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Constrained Consumption in Essential Service Ecosystems: A Multi-Level Systems Design Framework

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Abstract

Essential services such as maternal healthcare operate within structured systems characterized by institutional dependency, limited exit options, and asymmetric authority configurations. While Service-Dominant Logic conceptualizes service ecosystems as networks of resource-integrating actors coordinated through institutional arrangements (Vargo and Lusch 2016), it largely assumes symmetrical participation capacity. In essential service contexts, however, participation is conditioned by multi-level structural constraints that influence system performance and wellbeing outcomes. This study develops an empirically grounded conceptual systems framework to diagnose constrained consumption in essential service ecosystems. Drawing on Service-Dominant Logic, vulnerability theory, Transformative Service Research, and service system design, the research integrates macro-level institutional design, meso-level relational configuration, and micro-level participation activation into a unified Macro–Meso–Micro architecture. The proposed model conceptualizes consumption realization as a system performance outcome governed by cross-level interaction. It identifies key system mechanisms including downward constraint propagation, participation activation thresholds, feedback stabilization, and non-linear interaction effects, explaining how structural misalignment produces constrained consumption despite formal service availability. The framework reframes constrained consumption as an emergent property of system-level misalignment rather than individual disengagement and functions as a diagnostic tool for evaluating authority structures, relational mediation, and participation capability in essential service systems. The study contributes a structured systems architecture for analyzing how institutional asymmetry, relational mediation, and participation capability jointly determine consumption realization and wellbeing performance in high-dependency service environments.

Keywords
Essential service ecosystems, Constrained consumption, Systems design framework, Participation capability, Structural asymmetry

1.Introduction
Essential services—including healthcare, utilities, education, and social protection—are structurally distinct from discretionary consumption markets. In such contexts, consumers often engage under conditions of necessity rather

than preference, with limited exit options and heightened dependency on institutional arrangements. Service-Dominant Logic (SDL) conceptualizes service ecosystems as systems of resource-integrating actors coordinated by institutional structures (Vargo & Lusch, 2008; 2016). While this perspective has advanced understanding of value co-creation, it generally assumes that actors possess relatively symmetrical capacities to integrate resources and participate in exchanges.

However, in essential services—particularly maternal healthcare—participation is frequently mediated by structural inequality, gender norms, household hierarchies, and frontline intermediaries. Vulnerability is not incidental but structurally embedded (Baker et al., 2005). Under such conditions, consumption cannot be adequately interpreted as voluntary co-creation; rather, it reflects constrained participation shaped across multiple levels of the ecosystem.
Existing research in transformative service contexts emphasizes wellbeing outcomes (Anderson et al., 2013), yet limited attention has been paid to how multi-level structural constraints shape consumption realization itself. Without incorporating macro-level institutional stratification and meso-level relational mediation, ecosystem models risk overlooking systemic asymmetries that affect participation capability.

This research addresses this gap by developing a Macro–Meso–Micro systems framework to conceptualize constrained consumption within essential service ecosystems.

2. Problem Formulation

2.1 Service Ecosystems and Institutional Structuring

Service-Dominant Logic (SDL) conceptualizes service ecosystems as relatively self-adjusting systems of resource-integrating actors coordinated through shared institutional arrangements (Vargo and Lusch 2008; 2016). Actors integrate operant resources and co-create value within institutional rules, norms, and beliefs (Koskela-Huotari and Vargo 2016). Ecosystems operate across micro, meso, and macro levels, with institutional arrangements stabilizing and guiding resource integration (Chandler and Vargo 2011).

Recent research highlights institutional complexity, power asymmetries, and value co-destruction within ecosystems (Frow et al. 2019; Vargo et al. 2020). While SDL acknowledges embeddedness within institutional structures, it often assumes relatively comparable actor capacity for resource integration. Emerging work on vulnerability challenges this assumption, suggesting that participation capability within ecosystems is unevenly distributed (Beirão et al. 2017; Blocker and Barrios 2015).

Thus, ecosystem theory provides a structural foundation but requires further elaboration to explain stratified participation in contexts where engagement is necessity-driven rather than discretionary.

2.2 Essential Services as Structurally Constrained Ecosystems

Essential services such as healthcare, utilities, and social protection differ from discretionary market exchanges because participation occurs under conditions of necessity rather than choice. Individuals often have limited exit options and depend on institutional arrangements for service realization (Berry and Bendapudi 2007). Consequently, consumption cannot be understood through models assuming voluntary engagement and symmetrical participation.
Transformative Service Research (TSR) emphasizes the role of service systems in shaping wellbeing, particularly for vulnerable populations (Anderson et al. 2013). Vulnerability research shows that participation capacity is conditioned by socio-economic constraints, gender norms, and institutional hierarchies influencing decision authority and resource access (Baker et al. 2005). In healthcare systems, participation is typically mediated through family structures, frontline actors, and institutional gatekeeping rather than individual decision-making.

Recent work further suggests that interventions may reproduce inequality when underlying institutional conditions remain unchanged (Blocker et al. 2022). Participation within essential services therefore cannot be assumed; it emerges as a capability shaped by the interaction of institutional arrangements and relational mediation.

Despite these insights, most research evaluates outcomes through access or utilization metrics rather than examining participation capability as a system-level phenomenon. As a result, the translation of structural conditions into constrained consumption remains underexplored.

2.3 Service System Design and Cross-Level Alignment

Service system research conceptualizes service delivery as coordinated configurations of actors, resources, technologies, and institutions producing outcomes (Maglio and Spohrer 2008). System performance depends not only on individual behavior but on alignment across structural components.In essential services, misalignment between institutional design, organizational processes, and user capability can generate systemic failure even when access expands (Osborne et al. 2021). Policy initiatives may increase availability, yet relational hierarchies can restrict meaningful participation, leading to inequitable outcomes.

While ecosystem research emphasizes cross-level coordination (Vargo and Lusch 2016), it often overlooks how structural asymmetry shapes participation capability. In contexts of institutional dependency, asymmetries influence authority, voice, and decision-making power.Consequently, analyzing essential service systems requires a multi-level framework linking institutional arrangements, relational mediation, and participation capability. Without such integration, models risk overlooking how constraints propagate across levels to shape consumption outcomes.This study addresses this gap by developing a Macro–Meso–Micro systems architecture that models how institutional asymmetry, relational configuration, and participation activation jointly determine consumption realization.

3. Methods

3.1 Framework Development Process

This study adopts a structured conceptual synthesis approach to develop a Macro–Meso–Micro framework for analyzing constrained consumption in essential service ecosystems. Conceptual research is appropriate where existing theoretical streams provide partial explanations but lack integrative architecture (Jaakkola, 2020).
The framework development proceeded in three stages.

Stage 1: Construct Extraction
Key constructs were identified from Service-Dominant Logic, institutional ecosystem research, vulnerability theory, and Transformative Service Research, revealing tensions related to actor symmetry, participation capability, and wellbeing realization.
Stage 2: Cross-Level Reorganization
Constructs were reorganized across macro, meso, and micro levels (Chandler and Vargo 2011), highlighting that constrained consumption emerges from cross-level interaction rather than isolated variables.
Stage 3: System Integration
System design principles (Maglio and Spohrer 2008) were applied to translate constructs into a hierarchical architecture incorporating constraint propagation, relational mediation, participation activation, and feedback mechanisms.

3.2 Integrative Gap in Essential Service Ecosystem Research

Despite advances across Service-Dominant Logic, institutional research, vulnerability theory, and Transformative Service Research, their integration remains limited in essential service contexts characterized by structural necessity and institutional dependency.Three limitations emerge. First, ecosystem research often assumes actors possess resource integration capability, whereas essential services reveal systematic asymmetries in participation capacity. Second, vulnerability research explains reduced agency but does not specify how participation capability is activated within constrained systems. Third, transformative service research emphasizes wellbeing outcomes but lacks a structural account of how institutional design, relational mediation, and participation interact.

This study addresses these limitations by developing a Macro–Meso–Micro architecture that links institutional asymmetry, relational configuration, and participation activation to consumption outcomes.

4. Empirical Grounding of the Framework

This study adopts an empirically grounded conceptual approach informed by prior qualitative and mixed-method research on rural maternal healthcare service ecosystems. The framework builds on phenomenological insights derived from in-depth interviews and journey-mapping exercises capturing how vulnerable mothers navigate antenatal care through relational influence, emotional interpretation, and institutional constraints.

These insights are further complemented by ecosystem-level evidence from quantitative and field-based studies examining decision-making dynamics, relational support structures, and participation processes in maternal healthcare

contexts. Rather than presenting primary data, the study analytically abstracts and integrates these empirically observed patterns to develop a multi-level conceptual architecture explaining participation under vulnerability in essential service ecosystems. The framework thus represents a conceptual generalization of empirically observed maternal healthcare experiences across qualitative and quantitative research contexts.

5. Results and Discussion

5.1 System Definition and Boundary

The proposed architecture conceptualizes the essential service ecosystem as a bounded socio-technical system comprising institutional structures (macro), relational networks (meso), and individual actors (micro) engaged in service participation. The system boundary includes formal service provision mechanisms and socially embedded relational interactions that directly influence participation capability and consumption realization.

External conditions such as broader economic constraints, infrastructure availability, and demographic factors are treated as exogenous inputs that influence system parameters but are not explicitly modeled within the system boundary.From a systems perspective, the framework represents a hierarchical, adaptive system characterized by interdependent components, constraint propagation, and feedback stabilization mechanisms.

5.2 Integrated Constrained Consumption Architecture

The analytical synthesis results in a multi-level systems architecture for diagnosing constrained consumption within essential service ecosystems. The framework integrates ecosystem theory, consumer vulnerability, and service system design to explain how structural asymmetry shapes participation capability and consumption realization.

Figure 1 presents the Constrained Consumption Architecture, conceptualizing service delivery as a hierarchical system comprising interacting macro, meso, and micro layers. Consumption is modeled not as an individual behavioral outcome but as a system-level performance emerging from cross-level interactions.

The architecture consists of four interdependent components:

1. Macro-Level Institutional Design
2. Meso-Level Relational Configuration
3. Micro-Level Participation Activation
4. Consumption Realization and Wellbeing Performance

Macro-Level Institutional Design

At the macro level, institutional arrangements define the structural conditions governing service participation. Policy regimes, governance systems, authority hierarchies, and socio-cultural norms establish the rules that shape actor roles, participation rights, and accountability structures.While prior literature recognizes institutions as coordination mechanisms, this synthesis highlights their role in stratifying participation capability. In essential services such as maternal healthcare, authority is distributed across formal institutions, frontline actors, and household structures, creating asymmetrical participation conditions.

Meso-Level Relational Configuration

Institutional conditions influence service delivery indirectly through meso-level relational configurations. Household decision networks, frontline intermediaries, and community actors interpret and operationalize institutional rules within everyday interactions.This layer functions as the system's transformation mechanism, where structural asymmetries may either be reinforced or mitigated. Participation outcomes depend on how authority, trust, and influence are distributed across these relational networks.

Micro-Level Participation Activation

At the micro level, the framework introduces participation activation as a capability threshold. Participation occurs only when individuals convert service availability into meaningful engagement.This capability is shaped by trust, perceived legitimacy, autonomy, and decision confidence. Under conditions of vulnerability, these capabilities may be suppressed, limiting participation even when services are accessible.

Consumption Realization and System Performance
The final layer represents consumption realization and wellbeing performance. Outcomes depend on alignment across institutional design, relational mediation, and participation capability.
Misalignment across these layers produces constrained consumption, where services are available but fail to generate equitable outcomes.

The architecture incorporates two system dynamics:

- **Downward constraint propagation**, where institutional asymmetry shapes relational roles and participation boundaries
- **Upward feedback stabilization**, where consumption outcomes influence trust, legitimacy, and future participation

System Performance Representation

Consumption realization can be expressed as: **CR = f (I, R, P)**

Where: CR = Consumption Realization , I = Institutional Alignment , R = Relational Mediation , P = Participation Capability

If alignment across these components is weak:

$$\mathbf{I \times R \times P \rightarrow low \Rightarrow CR \rightarrow constrained\ consumption}$$

This representation emphasizes that consumption outcomes emerge from system-level interactions rather than isolated factors.

The system exhibits non-linear behavior under conditions of misalignment. Small reductions in relational mediation or participation capability can produce disproportionately large declines in consumption realization due to multiplicative interaction effects.For example, when institutional alignment remains high but relational mediation is weak, participation capability fails to activate, resulting in constrained consumption despite service availability. Conversely, improvements in relational mediation can partially compensate for institutional rigidity by enabling participation activation through trust-based mechanisms. This behavior indicates that the system is sensitive to cross-level bottlenecks rather than individual component performance.

System Efficiency and Loss
From a systems perspective, efficiency can be interpreted as the effectiveness with which service provision is converted into realized outcomes. Misalignment across institutional, relational, and participation components introduces systemic losses, where available resources do not translate into effective service utilization. These losses occur when institutional constraints restrict relational mediation or when participation capability remains inactivated despite service availability. As a result, the system exhibits reduced conversion efficiency, with gaps between provision and realization reflecting structural inefficiencies rather than individual-level failure.

System Performance Regimes
The system can exist in distinct performance regimes depending on the alignment of institutional structures, relational mediation, and participation capability .A high-alignment regime is characterized by supportive institutional conditions, enabling relational networks, and activated participation capability, resulting in effective conversion of service provision into wellbeing outcomes. A constrained regime emerges when misalignment across one or more system levels suppresses participation activation, leading to partial or failed consumption realization despite service availability. A transitional regime may occur when improvements at one level (e.g., relational mediation) temporarily compensate for structural rigidities at another level, producing uneven or unstable outcomes.These regimes highlight that essential service ecosystems do not operate in binary states but exhibit varying degrees of performance depending on cross-level alignment.

5.3 Graphical Interpretation of the Architecture

Figure 1 visualizes the proposed framework as a multi-level system linking institutional structures, relational mediation, and participation capability to consumption outcomes.

The model highlights three key mechanisms:

1. Downward Constraint Propagation

Institutional structures shape relational configurations and define participation boundaries. Structural asymmetry propagates through networks, influencing individual capability to engage.

2. Participation Activation Threshold

The micro layer represents the point at which service availability is converted into actual engagement. Participation occurs only when sufficient trust, legitimacy, and autonomy are achieved.

3. Upward Feedback Stabilization

Consumption outcomes feed back into the system by shaping trust, perceived legitimacy, and future participation behavior, thereby influencing system stability over time.

Interpretation

System performance improves when: institutional structures enable inclusive participation ,relational actors facilitate engagement and participation capability is activated Conversely, constrained consumption emerges when misalignment across these layers prevents effective conversion of service provision into wellbeing outcomes. The proposed framework can be interpreted as a socio-technical system with hierarchical structure and feedback loops, exhibiting characteristics of a constrained adaptive system (Figure 1).

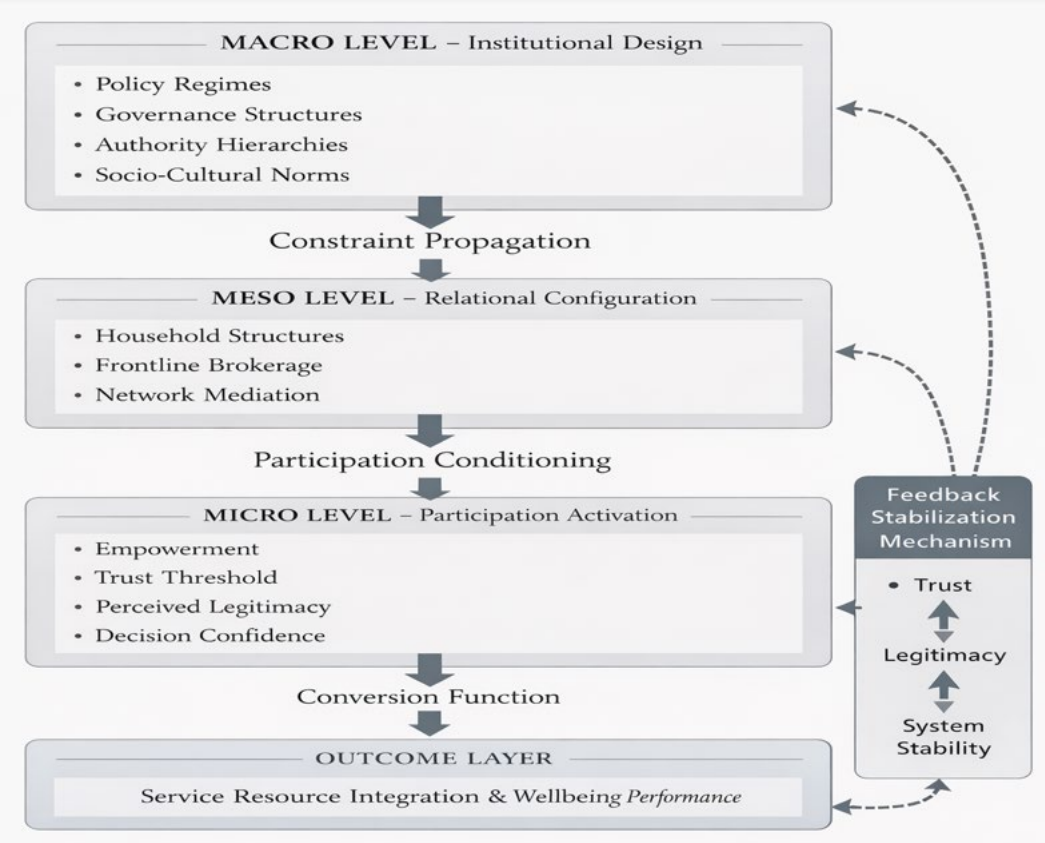

Figure 1. Constrained Consumption Architecture in Essential Service Ecosystems

5.4 System-Level Implications for Design and Analysis

The proposed architecture extends essential service analysis by reframing consumption as a system performance problem rather than an individual behavioral outcome. This perspective yields several system-level implications.

First, the framework identifies participation capability as a critical system bottleneck. Improving service outcomes therefore requires interventions that target activation mechanisms—such as trust formation, legitimacy perception, and decision support—rather than focusing solely on access expansion. Second, the model highlights the importance of cross-level alignment. Institutional reforms that are not supported by relational mediation structures may fail to translate into improved participation. Similarly, strengthening frontline actors without addressing institutional asymmetry may yield limited system-level improvement. Third, the architecture enables diagnostic analysis of failure points within the system. Misalignment across macro, meso, and micro levels can be interpreted as structural inefficiencies in resource conversion, where service provision does not translate into realized outcomes. Finally, the framework provides a foundation for future system modeling approaches, including multi-level empirical testing, system dynamics simulation, and network-based analysis of relational mediation. These extensions would allow formal evaluation of system performance under varying structural conditions.

Together, these implications position the framework as a tool for both theoretical advancement and practical system design in essential service ecosystems. The framework may be further formalized using system dynamics modeling to simulate cross-level interaction and feedback effects over time.

System Intervention Points

The framework also identifies key leverage points for system intervention. Institutional-level interventions target policy design and governance structures to reduce structural asymmetry. Meso-level interventions focus on strengthening relational mediation through frontline capacity building and community engagement. Micro-level interventions aim to activate participation capability by enhancing trust, legitimacy, and decision support.

These intervention points suggest that system improvement requires coordinated action across levels rather than isolated interventions, reinforcing the importance of integrated system design.

6. Conclusion

This study developed a multi-level systems design framework to diagnose constrained consumption in essential service ecosystems. Responding to limitations in existing ecosystem and vulnerability research, the framework integrates institutional asymmetry, relational mediation, and participation activation within a unified Macro–Meso–Micro architecture.

The first objective of this research was to extend service ecosystem theory by incorporating structural asymmetry into participation analysis. The findings demonstrate that institutional arrangements in essential services do not merely coordinate resource integration but actively stratify authority, legitimacy, and voice. Thus, actor participation must be understood as structurally conditioned rather than uniformly symmetrical.

The second objective was to conceptualize constrained consumption as a multi-level phenomenon. The proposed architecture shows that macro-level institutional design propagates through meso-level relational configurations to shape micro-level participation capability. Constrained consumption emerges when these levels are misaligned, resulting in performance breakdowns despite formal access provision.

The third objective was to provide a diagnostic framework for essential service system redesign. By identifying constraint propagation pathways and participation activation thresholds, the model shifts attention from utilization metrics toward structural alignment analysis. This systems perspective enables policymakers and service designers to evaluate whether institutional reforms translate into meaningful participation and equitable wellbeing realization.
The framework contributes to service research by embedding structural vulnerability within ecosystem logic and translating participation capability into a system performance variable. It also advances essential service scholarship by reframing consumption outcomes as emergent properties of cross-level interaction rather than isolated consumer behavior.

Future research may empirically operationalize the model through multi-level quantitative testing, system simulation, or comparative case analysis across essential service domains. Such extensions would further refine understanding of constraint dynamics and participation activation in high-stakes service systems.

In conclusion, essential service ecosystems are not merely value co-creation networks but stratified system architectures in which institutional design, relational mediation, and participation capability jointly determine consumption realization. Understanding and redesigning these cross-level interactions is central to achieving equitable wellbeing outcomes in essential services.

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