

Co-Creative Design Thinking, Power, and Boundary Critique: A Critical Systems Heuristics Perspective

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Abstract

This study develops a Critical Systems Heuristics (CSH)-informed framework for rethinking Co-Creative Design Thinking in Iran's socio-institutional context, with emphasis on power, participation, and boundary critique. Although Design Thinking and co-creation are widely promoted as human-centered and participatory approaches, their practical application often remains limited to consultation, workshops, and post-framing feedback. This study argues that such procedural participation is insufficient unless underlying boundary judgments are critically examined. The research adopts a qualitative interpretive design based on semi-structured expert interviews with specialists in Design Thinking, service design, urban and public-sector innovation, policy-making, community participation, and systems thinking. The empirical dataset consists of 24 interviews across six stakeholder groups in Iran. Data were analyzed through inductive coding, distinguishing "is" and "ought" conditions, and subsequently mapped onto the twelve CSH boundary questions and four dimensions: motivation, control, knowledge, and legitimacy. Findings reveal four boundary gaps: a motivation gap between public value claims and institutional priorities; a control gap in decision authority and resource allocation; a knowledge gap reflecting marginalization of experiential knowledge; and a legitimacy gap involving exclusion of affected stakeholders. The study contributes a boundary-critical methodological framework that operationalizes CSH in analyzing co-creative design systems in constrained contexts. It reconstructs design practice through expert-elicited boundary judgments, producing a model of participation-as-legitimacy. The framework extends co-creation and Design Thinking literature by offering a fourfold boundary gap typology to diagnose participatory distortion and explain when co-creation becomes symbolic rather than substantive.

Keywords

Co-Creative Design Thinking, Critical Systems Heuristics, boundary critique, participation, Iran.

Introduction

Design Thinking has increasingly moved from a managerial technique for creative problem solving toward a broader interdisciplinary paradigm for addressing complex, human-centered, and socially embedded challenges. Recent scholarship emphasizes that Design Thinking does not operate merely through ideation or prototyping, but through deeper mechanisms of reframing, integration, enablement, and collaborative engagement (Mayer & Schwemmler, 2025; Verganti et al., 2021). In parallel, co-creation has become a central orientation in design and innovation research, promising to redistribute creative agency among designers, users, institutions, and communities (Gemser et al., 2025; Jones, 2018). Yet this promise remains theoretically and practically fragile. Co-creative design processes often celebrate participation while leaving insufficiently examined the conditions under which participation is organized, controlled, legitimized, and translated into actual design decisions.

This limitation is especially important in socio-institutional contexts where design problems are inseparable from public governance, resource constraints, social inequalities, and uneven access to decision-making. In such settings, the question is not only whether stakeholders are invited into a design process, but whether they can influence how the problem is framed, whose knowledge is recognized, which consequences are made visible, and who has the authority to define improvement. This concern is intensified where digital and AI-enabled tools enter public design and governance, since optimization logics may privilege efficiency while leaving questions of equity, expertise, transparency, and legitimacy insufficiently examined (Sobhani et al., 2026). Critical studies of co-design and co-production show that participatory processes may reproduce existing power asymmetries when institutional actors retain control over resources, agendas, and implementation pathways (Farr, 2018; Leino & Puumala, 2021). Thus, co-creation requires more than methodological facilitation; it requires a critical inquiry into power, participation, and legitimacy.

The Iranian context offers a particularly significant setting for such inquiry. Iran's design, urban, public-service, and innovation challenges are shaped by intersecting pressures: centralized decision-making traditions, fragmented institutional responsibilities, sanctions-related technological and infrastructural constraints, urban inequality, environmental stress, and limited mechanisms for sustained citizen participation. Studies on Iranian urban development have shown that despite formal references to participation, many planning and redevelopment processes remain strongly influenced by technocratic, institutional, and top-down rationalities (Erfani & Roe, 2020; Mashhadi Moghaddam & Rafieian, 2020). More recent work on Iranian smart-city and urban digital-twin development similarly highlights the importance of stakeholder engagement while identifying organizational, infrastructural, policy, and sanctions-related barriers to collaborative urban innovation (Zali et al., 2024). Moreover, emerging research on gender and public space in Iran demonstrates how design decisions may produce unequal urban experiences unless the affected groups are explicitly recognized in the design process (Askarizad et al., 2025). These conditions make Iran a powerful context for reconsidering Co-Creative Design Thinking as a critically reflexive rather than merely participatory practice.

This article argues that Critical Systems Heuristics (CSH) provides a rigorous methodological lens for such reconsideration. This boundary-critical logic is consistent with CSH applications in safety-critical infrastructure, where GPRS policy analysis shows that technically oriented reliability regimes can obscure stakeholder representation, learning mechanisms, and public/environmental protection unless their boundary judgments are made explicit (Fathi et al., 2026). Developed by Ulrich and later elaborated with Reynolds, CSH is centered on boundary critique, a reflective process for questioning the assumptions that determine what counts as the system of concern, who is considered involved or affected, whose expertise is acknowledged, and whose interests are treated as legitimate (Ulrich & Reynolds, 2010). The knowledge dimension is especially important because structured knowledge processes have been empirically linked to organizational agility, customer knowledge management, and performance, indicating that participation must be supported by systematic knowledge conversion and application rather than informal consultation alone (Fathi et al., 2021). Its distinction between "is" and "ought" judgments is especially important for

design research: it enables comparison between the actual boundaries of a design process and the boundaries that would be ethically, socially, and democratically justifiable. Recent systematic review evidence confirms that CSH remains particularly relevant for contexts involving coercion, marginalization, emancipation, and power asymmetries (Hutcheson et al., 2023).

Accordingly, this study positions CSH not as an auxiliary theory, but as the core methodological architecture for critically reconstructing Co-Creative Design Thinking. Through CSH, the conventional design-thinking emphasis on empathy can be extended toward stakeholder legitimacy; the focus on users can be expanded toward affected but excluded groups; and the practice of participatory workshops can be transformed into a process of boundary critique. In the Iranian context, this means asking whether co-creative design processes genuinely include citizens, marginalized communities, women, local users, frontline implementers, future generations, and ecological stakeholders, or whether they primarily serve institutional, managerial, or symbolic objectives.

The central contribution of this article is therefore to develop a CSH-informed understanding of Co-Creative Design Thinking that makes power, participation, and boundary judgments analytically visible. By integrating the four CSH sources of motivation, control, knowledge, and legitimacy into the study of design processes, the article offers a framework for examining who benefits from design, who controls design decisions, whose knowledge counts, and who has the moral standing to challenge design outcomes. In doing so, it contributes to design-thinking scholarship by advancing a more critical, systemic, and context-sensitive model of co-creation one capable of responding to the institutional and social complexities of Iran while also offering broader implications for design research in contested and resource-constrained environments.

This study is positioned as a methodological contribution to design research, rather than a purely empirical evaluation of participatory practice. It develops a structured way of translating qualitative expert accounts into a Critical Systems Heuristics-based boundary critique of co-creative design systems. The empirical material is therefore not used to generalize about all design practices, but to reconstruct the boundary conditions under which co-creation becomes symbolically participatory rather than substantively influential.

Literature Review

1. Design Thinking

Recent design-thinking scholarship increasingly frames Design Thinking as a systemic, ethical, and sustainability-oriented approach rather than a narrow toolkit for ideation and prototyping. Baldassarre et al. (2024) argue that conventional design-thinking research has been overly aligned with market-driven innovation and insufficiently attentive to social and environmental consequences, proposing “responsible Design Thinking” as a corrective orientation. Similarly, Martínez Casanovas (2025) links design-thinking methodologies to the Sustainable Development Goals and identifies empathy, iteration, user-centeredness, and systems thinking as central principles, while also noting persistent weaknesses in evaluation, ethical contextualization, and vulnerable-community inclusion. This literature is highly relevant to the present study because Iran’s design challenges—urban inequality, service inefficiency, environmental pressure, and resource constraints—cannot be adequately addressed through creativity alone; they require a design logic capable of examining consequences, exclusions, and legitimacy.

2. Co-creation, co-design, and co-production

Co-creation, co-design, and co-production are widely discussed as participatory approaches. Recent reviews show that co-creation has expanded across health, education, sustainability, public services, information systems, and urban environments, but that its theoretical and methodological foundations remain uneven. In educational services, value co-creation has been shown to generate reciprocal outcomes for users and institutions, including relationship development, graduate capability formation, academic identity, improved brand image, and financial continuity (Zargaran Khouzani et al., 2022). Messiha et al.

(2023), reviewing co-creation, co-design, and co-production in public health, found limited explicit use of theory despite the growing popularity of these approaches. Ávila-Garzón and Bacca-Acosta (2024) similarly show that co-creation and co-design have generated numerous methodologies, yet the field still lacks clarity about how different approach's structure stakeholder roles and decision-making authority. Iranian evidence from foreign-language institutions further demonstrates that co-creation can be operationalized through identifiable fields and mechanisms; Sobhani et al. (2023) identified five fields and 27 mechanisms through thematic analysis and fuzzy DEMATEL (Decision-Making Trial and Evaluation Laboratory), emphasizing mutual satisfaction, engagement, and feedback-based development. Nguyen et al. (2024), in the context of green-space studies, further demonstrate that co-production, co-creation, and co-design are often used interchangeably, with insufficient explanation of process quality, stakeholder influence, and impact evaluation. These findings support the need for a stronger critical-methodological frame in Co-Creative Design Thinking.

3. *Sustainability and environment*

Kurek et al. (2023) show that Design Thinking contributes to sustainable business model innovation mainly through workshops, brainstorming, co-creation, and prototyping; however, they also identify gaps in experimentation and stakeholder-oriented implementation. Tantiyaswasdikul (2023) extends this debate to sustainable built environments, arguing that Design Thinking must be integrated with foresight because design interventions often generate unanticipated effects. This insight is important for Iran, where urban, infrastructural, and environmental decisions frequently produce long-term consequences for citizens who may not be meaningfully involved in the original design process. Evidence from desalination supply chains reinforces this systemic reading: resilient infrastructure depends not only on technical performance but also on management, financial status, culture, adaptive capacity, relationship building, and responsiveness (Nasrollahi et al., 2021). In such conditions, Co-Creative Design Thinking must move beyond short-cycle ideation and include anticipatory judgment, affected-stakeholder analysis, and ethical evaluation.

4. *Iran's institutional context*

Although not all recent studies are explicitly framed as design-thinking research, they reveal the contextual conditions that make a CSH-based approach necessary. Shahab et al. (2021) identify barriers to e-participation in the Iranian planning system, including attitudes toward participation, institutional culture, planning-system structure, and limited staff capacity. This indicates that co-creative design capacity is also organizational: sustainable HRM research in Tehran hospitals shows that socially responsible HRM, green HRM, triple-bottom-line HRM, and common-good HRM positively affect sustainable marketing, while sustainable marketing enhances customer equity (Khosravi et al., 2022). Workforce retention is also relevant to co-creative design capacity, since turnover intention is associated with human-capital loss, increased training costs, declining productivity, and deterioration of service quality, all of which can weaken the continuity of participatory design and public-service innovation (Nafchi et al., 2022). Mirzakhani et al. (2021), studying historical urban-fabric regeneration in Iran, reveal conflicts among responsible institutions, unclear duty descriptions, and inadequate participation of local people and NGOs. Manouchehri et al. (2022) show that Iranian planning professionals express ambivalent attitudes toward children's active participation in urban planning, indicating that inclusion remains both institutionally and culturally constrained. These studies collectively suggest that participation in Iran is not merely a methodological issue; it is embedded in power relations, bureaucratic boundaries, professional authority, and uneven recognition of stakeholder voice. Within this combined literature, the central gap is clear. Design-thinking research increasingly recognizes sustainability, responsibility, and co-creation, yet it often lacks a sufficiently critical framework for examining who defines the design problem, who controls the process, whose knowledge is validated, and who has legitimacy to judge the outcome. Co-creation literature emphasizes stakeholder involvement, but still struggles with conceptual ambiguity, process evaluation, and power asymmetry. Iranian urban and governance studies reveal participation deficits, institutional fragmentation, and weak inclusion of affected groups, yet they rarely connect these issues to design-thinking methodology. Therefore, the present study positions Critical Systems Heuristics as a necessary

bridge between Design Thinking, co-creation, and Iran's socio-institutional challenges. Its value lies in transforming Co-Creative Design Thinking from a participatory method into a boundary-critical inquiry into motivation, control, knowledge, and legitimacy.

Despite advances in participatory design, co-creation, and design justice, existing literature lacks a formalized boundary-analytic mechanism capable of systematically linking stakeholder participation to underlying power structures. Most studies identify exclusion or symbolic participation descriptively, but do not provide a structured method for diagnosing where and how boundary judgments produce these effects. This study addresses this gap by operationalizing Critical Systems Heuristics as a design research analytical infrastructure, rather than only a systems-theoretical lens. The reviewed literature and methodological trends across Design Thinking, co-creation, sustainability, and participatory governance are systematically summarized in [Table 1](#), which highlights the thematic focus, methods, and key insights of prior studies.

Table 1: *Selected Literature Review Mapping Table*

Authors	Main Objective	Domain	Methodology	Key Insights
Baldassarre et al. (2024)	Reconsider design thinking for sustainable development	Responsible innovation / design thinking	Critical literature review and conceptual framework	Design thinking should move beyond economic innovation toward social and environmental responsibility.
Martínez Casanovas (2025)	Examine design-thinking methodologies and SDG linkages	Design thinking / sustainability	Systematic literature review using PRISMA and inductive analysis	DT supports sustainability but lacks robust evaluation and ethical-contextual adaptation.
Messiha et al. (2023)	Identify theories used in co-creation, co-design, and co-production	Public health / co-creation	Systematic review	Co-creation practices are growing, but explicit theoretical grounding remains limited.
Ávila-Garzón & Bacca-Acosta (2024)	Map methodologies in value co-creation and co-design	Co-creation / co-design	Bibliometric and scoping review	Many methodologies exist, but clearer methodological differentiation is still needed.
Nguyen et al. (2024)	Review co-production, co-creation, and co-design in green-space studies	Environmental planning / participation	Systematic review	Participatory methods can improve engagement, but impact evaluation and process transparency are weak.
Kurek et al. (2023)	Analyze links between design thinking and sustainable business models	Sustainability / innovation	Bibliometric analysis and systematic review	Workshops, co-creation, brainstorming, and prototyping are common, but experimentation remains underdeveloped.
Tantiyaswasdikul (2023)	Examine design thinking for sustainable built environments	Built environment / sustainability	Systematic literature review	DT should be integrated with foresight to address long-term and unintended consequences.
Shahab et al. (2021)	Identify barriers to e-participation in Iran's planning system	Iranian planning / e-participation	Interviews with planning actors	Participation is constrained by institutional culture, planning structures, and staff capacity.
Mirzakhani et al. (2021)	Analyze stakeholders in historical urban-fabric regeneration in Iran	Urban regeneration / Iran	Legislative analysis and stakeholder survey	Institutional conflict and weak local/NGO participation undermine regeneration governance.
Manouchehri et al. (2022)	Explore planners' views on children's participation in Iranian urban planning	Inclusive urban planning / Iran	Empirical study with planning professionals	Inclusion of affected groups remains ambivalent and institutionally difficult.

Methodology

1. Research Design and Materials

This study is designed as a qualitative, interpretive inquiry into how Co-Creative Design Thinking can be critically reconstructed through Critical Systems Heuristics in the Iranian context. The empirical setting is defined as co-creative design processes in Iranian urban and public-service innovation, including urban renewal, public-space design, municipal digital services, and citizen-oriented service improvement. These domains are suitable because they involve multiple actors, unequal access to decision-making, institutional constraints, and direct consequences for citizens. The primary material consists of semi-structured expert interviews, interview transcripts, field notes, and analytical memos. A purposive sampling strategy included 24 expert interviews conducted across six stakeholder groups in Iranian design and public-sector innovation domains.

The expert sample consisted of six groups with a total of 24 participants. The first group included design-thinking academics and design researchers, with 5 participants, selected to capture theoretical and pedagogical views. The second group included service designers, UX designers, and design facilitators, with 5 participants, selected to understand practical co-creation processes. The third group included urban planners and municipal innovation experts, with 5 participants, selected to reflect institutional and public-sector realities. The fourth group included policy-making and public-management scholars, with 4 participants, selected to examine governance and strategic implications. The fifth group included NGO and community participation experts, with 3 participants, selected to represent affected and less powerful voices. The sixth group included systems-thinking and CSH-oriented researchers, with 2 participants, selected to support methodological interpretation. Interviews were conducted using an open-ended guide addressing problem framing, stakeholder involvement, decision authority, knowledge legitimacy, participation limits, and desirable reforms in Iranian design practice. Interview participants were selected through purposive expert sampling. Inclusion criteria required (i) demonstrable professional or academic experience in Design Thinking, co-creation, systems thinking, urban/public-sector innovation, or participatory governance; (ii) direct involvement in design-related projects or policy-making contexts in Iran; and (iii) recognized expertise evidenced through publications, professional practice, or institutional roles. This ensured that interviewees could provide both reflective and practice-based insights into co-creative design processes.

Justification of Expert-Based Reconstruction Design

This study does not claim direct observational access to design interventions. Instead, it adopts an expert-based reconstructive methodology, where experienced practitioners articulate boundary conditions of co-creative design systems. This approach is consistent with interpretive design research traditions in which expert cognition is treated as a valid representation of systemic practice structures when direct observation is constrained or when the object of inquiry is distributed across institutional settings. The aim is not behavioral verification but structural reconstruction of design boundary regimes.

2. Data Familiarization

Data acquaintance begins with repeated reading of the interview transcripts to gain familiarity with the language, assumptions, tensions, and implicit judgments embedded in participants' accounts. At this stage, the researcher does not impose CSH categories prematurely. Instead, attention is given to how experts describe actual participation, institutional control, excluded groups, power relations, and desired changes. Reflexive memos are written to document emerging contrasts between current design practices and preferred participatory conditions.

3. Initial Coding

Initial coding is conducted inductively. Statements are coded according to their meaning rather than according to predetermined theoretical labels. Examples of initial codes included: "*citizens consulted after decisions*", "*expert-led problem framing*", "*symbolic participation*", "*lack of authority for users*", "*local*

knowledge ignored", *"institutional veto power"*, *"need for inclusive problem definition"*, and *"affected groups absent from workshops"*.

These codes are then reviewed for repetition, conceptual similarity, and analytical relevance. At this stage, the coding pattern indicates that many statements are not merely descriptive but comparative: participants repeatedly distinguish between how co-creative design currently works and how it should work.

4. Distinguishing Statements Related to the "Is" and "Ought to Be" Situations

The distinction between the "is" situation and the "ought to be" situation emerges directly from the coding structure. The codes led to the selection of CSH because many interview statements naturally expressed either the current boundary condition of design practice or the desired boundary condition. For example, the code "citizens are invited only after the main solution is already defined" represents the "is" situation, while "citizens should participate in defining the problem before solutions are proposed" represents the "ought to be" situation.

The analytical process began with reading and extracting statements from the interview transcripts. This step produced raw meaning units related to participation, control, knowledge, and legitimacy, with an example of an extracted theme being "Participation often begins too late". The second step involved separating statements into current and desired states. This produced "is" and "ought to be" statement groups, such as the contrast between current consultation and desired co-definition. The third step mapped the statements onto the twelve CSH boundary questions, resulting in a boundary-question matrix; an example question at this stage was "Who controls problem framing?" The fourth step aggregated the boundary questions into the four CSH dimensions: motivation, control, knowledge, and legitimacy. This produced categories such as institutional aims dominating citizen needs. The fifth step compared current and desired states in order to identify boundary gaps, such as the gap between symbolic inclusion and meaningful authority. Finally, the sixth step translated these gaps into reform implications, producing methodological and policy recommendations, including the need to redesign participation before agenda-setting.

5. Code Mapping Based on the Twelve CSH Boundary Questions

After inductive coding, the codes are deductively mapped onto Ulrich and Reynolds' CSH structure. Each code is linked to one or more of the twelve boundary questions: beneficiary, purpose, measure of improvement, decision-maker, resources, decision environment, expert, expertise, guarantor, witness, emancipation, and worldview. This allows the analysis to move from scattered qualitative codes to a systematic boundary critique.

6. Comparison of the Current Situation, Desired Situation, and Gap Identification

The analysis compares "what is" with "what ought to be" for each CSH boundary category. The analytical focus is not only on identifying problems but on locating boundary gaps: differences between actual and legitimate participation, existing and desired authority, recognized and excluded knowledge, and declared and ethically defensible beneficiaries.

7. Data Saturation and Validity

Data saturation was achieved when additional interviews no longer produce substantially new boundary issues within the four CSH dimensions. Validity is supported through expert diversity, audit trails, reflexive memoing, peer debriefing, and member checking with selected participants. Analytical credibility is strengthened by preserving the link between raw statements, initial codes, CSH boundary questions, and final interpretive claims.

8. Critical Systems Heuristics-Based Analysis

Critical Systems Heuristics Explanation

Critical Systems Heuristics, developed by Werner Ulrich and later elaborated with Martin Reynolds, is a critical systems methodology designed to support reflective inquiry into complex problem situations. Its central analytical concern is not merely how a system functions, but how the system is bounded: what is

included, what is excluded, who is considered relevant, who is affected but absent, and whose values define improvement. In this sense, CSH is particularly appropriate for studying Co-Creative Design Thinking because design processes always involve boundary judgments, even when these judgments remain implicit.

In conventional design-thinking practice, participation is often framed through empathy, user research, workshops, ideation, prototyping, and iteration. While these practices can generate valuable insights, they do not automatically answer deeper critical questions: Who was invited into the process? Who was absent? Who defined the design challenge? Who controlled the resources? Whose knowledge was considered valid? Who had authority to reject or revise the outcome? These questions are central to CSH.

CSH is structured around four sources of boundary judgment: motivation, control, knowledge, and legitimacy. Motivation concerns the beneficiaries, purposes, and measures of improvement. Control concerns decision-makers, resources, and constraints. Knowledge concerns experts, expertise, and guarantees of validity. Legitimacy concerns witnesses, emancipation, and worldview. Each source contains three boundary questions, making twelve questions in total. These questions can be asked in two modes: the “is” mode, which examines the actual situation, and the “ought to be” mode, which examines the desirable or justifiable situation. For this article, CSH is not used as a general philosophical background; it is used as the main analytical framework for examining whether Co-Creative Design Thinking is perceived and reconstructed by experts as genuinely participatory or only procedurally participatory. The Iranian context makes this especially significant. In many public-service, urban, and institutional design processes, participation may be constrained by bureaucratic hierarchies, expert dominance, limited citizen access, weak inter-organizational coordination, and unequal recognition of marginalized voices. Therefore, CSH enables the study to examine the gap between the language of co-creation and the actual distribution of power, voice, and legitimacy.

Critical Systems Heuristics Framework

The CSH framework in this study translates interview-based qualitative findings into a structured boundary critique of Co-Creative Design Thinking. The framework proceeds through five analytical movements. First, interview statements are divided into claims about the current condition and claims about the desired condition. This distinction is fundamental because experts often speak comparatively: they describe how participation currently occurs and how it should occur if Co-Creative Design Thinking is to become meaningful. Second, the statements are mapped onto the twelve CSH boundary questions. For instance, statements about “municipal managers defining the problem before citizen consultation” are mapped under the decision-maker and purpose questions. Statements about “local experience being ignored” are mapped under expertise and guarantor questions. Statements about “women, children, low-income residents, or informal communities being absent from design workshops” are mapped under witness and emancipation questions. Third, the twelve questions are aggregated into the four CSH dimensions: motivation, control, knowledge, and legitimacy. This allows the researcher to identify whether the main weaknesses of Co-Creative Design Thinking are related to purpose, authority, expertise, or moral justification. Fourth, the “is” and “ought to be” conditions are compared within each CSH dimension. The difference between them is treated as a boundary gap. A boundary gap does not simply indicate a practical problem; it indicates a deeper mismatch between declared participation and legitimate participation. Fifth, these boundary gaps are translated into reform implications for Co-Creative Design Thinking in Iran. The goal is not only to criticize existing practices but to propose a more ethically grounded, reflexive, and institutionally realistic model of co-creation.

Boundary-Critical Synthesis Matrix

The synthesized boundary structure is summarized in [Table 2](#), which integrates the four CSH dimensions with their corresponding empirical patterns and design implications. Unlike linear participation hierarchies (e.g., Arnstein’s ladder), this framework does not classify levels of participation but analyzes boundary constitution mechanisms that generate participation outcomes.

Table 2: Synthesized Boundary-Critical Co-Creation Structure

CSH Dimension	Boundary Focus	Empirical Pattern (Iran)	Design Implication
Motivation	Beneficiaries & Purpose	Institutional priorities dominate public value framing	Reframe toward affected-stakeholder value
Control	Authority & resources	Centralized decision-making persists	Shift toward shared decision influence
Knowledge	Expertise Validity	Technical knowledge dominates lived experience	Recognize experiential knowledge as design expertise
Legitimacy	Representation & Emancipation	Exclusion of affected groups from decision influence	Institutionalize affected-stakeholder voice

Figure 1 illustrates the synthesized Boundary-Critical Co-Creation Framework derived from the CSH-based analytical process.

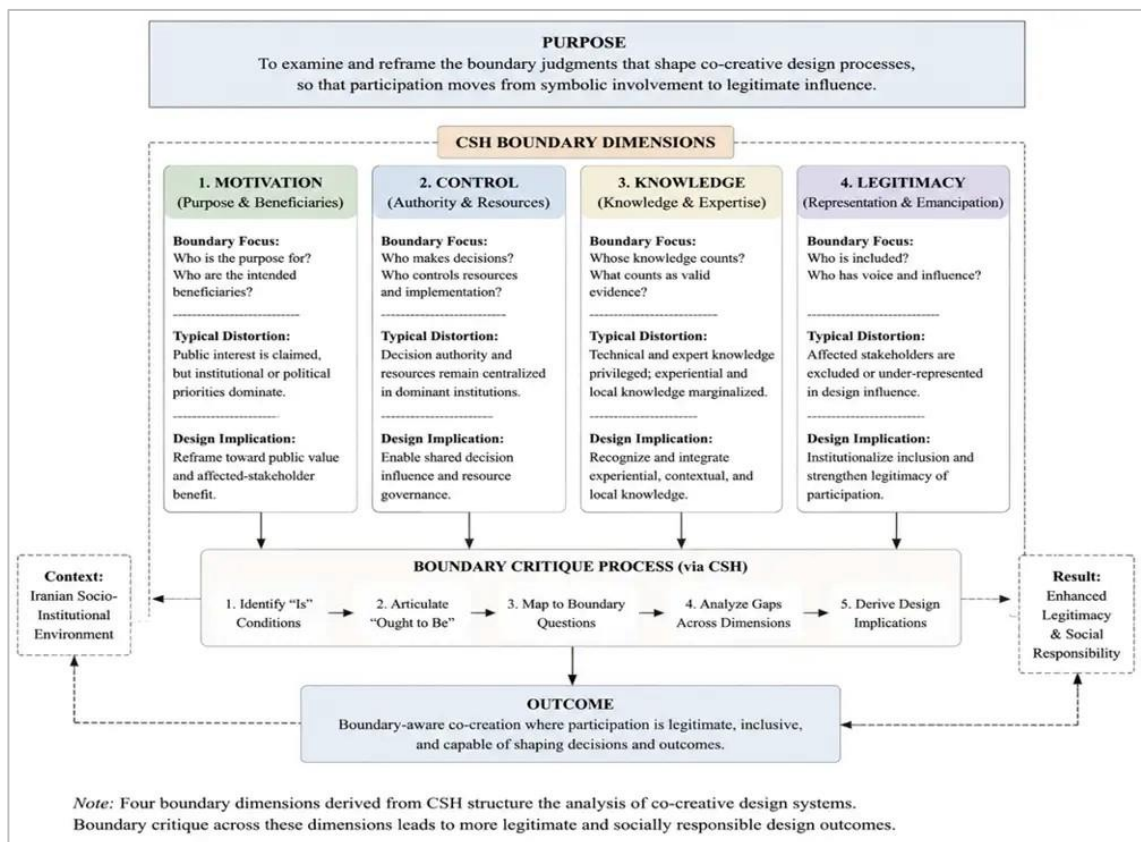


Figure 1: Boundary-Critical Co-Creation Framework (Synthesized Model)

Analysis: From Expert Interviews to CSH-Based Boundary Gaps

The interview data were analyzed through a staged thematic analysis procedure integrated with Critical Systems Heuristics (CSH). The purpose of the analysis was to show how expert accounts were transformed into initial codes, how the codes were organized into concepts, and how these concepts were finally synthesized into the CSH-based boundary-critical framework.

First, all interview transcripts were reviewed several times to develop familiarity with the data. During this stage, attention was given to statements about participation, problem framing, institutional authority, stakeholder inclusion, knowledge validation, and the legitimacy of design decisions. The unit of analysis was a meaningful statement, defined as any segment of interview text that referred to how co-creative design is currently practiced or how it should be practiced in a more legitimate form. Second, meaningful

statements were extracted from the interview transcripts and coded inductively. At this stage, the coding remained close to the participants' meanings and was not forced into CSH categories. For example, statements about citizens being invited only after project decisions had already been made were coded as "citizens consulted after decisions" and "late-stage participation". Statements about the dominance of technical and managerial expertise were coded as "technical expertise dominates" and "local knowledge marginalized".

Third, the initial codes were compared, refined, and grouped into broader conceptual categories. Similar codes were merged, while analytically distinct codes were retained. This process produced several recurrent concepts, including institutional priority-setting, symbolic co-creation, delayed participation, centralized decision authority, knowledge hierarchy, marginalization of experiential knowledge, exclusion of affected stakeholders, and limited contestability. Fourth, the coded statements were classified into two analytical groups: statements describing the current situation and statements describing the desired situation. This distinction was important because many experts spoke comparatively. They described how co-creation currently occurs in Iranian design and public-sector innovation contexts, and then explained how it should occur if participation were to become more meaningful. The current situation was treated as the "is" condition, while the desired situation was treated as the "ought to be" condition. Fifth, the concepts were mapped onto the twelve CSH boundary questions. Concepts related to beneficiaries, purposes, and improvement criteria were mapped to motivation. Concepts related to decision-makers, resources, and constraints were mapped to control. Concepts related to expertise, evidence, and knowledge validity were mapped to knowledge. Concepts related to affected groups, representation, objection, and worldview were mapped to legitimacy. Finally, the comparison between the "is" and "ought to be" conditions within each CSH dimension led to the identification of four boundary gaps: the motivation gap, the control gap, the knowledge gap, and the legitimacy gap. These gaps formed the basis of the final CSH synthesis table.

Table 3: Expert Interview Excerpts, Initial Codes, and Thematic Concepts

Expert	Interview quotation	Initial code	Concept / theme	CSH dimension	Boundary gap
E1	<i>"In many project documents, participation is mentioned, but in practice the main concern is usually delivering the project and satisfying administrative requirements."</i>	Institutional priority over public value	Institutional priority-setting	Motivation	Motivation gap
E2	<i>"Many design projects say they are citizen-centered, but success is still judged by time, budget, and how visible the project is for the organization."</i>	Public value subordinated to efficiency	Institutional performance logic	Motivation	Motivation gap
E3	<i>"The user is formally introduced as the beneficiary, but the institution usually decides what improvement means and how success should be measured."</i>	Institution defines improvement	Beneficiary-purpose mismatch	Motivation	Motivation gap
E4	<i>"Sometimes co-creation is used to show that the organization is innovative, but it does not really change who has influence over the project."</i>	Innovation branding	Symbolic co-creation	Motivation	Motivation gap
E5	<i>"Citizens are usually invited to workshops after managers or consultants have already defined the main problem."</i>	Citizens consulted after decisions	Delayed participation	Control	Control gap
E6	<i>"Users can express their preferences, but they rarely have influence over the project scope, budget, timeline, or final approval."</i>	Participation without authority	Weak decision influence	Control	Control gap

E7	<i>"The agenda is often prepared before participation begins, so stakeholders are mostly responding to choices that have already been defined."</i>	Predefined agenda	Controlled problem framing	Control	Control gap
E8	<i>"Even when participatory sessions are organized, the municipality or institution keeps control over the resources, timing, and final decisions."</i>	Institutional control of resources	Centralized decision control	Control	Control gap
E9	<i>"There is consultation, but it is not always clear how citizens' comments actually change the final decision."</i>	Weak feedback loop	Limited influence pathway	Control	Control gap
E10	<i>"Technical experts usually filter user comments and decide which ones are relevant for the design process."</i>	Expert filtering of user input	Knowledge gatekeeping	Knowledge	Knowledge gap
E11	<i>"Local experience is collected in interviews, but it is often treated as informal opinion rather than valid design knowledge."</i>	Local knowledge marginalized	Experiential knowledge undervalued	Knowledge	Knowledge gap
E12	<i>"Frontline staff know many practical problems, but their knowledge is rarely included in strategic design decisions."</i>	Frontline knowledge underused	Practical knowledge exclusion	Knowledge	Knowledge gap
E13	<i>"Professional and managerial knowledge usually dominates how the problem is interpreted."</i>	Technical expertise dominates	Knowledge hierarchy	Knowledge	Knowledge gap
E14	<i>"Citizens talk about everyday difficulties, but the final design language is mainly shaped by technical feasibility."</i>	Lived experience reduced to technical terms	Reduction of experiential evidence	Knowledge	Knowledge gap
E15	<i>"Some affected groups are not present in workshops because they lack access, time, confidence, or institutional recognition."</i>	Affected groups absent	Exclusion from participation	Legitimacy	Legitimacy gap
E16	<i>"Children, elderly users, disabled citizens, and low-income residents may be affected by decisions, but they are not always represented."</i>	Vulnerable stakeholders under-represented	Weak representation	Legitimacy	Legitimacy gap
E17	<i>"Participation becomes weak when stakeholders cannot question the assumptions behind the project."</i>	No channel to challenge assumptions	Limited contestability	Legitimacy	Legitimacy gap
E18	<i>"Citizens may provide feedback, but they usually cannot object to the final decision or request a revision."</i>	Weak objection mechanism	Limited stakeholder voice	Legitimacy	Legitimacy gap
E19	<i>"The dominant worldview of the project is usually institutional, while community perspectives remain secondary."</i>	Institutional worldview dominates	Institutionally controlled legitimacy	Legitimacy	Legitimacy gap
E20	<i>"Co-creation should begin before the design brief is fixed, not after the solution space has already been limited."</i>	Need for early participation	Inclusive problem definition	Control	Control gap

E21	<i>“Affected stakeholders should help define success criteria instead of only reacting to solutions proposed by others.”</i>	Stakeholders define criteria	Shared evaluation logic	Motivation	Motivation gap
E22	<i>“Local and cultural knowledge should be treated as evidence, especially in urban and public-service design.”</i>	Local knowledge as evidence	Plural knowledge recognition	Knowledge	Knowledge gap
E23	<i>“A legitimate process should allow excluded groups to question priorities and reshape the boundaries of the design.”</i>	Stakeholders challenge priorities	Boundary contestation	Legitimacy	Legitimacy gap
E24	<i>“Participation becomes meaningful only when users can influence framing, criteria, resources, and evaluation.”</i>	Participation as influence	Boundary-critical co-creation	Control / Legitimacy	Control and legitimacy gaps

As shown in [Table 3](#), one representative statement was selected from each expert interview to illustrate the movement from empirical evidence to initial coding and thematic conceptualization. Each statement was first condensed into a meaning unit, then assigned an initial code, and finally grouped into a broader concept. These concepts were subsequently mapped onto the four CSH dimensions of motivation, control, knowledge, and legitimacy. This procedure demonstrates that the final boundary gaps were not imposed only by the theoretical framework, but were developed through a systematic interpretation of expert accounts

Table 4: *From Concepts to “Is” and “Ought to Be” Conditions*

Concept / theme	Current “is” condition	Desired “ought to be” condition
Institutional priority-setting	Co-creation is often justified through public-value language, but shaped by institutional efficiency, project completion, or organizational visibility.	Co-creation should prioritize public value, affected stakeholders, social inclusion, and long-term consequences.
Symbolic co-creation	Participation is sometimes used to demonstrate innovation or responsiveness without changing decision authority.	Co-creation should redistribute influence over problem framing, criteria, and evaluation.
Delayed participation	Citizens and users are invited after the problem frame, scope, and solution space have already been defined.	Stakeholders should participate in early problem framing and agenda setting.
Centralized decision authority	Institutions, managers, consultants, or project sponsors retain control over resources, timelines, and final decisions.	Decision authority and design criteria should be made more transparent and shared where possible.
Knowledge hierarchy	Technical, managerial, and professional expertise dominate design interpretation.	Local, experiential, cultural, frontline, and user knowledge should be treated as valid design knowledge.
Exclusion of affected stakeholders	Affected groups may be excluded or under-represented in workshops and decision meetings.	Affected stakeholders should have recognized channels for participation, objection, and boundary revision.
Limited contestability	Stakeholders may provide feedback but cannot question assumptions or challenge final decisions.	Legitimate co-creation should allow affected stakeholders to contest, revise, and reshape design boundaries.

Table 5: *Mapping Thematic Concepts to CSH Boundary Questions*

CSH dimension	CSH component	Boundary question	Related thematic concept
Motivation	Beneficiary	<i>Who is the actual and desired beneficiary of the design process?</i>	Institutional priority-setting
Motivation	Purpose	<i>What is the actual and desired purpose of co-creation?</i>	Institutional performance logic
Motivation	Measure of improvement	<i>What counts as improvement or success?</i>	Shared evaluation logic

Control	Decision-maker	<i>Who actually controls design decisions?</i>	Centralized decision authority
Control	Resources	<i>Who controls resources, budget, time, data, and implementation capacity?</i>	Institutional control of resources
Control	Decision environment	<i>Which constraints are treated as fixed before participation begins?</i>	Controlled problem framing
Knowledge	Expert	<i>Who is recognized as an expert in the design process?</i>	Knowledge hierarchy
Knowledge	Expertise	<i>What forms of knowledge are considered valid?</i>	Plural knowledge recognition
Knowledge	Guarantor	<i>Who guarantees the validity and reliability of design knowledge?</i>	Knowledge gatekeeping
Legitimacy	Witness	<i>Who represents those affected by the design outcome?</i>	Weak representation
Legitimacy	Emancipation	<i>Who can question, object to, or challenge the design assumptions?</i>	Limited contestability
Legitimacy	Worldview	<i>Which worldview defines the boundaries of the design problem?</i>	Institutionally controlled legitimacy

Table 5 maps the thematic concepts derived from expert interviews onto the twelve boundary questions of Critical Systems Heuristics. Each CSH dimension consists of three boundary components: motivation includes beneficiary, purpose, and measure of improvement; control includes decision-maker, resources, and decision environment; knowledge includes expert, expertise, and guarantor; and legitimacy includes witness, emancipation, and worldview. This mapping clarifies how the interview-based concepts were translated into the full CSH analytical structure.

Table 6: Summary of Boundary Judgments Across the Four CSH Dimensions

CSH Dimension	Boundary Focus	What Is	What Ought to Be	Critical Reflection
Motivation	Beneficiary, purpose, measure of improvement	Co-creative design is often framed around institutional efficiency, project delivery, service modernization, or innovation branding.	Co-creation should prioritize public value, affected stakeholders, social inclusion, and long-term design consequences.	The key issue is whether the declared beneficiary is the real beneficiary.
Control	Decision-maker, resources, decision environment	Public bodies, managers, consultants, and experts often retain agenda-setting and final decision authority.	Decision authority should be shared more transparently with affected users, communities, and implementers.	Participation without influence risks becoming symbolic.
Knowledge	Expert, expertise, guarantor	Technical, managerial, and professional knowledge often dominate local and experiential knowledge.	Citizen experience, frontline practice, cultural knowledge, and local knowledge should be treated as valid design knowledge.	Co-creation fails when users provide data but are not recognized as knowledge holders.
Legitimacy	Witness, emancipation, worldview	Affected but excluded groups may lack representation or the ability to challenge design assumptions.	Excluded and vulnerable groups should have channels to question, revise, and contest design boundaries.	Legitimacy depends on the voice of those affected, not only those invited.

Table 6 synthesizes the boundary judgments identified through the CSH mapping process. While **Table 5** shows how thematic concepts were linked to the twelve CSH boundary questions, **Table 6** summarizes the resulting “is” and “ought to be” conditions across the four CSH dimensions.

1. Toward Boundary-Critical Co-Creation

The findings suggest that Co-Creative Design Thinking becomes stronger when it is reframed as boundary-critical co-creation. This means that design processes should not only ask users what they need, but also ask who defines the users, who frames the problem, who controls the process, who validates the solution, and who bears the consequences. CSH therefore expands Co-Creative Design Thinking from a creativity-centered method into a reflective, ethical, and systemic practice.

2. Boundary-Critical Co-Creation Model (BCCM)

This study introduces a Boundary-Critical Co-Creation Model that integrates four analytically distinct but interdependent dimensions:

- *Motivation (beneficiary orientation distortion)*
- *Control (decision authority asymmetry)*
- *Knowledge (epistemic exclusion)*
- *Legitimacy (affected stakeholder absence)*

These dimensions collectively explain how participatory design processes transition from substantive co-creation to procedural simulation. The model reframes co-creation not as a binary condition (participatory vs. non-participatory) but as a gradient of boundary legitimacy degradation. The structural relationships between motivation, control, knowledge, and legitimacy are visualized in Figure 2 as the Boundary-Critical Co-Creation Model.

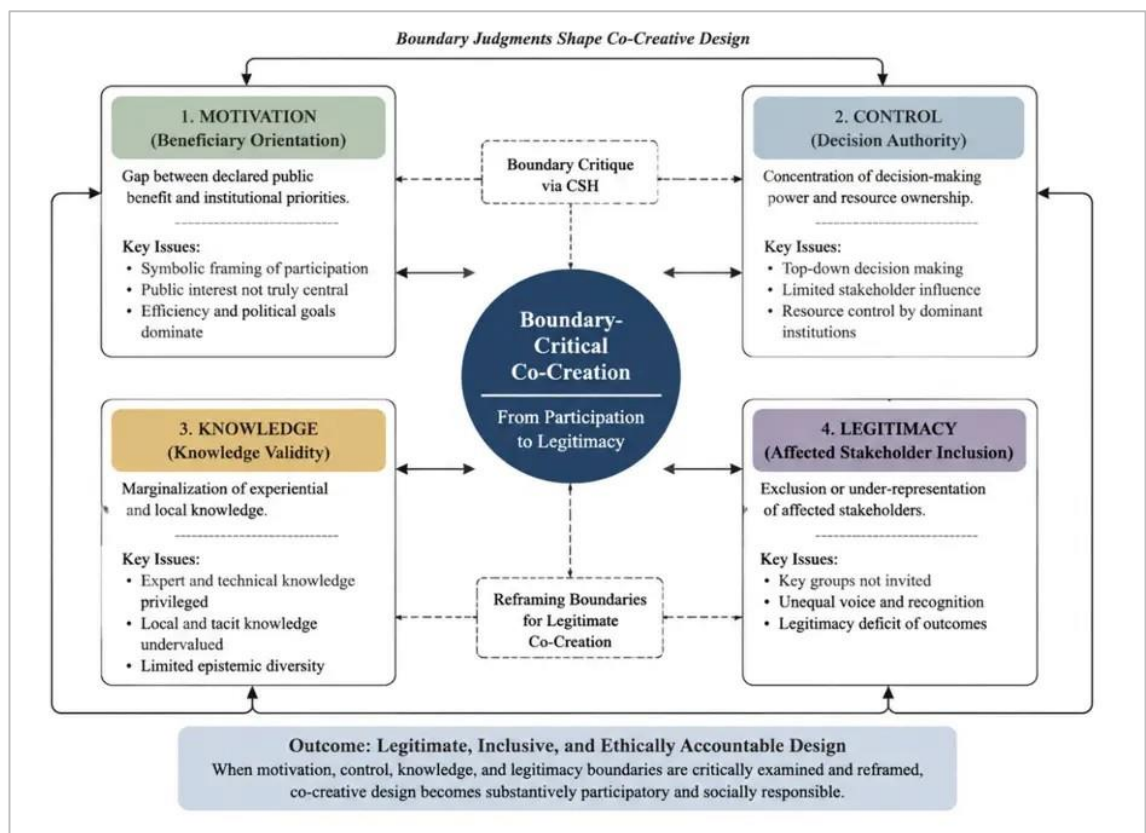


Figure 2: Boundary-Critical Co-Creation Model (BCCM)

Discussion

1. Repositioning Co-Creation from Involvement to Legitimacy

The findings challenge the assumption that stakeholder involvement automatically produces legitimate design outcomes. In many design-thinking practices, participation is treated as evidence of inclusiveness. However, the CSH analysis shows that participation is only meaningful when stakeholders can influence boundary judgments. This shifts the theoretical focus from who participates to what participation allows them to change.

For the Iranian context, this distinction is crucial. Public-service, urban, and institutional design problems are deeply connected to power, governance, inequality, and resource constraints. In such settings, co-

creation cannot be reduced to workshops or consultation. It must include mechanisms for contesting assumptions, revising objectives, and making trade-offs visible.

2. Theoretical Contribution

The study contributes to design-thinking literature by integrating Critical Systems Heuristics into co-creative design theory. Conventional Design Thinking emphasizes empathy, ideation, prototyping, and iteration. These are valuable, but they do not sufficiently address the politics of problem framing. CSH adds a critical layer by examining motivation, control, knowledge, and legitimacy.

This integration allows the article to move beyond a purely human-centered view toward an affected-stakeholder-centered view. Human-centered design often focuses on the direct user, whereas CSH asks whether the interests of all affected parties have been adequately considered, including absent or marginalized groups, future generations, and ecological entities. This is a meaningful theoretical extension because it connects Design Thinking with ethical systems inquiry.

3. Methodological Contribution

Methodologically, the study demonstrates how qualitative interview data can be transformed into CSH-based analysis. The movement from initial coding to “is/ought” classification, then to twelve boundary questions and four CSH dimensions, provides a systematic analytical procedure. This strengthens the rigor of qualitative design research by making normative interpretation transparent.

The proposed analytical logic also helps avoid vague claims about power and participation. Instead of merely stating that power exists, the framework identifies where power operates: in purpose definition, beneficiary selection, resource control, expertise recognition, validation procedures, and representation of affected groups.

4. Contextual Contribution to Iran

The Iranian context in this study functions not merely as a geographic case, but as a high-boundary-control institutional environment, where participation is structurally mediated by hierarchical governance, resource centralization, and expert authority. These conditions amplify the visibility of boundary distortions, making Iran an analytically revealing context for studying co-creative design systems under constrained legitimacy regimes. The Iranian context gives the study practical and conceptual significance. Iran’s design and innovation context is marked by strong technical capability and institutional need for transformation, but also by centralized decision-making, fragmented governance, uneven public participation, and social diversity. These conditions make co-creative design both necessary and difficult. The findings suggest that Iranian design processes require more than imported design-thinking toolkits. They need context-sensitive frameworks that can address institutional boundaries, cultural conditions, public trust, and unequal access to voice. CSH is valuable here because it does not assume ideal participation. Instead, it provides a way to critically examine constrained participation and identify feasible reforms. These conditions are not uniform across all sectors but manifest differently across municipal, policy, and service-design domains.

5. Re-anchoring in Design Research Traditions

The proposed boundary-critical framework extends participatory design (PD), co-design, and design justice by shifting analytical focus from participation intensity to boundary legitimacy. Unlike PD approaches that emphasize inclusion mechanisms, this study emphasizes structural control over participation boundaries. It also complements systemic design by operationalizing boundary critique as a measurable interpretive process, rather than a purely conceptual orientation.

P **Practical Implications**

1. Field Application Protocol for a Public-Sector Design Project

To clarify the practical value of the proposed framework, this section demonstrates how the boundary-critical co-creation framework can be applied in a real-world public-sector design setting. The example is

framed as a field application protocol for a municipal public-space redesign project, such as the redesign of a neighborhood park or public square in an Iranian city. The example is not presented as a completed and validated case study; rather, it shows how the framework can guide the diagnosis, planning, implementation, and evaluation of a real design intervention. In a conventional co-creation process, citizens may be invited to comment on visible design features such as seating, greenery, lighting, playground facilities, or accessibility.

While such consultation is useful, it may leave deeper boundary issues unexamined. The proposed framework asks whether citizens and affected stakeholders can influence the definition of the problem, the criteria of success, the distribution of decision authority, the recognition of local knowledge, and the legitimacy of the final design outcome. For example, in a municipal public-space redesign project, the municipality may initially define the problem as physical deterioration, low visual quality, or inefficient maintenance. However, affected users may define the same space through different concerns, such as women's safety, children's play needs, elderly access, informal vendors' livelihoods, disabled users' mobility, or residents' lack of trust in municipal decision-making. Applying the CSH-informed framework therefore shifts the project from collecting preferences to examining boundary judgments.

Table 7: *Field Application Protocol for Applying the Boundary-Critical Framework in a Municipal Public-Space Redesign Project*

Project phase	Conventional design activity	Boundary-critical CSH application	Empirical input to be collected	Practical design response
Problem framing	Define the design brief based on municipal priorities	Identify who defined the problem and whose problem definition is absent	Interviews with municipal managers, residents, shop owners, women, children, elderly users, disabled users, maintenance staff, and informal users	Revise the design brief to include both institutional concerns and affected-stakeholder concerns
Stakeholder mapping	Invite visible or accessible users to workshops	Identify affected but absent stakeholders	Stakeholder map showing direct users, indirect users, excluded groups, and decision-makers	Add usually absent groups to the engagement process before design criteria are finalized
Motivation review	Clarify project goals such as beautification or efficiency	Examine whether the declared beneficiary is the real beneficiary	Comparison of municipal objectives with stakeholder-defined needs	Redefine success criteria to include public value, safety, inclusion, accessibility, and long-term social consequences
Control review	Collect user feedback on proposed alternatives	Examine who controls budget, timeline, approval, and design trade-offs	Documentation of decision rights, approval procedures, and constraints	Create transparent mechanisms showing how stakeholder input can influence priorities and trade-offs
Knowledge validation	Use technical and professional assessment	Examine whose knowledge counts as valid design knowledge	Local narratives, spatial-use observations, accessibility experiences, frontline maintenance knowledge, and professional design evidence	Treat experiential, cultural, local, and frontline knowledge as legitimate evidence alongside technical expertise
Legitimacy review	Present final design for approval	Examine who can question assumptions or challenge the final decision	Feedback sessions with affected groups and documentation of objections or requested revisions	Establish a revision mechanism before final approval, especially for affected and vulnerable groups
Evaluation	Assess project completion, cost, and user satisfaction	Evaluate success for whom, by which criteria, and with what consequences	Post-implementation feedback, accessibility checks, use-pattern observation, and stakeholder review	Evaluate the project through public value, inclusion, accessibility, legitimacy, and long-term consequences

As shown in [Table 7](#), the framework can be used before, during, and after a co-creative design process. Before the project begins, it supports boundary mapping and revision of the design brief. During the project, it helps practitioners monitor whether affected stakeholders can influence criteria, trade-offs, knowledge validation, and decision priorities. After implementation, it provides an evaluative lens for examining

whether the project produced public value or merely satisfied institutional delivery criteria. In this sense, the framework functions not only as an analytical model, but also as a practical diagnostic and planning tool for public-sector design. However, this application remains a structured field protocol rather than a fully validated intervention-based case study. Future research should therefore apply the framework in an ongoing public-space, service-design, urban planning, or digital public-service project and evaluate how boundary judgments are negotiated in real time.

2. Design Practitioners, Public Managers and Policy-Makers

Building on the field application protocol above, the framework provides several practical implications for design practitioners, public managers, and policy-makers. The proposed boundary-critical co-creation framework provides actionable implications for both design practitioners and public-sector innovation managers. First, it suggests that participatory design activities should begin with explicit boundary mapping, identifying who defines the problem, who controls resources, and who is excluded from decision-making authority. Second, it encourages practitioners to move beyond workshop-based participation toward structured mechanisms for influencing design boundaries, particularly during early problem framing stages. Third, public-sector managers are encouraged to treat participation not as a consultative add-on but as an institutional design condition requiring redistribution of decision rights, transparency in knowledge validation, and inclusion of affected stakeholders in evaluative processes. Overall, the framework operationalizes co-creation as a governance-sensitive design practice rather than a purely methodological technique.

C Conclusion

This study developed a Critical Systems Heuristics (CSH)-informed framework for rethinking Co-Creative Design Thinking in contexts characterized by asymmetric power relations and constrained participatory structures, with a specific focus on Iran's socio-institutional environment. The central argument advanced is that contemporary co-creative and participatory design approaches, while increasingly adopted across design and public-sector innovation domains, often remain confined to procedural forms of participation that do not adequately interrogate the boundary conditions through which participation itself is constructed. Through a qualitative interpretive analysis of 24 expert interviews across six stakeholder groups, the study demonstrated that Co-Creative Design Thinking is not only shaped by methods of engagement but, more fundamentally, by underlying boundary judgments concerning motivation, control, knowledge, and legitimacy. The empirical analysis revealed four interrelated boundary gaps: a motivation gap between declared public value and institutional priorities, a control gap reflecting centralized decision authority, a knowledge gap characterized by the marginalization of experiential and local knowledge, and a legitimacy gap involving the exclusion or under-representation of affected stakeholders.

Building on these findings, the study proposed a boundary-critical co-creation framework that repositions Design Thinking from a method-centered approach toward a boundary-aware analytical perspective. In this framing, co-creation is not evaluated primarily by the presence of participatory tools or stakeholder engagement activities, but by the degree to which stakeholders can influence the definition of problems, the distribution of decision authority, the validation of knowledge, and the construction of legitimacy.

The primary theoretical contribution of this study lies in its differentiation from existing co-creation, co-design, and participatory design models. Whereas dominant approaches in the literature emphasize techniques for inclusion, collaboration, and iterative engagement, the proposed framework introduces a second-order analytical lens that interrogates the boundary structures that make participation possible, limited, or symbolic. In this sense, the framework extends Co-Creative Design Thinking by shifting attention from participation intensity to participation legitimacy, thereby revealing the systemic conditions under which co-creation becomes substantively influential rather than procedurally symbolic.

From a broader design research perspective, this repositioning enables Co-Creative Design Thinking to be understood not merely as a toolkit for innovation, but as a boundary-governed system of legitimacy,

knowledge validation, and power distribution. Consequently, design outcomes can no longer be assessed solely in terms of usability, efficiency, or stakeholder involvement, but must also be evaluated in terms of who defines the boundaries of participation and whose interests, knowledge, and voices are structurally recognized within those boundaries. Overall, the study contributes to design-thinking scholarship by offering a structured and transferable boundary-critical framework that integrates systems thinking with design research. It provides both a conceptual and analytical basis for examining co-creation in complex socio-institutional contexts, where participation is simultaneously enabled and constrained by underlying institutional logics. In doing so, it opens a pathway for future research to further empirically validate boundary-critical design frameworks through comparative case studies, design ethnography, and intervention-based evaluations across different institutional and cultural settings.

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