing radical novelty. Reported breakdowns in the Hero's Journey area indicate that the perceived value of constraints depends on stable, predictable feature behavior during use.

Instructions Component: Guiding User Engagement

The Instructions component (including the Hero's Journey tool) is intended to guide users through a structured ideation sequence and to reduce drift during development. Participants generally valued guided development when the feature worked as expected, but reported that unclear prompts and intermittent errors reduced confidence and disrupted engagement. The average *flow* rating was *3.6 (Figure 9)*, consistent with moderate immersion and occasional interruptions. These results suggest that guidance features in a constrained workflow must prioritize clarity, progressive disclosure, and reliability to avoid increasing cognitive load.

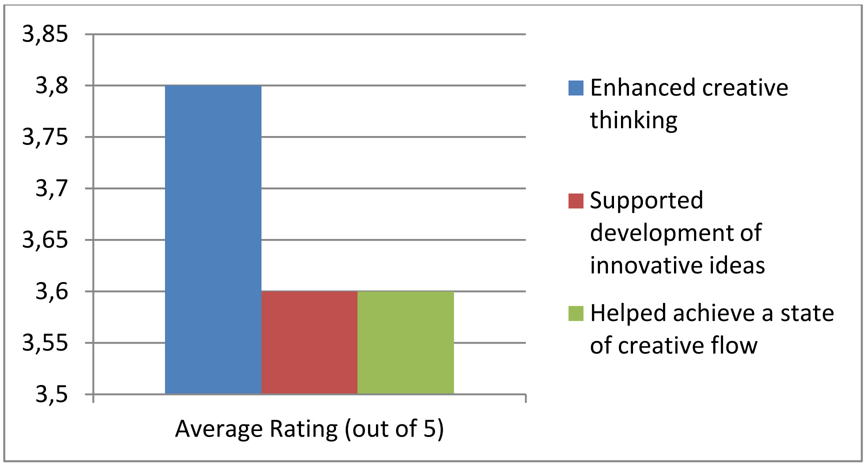

Figure 9: *Average Creativity Ratings*

Technical Reliability and Its Impact

Technical reliability affected both perceived usability and engagement. Participants reported failures and interruptions concentrated around the Hero's Journey functionality (e.g., fetch failures or non-responses) and noted that slow loading and session interruptions disrupted their workflow. These issues plausibly contributed to the observed spread in SUS scores (Figure 8) and to the moderate flow rating (Figure 9). In a constraint-driven co-creative system, reliability problems are not only technical defects; they directly undermine collaboration continuity and reduce users' willingness to follow structured sequences.

Perceived Ideation Support Within Constraints (RQ4)

RQ4 concerns participants' perceived ideation support when working within IdeasLand's constrained workflow. Ratings on the perceived creativity-support items clustered between 3.6 and 3.8 (Figure 9), suggesting moderate-to-positive perceived support, particularly for refinement and development within structure. Participant feedback indicates that constraints and structured prompts were experienced as helpful for organizing and iteratively improving ideas, while onboarding friction and intermittent reliability issues could offset these benefits, especially for first-time users. Because the study uses a single-group design and self-report measures, these findings are reported as feasibility evidence and design guidance rather than as comparative gains.

Study Limitations Relevant to Interpretation

This formative study was not designed to assess long-term effects on creative practice. The sample size (n = 5), the single-group design, and reliance on self-report measures limit generalizability and preclude causal attribution. Results should therefore be interpreted as indicators of feasibility and as guidance for iterative improvement. A larger study with stronger instrumentation (e.g., baseline conditions, structured output assessment, and longitudinal use) is required to evaluate longer-term outcomes.

Synthesis and Implications for the CCE Framework

Across the evaluation dimensions, results suggest that IdeasLand provides feasible support for constraint-driven ideation, with usability that is acceptable on average but uneven across users. Participants' perceived creativity-support ratings were moderate-to-positive, with the strongest signal around refinement and idea development rather than breakthrough novelty. At the same time, the findings highlight two primary barriers to a stable constraint-driven experience: learnability (users must quickly understand why constraints exist and how to use them) and reliability (failures in guidance features disrupt collaboration continuity). Feedback also raised practical questions about authorship and reuse that should be addressed explicitly as part of the system's transparency and user-control design in the next iteration.

Impact of Constraints on Creative Outcomes and User Perceptions

This subsection consolidates results related to how constraints shaped perceived outcomes and how users experienced constraint-driven collaboration. The aim is to characterize trade-offs observed in this formative study, using the self-report ratings and structured participant feedback.

In this formative study, constraints were most strongly associated with perceived support for structuring and refining ideas. Ratings show refinement scoring higher than innovation (Figure 9), suggesting that the constrained workflow may be experienced as more effective for developing and improving concepts than for producing radically novel directions. This pattern is consistent with participant feedback describing constraints as clarifying goals, reducing drift, and encouraging iterative improvement. At the same time, constraints can amplify the impact of interaction friction: when guidance features fail or become confusing, the structure that is intended to support creativity can instead slow progress.

Participants' perceptions of constraint-driven collaboration were mixed but interpretable. Several participants described the structured environment as helpful for maintaining direction, and some characterized IdeasLand as accelerating development by reducing ambiguity about next steps. Others reported a learning curve and described the Hero's Journey area as overwhelming or difficult to use without clearer guidance. Suggestions such as improved onboarding, clearer prompts, and changes to visual presentation indicate that constraint-driven collaboration is sensitive to interaction design quality: constraints can support steerability, but only when their purpose and operation are legible and the workflow remains low-friction.

Discussion, Limitations, and Future Work

This paper introduced the Constrained Collaborative Environment (CCE) model and presented IdeasLand as an instantiation of CCE for structured human–AI ideation. The formative evaluation reported in Section 4 provides feasibility evidence about how a constraint-driven workflow is experienced in practice and identifies concrete design risks that must be addressed for constrained co-creative collaboration to remain usable and trustworthy.

What the formative findings suggest

Constraints as collaboration structure rather than output filtering. The study results suggest that participants primarily experienced constraints as a mechanism for structuring and refining ideas rather than as a generator of radically novel directions. This aligns with the view that constraints can function as interaction scaffolds: they help users maintain direction, make decisions explicit, and iterate without repeatedly reconstructing intent through prompt rephrasing. The implication for CCE is that its value may be strongest in workflows where the goal is coherent development and incremental improvement, and where the collaboration is expected to preserve user authorship and steering over time.

Steerability depends on legibility and reliability. A key implication from the reported variation in usability and the feedback on workflow friction is that constrained collaboration is sensitive to two practical factors. First, users must quickly understand what constraints are doing and how they shape the collaboration; otherwise, the structure becomes overhead rather than support. Second, reliability failures—particularly in guidance features intended to scaffold ideation sequences—disrupt continuity and can undermine trust in the constrained process. In constraint-driven systems, these failures are not merely technical; they directly affect perceived control and willingness to follow the workflow.

Interaction complexity as a trade-off. IdeasLand integrates multiple features intended to support ideation (structured metadata, development posts, guidance scaffolds, and visualization). The formative results indicate that this richness can introduce cognitive load and onboarding challenges. This suggests a design trade-off that future CCE implementations should treat explicitly: increasing structure can improve coherence, but only if the interface provides progressive disclosure, clear cues, and a minimal path that supports early success.

Design implications for constrained co-creative systems

Based on the patterns identified in Section 5.1 and the feasibility evidence, the following implications are prioritized:

*Onboarding as part of the model, not an add-on***.** Constrained workflows require an explanation of “why constraints exist” and “how to use them.” This can be implemented through short guided tours, contextual tooltips, and examples that show how constraints reduce drift.

*Reliability-first for scaffolding tools***.** Features that define the ideation sequence (e.g., narrative scaffolds) must degrade gracefully: clear error messaging, fallback states, and recovery paths are required to preserve creative flow.

Legibility of constraint state. Users should be able to see what constraints are active, how they influence suggestions, and how to revise them without losing context.

Progressive disclosure and a minimal viable path. A constrained system should support a low-friction path for first-time users (core workflow) while keeping advanced features optional to reduce cognitive load.

Transparency and authorship support. The system should make AI involvement explicit and support user control over reuse and attribution practices, particularly for creative outputs.

These implications are actionable irrespective of whether future evaluations adopt comparative designs; they follow directly from the observed usability variation, reliability issues, and perceived support signals in the present formative study.

Limitations and threats to validity

The present evaluation has several limitations that bound interpretation.

Small sample and single-group design. With n = 5 and no baseline condition, results cannot support causal attribution or comparative claims. The reported findings should be interpreted as feasibility evidence and design guidance.

Reliance on self-report measures. SUS and Likert-style creativity-support items capture perceived experience rather than objective performance, output quality, or novelty.

Measurement scope. The study does not include time-on-task or system-logging measures and does not use external judges or rubrics to assess creative output quality.

Short deployment duration and novelty effects. A two-week period may reflect early adoption and novelty; longer-term use patterns and skill effects are not assessed.

System maturity. Reliability issues, particularly around guidance features, likely influenced both usability and perceived flow. Findings therefore reflect this version of the system rather than an idealized CCE implementation.

Ethical and practical considerations

Constraint-driven co-creative systems raise practical questions about authorship, transparency, and reuse. From an HCAI perspective, users should understand when AI is contributing to content, what information is used to generate suggestions, and how outputs may be reused. In IdeasLand, constraints can serve not only as creativity scaffolds but also as governance mechanisms: they can limit unsafe or undesired output directions and support user control over the collaboration process. However, constraints do not eliminate ethical risks; disclosure, attribution guidance, and user control over storage and sharing remain necessary design requirements.

Implications for Distance Education and Online Learning Contexts

Although IdeasLand was evaluated outside a formal instructional setting, several of its design features intersect with established challenges in distance education. Online learning environments often struggle to sustain learner agency, maintain engagement over time, and provide meaningful structure without over-automating the learning process. A constraint-based model of human–AI collaboration offers one possible approach to addressing these issues.

The structured ideation process in IdeasLand—through defined metadata fields and staged narrative scaffolds—can function as embedded pedagogical support in asynchronous contexts. In settings where instructor presence is mediated and feedback delayed, clearly articulated constraints reduce ambiguity about task progression. Because constraints are visible and editable, learners can see how their inputs shape system responses, potentially strengthening awareness of their own decision-making and supporting reflective engagement.

The model's emphasis on steerability and authorship preservation is particularly relevant in AI-supported online education, where automation may otherwise displace learner effort. In CCE, AI suggestions are integrated into a workflow that keeps decisions with the user and requires iterative commitment. This interaction pattern aligns with learner-centered approaches in open and distance education, which prioritize structured development of ideas over rapid output generation.

IdeasLand's web-based architecture makes it technically suitable for distributed cohorts. At the same time, the formative findings indicate that interaction clarity and technical stability are critical in remote settings, where learners may not have immediate instructional support. In such contexts, reliability and transparent interaction logic become prerequisites for sustained engagement.

The present study did not examine IdeasLand within a formal instructional setting, and no claims are made regarding learning outcomes. Future research should therefore investigate constraint-based co-creative systems in authentic online courses, including comparisons with open prompting approaches, in order to assess their impact on engagement, perceived agency, and the quality of learner-produced work in distance education contexts. These considerations reinforce the need for systematic empirical investigation in both general and educational contexts.

Future work

Future work should extend this formative evidence through stronger study designs and instrumentation. Key directions include: (i) improving onboarding and progressive disclosure and re-evaluating usability with a larger sample; (ii) adding instrumentation such as interaction logging and time measures to evaluate perceived versus objective workflow efficiency; (iii) introducing baseline conditions to assess comparative effects of constraint-driven workflows; (iv) using structured rubrics and/or external ratings to assess creative output quality and novelty; (v) conducting longitudinal deployment to examine longer-term effects on creative practice and user trust; and (vi) deploying CCE-based systems in distance education contexts to assess learner engagement, agency, and artifact quality under constrained co-creative conditions.

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