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Making Programs Work: Applying Luhmann's Social Systems Theory to Quality Management and AI in Statistical Organizations

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Abstract

This paper asks how statistical organizations can make programs—quality frameworks, planning documents, etc.—work as practical tools for managing complexity and improving quality, especially when supported by AI. Using Luhmann's social systems theory, we treated programs not as checklists but as devices of second-order observation that structure self-observation and guide decisions under uncertainty, and examined two practice-based cases: a 10-day quality training in Bangladesh and an AI-enhanced consulting workshop.

Findings: (1) when the quality framework is used as a living program, it converts generic guidance into emergent, context-specific knowledge and stabilizes distinctions (e.g., timely/not timely; fit for use/not fit) that improve the preparation of decision premises; (2) AI, configured as artificial communication, widens the option space, accelerates cross-referencing, and depersonalizes conflict while preserving organizational closure; (3) programs provide structured arenas to negotiate competing codes—power, money, law, science, media—enabling indirect coordination beyond hierarchical command; evidence of uptake included proposals entering action plans and a roadmap for program-aware AI.

Implications: statistical organizations should design quality frameworks as reflexive programs, institutionalize second-order tools and processes (e.g. specific designed workshop) and deploy AI to augment —not replace—communicative work. Doing so improves communication, decision-making, and quality management, equipping organizations to handle complexity in functionally differentiated environments.

Introduction

BACKGROUND AND PROBLEM

National Statistical Systems (NSS) exist to produce trustworthy, independent, and useful statistics for society. This crucial element in our society is under pressure - e.g., the dismissal in 2025 of the chief statisticians at the Bureau of Labor Statistics in the USA – despite legal protection of independence and coherent and well-crafted guidelines on how an NSS should be run. Around the Sustainable Development Goals, guidance and tools are plentiful—e.g., the Cape Town Global Action Plan (UN, 2017), the UN *Handbook on Management and Organization of National Statistical Systems* (UN, 2021), Eurostat quality and metadata guides (Eurostat, 2022), and PARIS21 coordination resources (PARIS21, 2021)—yet coherent implementation remains uneven. A recent global survey reports persistent coordination weaknesses, particularly in low- and middle-income contexts (PARIS21, 2022). The gap is not due to lack of documents but communicative mechanisms that turn documents into decision-relevant observation and learning.

A SYSTEMS-THEORETICAL STANCE

We ask how statistical organizations can make **programs**—quality frameworks, planning documents, guidelines, and process descriptions—*work* as practical instruments for managing complexity, particularly when supported by AI. Adopting Luhmann's social systems theory, we treat organizations as **autopoietic decision systems** reproduced by communication rather than as aggregates of actors or means–end machines (Luhmann, 2018; Seidl, 2006). Improvement emerges when organizations reorganize how they **observe**—how they draw and circulate distinctions that orient further decisions under uncertainty (Besio & Pronzini, 2010; Luhmann, 2012a).

PROGRAMS AND DECISION PREMISES

In Luhmann's terms, **decision premises**—notably *programs*, *personnel*, and *communication structures*—guide selections without determining them (Luhmann, 2018). Programs absorb uncertainty by providing criteria (goal programs) and if–then conditions (conditional programs) and can be re-entered as records of prior observations (Luhmann, 2012a; 2018). This reflexivity is crucial in **functionally differentiated** environments where statistical organizations couple simultaneously to politics, law, economy, science, and media (Luhmann, 2012a; 2012b). Such multifunctionality renders conflicts of code and priority normal; programs become arenas where these conflicts are translated into negotiable distinctions and rules (Roth, 2025; Knudsen, 2017; Van Assche & Verschraegen, 2008, Drepper, 2006).

PROGRAMS PLUS AI: FROM AUTOMATION TO ARTIFICIAL COMMUNICATION.

Current uses of AI in official statistics emphasize automation and efficiency (e.g., machine learning for data processing) (PARIS21, 2024). We instead configure generative AI as **artificial communication**—a selectable stream of distinctions, cross-references, and candidate formulations that widens the option space and de-personalizes contentious topics while preserving organizational closure (Esposito, 2017; 2021; Luhmann, 2006b). In this

augmentation role, AI accelerates comparison across sources and helps organizations observe their own descriptions in real time (Porter & Heppelmann, 2019; Nielsen, 2024).

RESEARCH QUESTIONS.

1. How can programs help statistical organizations reflect on and improve their own work?
2. How can organizations coordinate across departments and manage conflicts when each follows different codes and priorities?
3. How can AI be designed not merely to automate tasks but to support programs as communicative devices—i.e., to help organizations use programs actively as knowledge in AI-mediated work?

APPROACH AND EMPIRICAL SETTING.

Methodologically, we design interventions as **second-order observational settings**: we introduce and sequence distinctions (e.g., timely/not timely; internal/external; past/present/future; individual/group) so participants can observe *their own* observations and convert generic guidance into emergent, context-specific decision premises (Besio & Pronzini, 2010; Luhmann, 2006a; Seidl, 2006; Nielsen, 2024). Assuming **loose coupling** between premises and decisions, the goal is orientation rather than control (Van Assche & Verschraegen, 2008; Luhmann, 2018).

We analyze two practice-based cases:

Case 1 (Bangladesh Quality Training, 10 days): international quality frameworks were used as shared distinctions for sense-making and planning, supported by second-order tools (xxxxxaudits that read audits, process maps that rewrite process maps, decision-premise canvases). Outputs entered action plans (Eurostat, 2022; Radermacher, 2021; Nielsen, 2024).
Case 2 (AI-Enhanced Consulting Workshop): a triadic dialogue among organization experts, facilitators, and a program-aware generative-AI assistant; AI functioned as irritation and amplifier while selection and judgment remained organizational (Esposito, 2017; 2021; Nielsen, 2024).

In parallel, we **reframe GAMSO** as a *program architecture*: each area is treated as a function that solves a complexity by installing distinctions that can be re-entered in everyday work (UNECE, 2019; Luhmann, 2012a; 2018, Knudsen, 2010, John 2010).

Core argument and contributions.

(1) **Programs as cognitive devices:** used as second-order observers, programs transform generic guidance into emergent, context-specific knowledge and stabilize operational distinctions that improve the preparation of decision premises (Luhmann, 2018; Radermacher, 2021; Scheytt, 2006; Besio & Pronzini, 2010).
(2) **AI as artificial communication:** seeded with local programs, AI widens the option space, accelerates cross-referencing, and supports reflexivity without dissolving closure (Esposito, 2017; 2021; Luhmann, 2006b; Nielsen, 2024).

(3) **Governing multifunctionality:** programs serve as structured arenas for negotiating competing codes (power, law, money, science, media), enabling **indirect coordination** beyond hierarchical command (Luhmann, 2012a; 2012b; Roth, 2025; Van Assche & Verschraegen, 2008; Knudsen, 2017).

STRUCTURE OF THE PAPER.

After **Introduction** (Background and research question; Details about the Luhman based perspective on organisations; Details about operationalisation; Details about content), we turn to **Theoretical background** (Epistemological foundation—From subject–object to self-referential systems; Programs, complexity, and change—Beyond mechanical implementation), then **Cases – how to make programs work** (Introduction — operationalization via structural coupling and distinctions; Reframing GAMSO as a program-centric, function-analytical framework; Case 1: Bangladesh Quality Training Initiative; Case 2: AI-Enhanced Consulting Workshop), followed by **Discussion & implications** and **Conclusion.**

Theoretical background

EPISTEMOLOGICAL FOUNDATION—FROM SUBJECT–OBJECT TO SELF-REFERENTIAL SYSTEMS

A frequent "methods gap" complaint about Luhmannian research misidentifies an epistemological shift as a methodological deficit (Besio & Pronzini, 2010). Systems theory does not lack methods; it reframes how observation relates to its object. As Besio & Pronzini put it, the confusion arises when we "measure" systems theory against methods grounded in a subject/object correspondence model (Besio & Pronzini, 2010).

Luhmann's constructivist move is decisive here. "Cognition is manufactured by operations of observing … [including] the observation of observations" (Luhmann, 2006a). Where classical epistemology asked how cognition can access an independent reality, radical constructivism in Luhmann's version starts from the inverse: cognition is possible **because** systems close operationally; they do not "import" distinctions from their environment but produce them (Luhmann, 2006a, Nielsen, 2022; Schiltz, 2002).

In social systems, this means communications draw distinctions (e.g., accurate/inaccurate, timely/not timely), record them in texts, and recursively observe earlier observations (Luhmann, 2006a; 2012a/2012b). Accordingly, we use a set of distinctions to organize key working concepts for our cases.

This epistemology has practical payoffs. Programs and self-descriptions (policies, quality frameworks, SOPs) are not mirrors of reality; they are selective second-order observations that "coordinate memory performance" and guide follow-on decisions under uncertainty (Luhmann, 2018).

Against this backdrop, we adopt the system/environment distinction as the primary observational schema. Organizations are not objects awaiting external diagnosis; they are autopoietic social systems reproduced by decisions (Luhmann, 2018; Seidl, 2006; Besio & Pronzini, 2010). In this frame, "second-order observation"—observing how observers observe—becomes methodologically central (Luhmann, 2012a/2012b).

Following (Nielsen, 2024), we treat the paper's core distinctions— sense-making (factual/temporal/social), emergent vs. generic knowledge, decision/decision-premises, program types, and cognitive capacity as **decision-relevant distinctions** —as the operational grammar when observing the organisation (Nielsen, 2024).

Implications: Our cases are designed as second-order observational settings. We study how statistical organizations construct decision premises via programs (quality criteria, process descriptions, plans) and how these programs reflexively re-shape subsequent decisions (Nielsen, 2024; Luhmann, 2018).

PROGRAMS, COMPLEXITY, AND CHANGE—BEYOND MECHANICAL IMPLEMENTATION

Traditional change models cast organizations as means–ends machines steered from above; in modern settings this underestimates contingency and the loose coupling of decisions and premises (Andersen, 2000; Drepper, 2006; Luhmann, 2018; Van Assche & Verschraegen, 2008). In Luhmann's terms, **planning cannot tightly bind** decisions to decision premises because interpretation, personnel effects, and environmental irritations intervene; hence "one has to proceed on the assumption of loose coupling" (Luhmann, 2018, 2006b)

Programs operate precisely in this space. They **absorb uncertainty** by providing criteria (goal programs) and if–then conditions (conditional programs). Crucially, at the level of society, codes remain invariant (e.g., true/false, pay/non-pay), while **programs are the changeable semantic apparatus** that conditions their application: "I shall be calling this conditioning 'programs'" (Luhmann, 2012a). Within organizations, management accounting illustrates how such distinctions both measure and **increase cognitive capacity**—they orient attention and enable selective connection among communications (Scheytt, 2006).

Following (Nielsen, 2024), we treat quality frameworks and planning artifacts **as programs** that structure second-order observation in day-to-day work, not as static checklists (Nielsen, 2024). This reframing aligns with Åkerstrøm Andersen's analyses of "semantic tricks" around complexity and change, where steering shifts from command to programming distinctions that make coordination possible across contexts (Andersen,2000).

FUNCTIONAL DIFFERENTIATION AND ORGANIZATIONS—STRUCTURAL COUPLINGS, NOT ISOLATION

Modern society is **functionally differentiated** into partially autonomous systems (science, economy, law, politics, mass media), each operating via a binary code (Luhmann, 2012a/2012b; Drepper, 2006). Organizations are not "islands" but structurally coupled to multiple function systems at once. They are **multifunctional**: they enact scientific,

economic, legal, and political logics simultaneously (Roth, 2025; Knudsen 2017; Drepper 2006).

Standards and frameworks often **mediate** these couplings. In health care, for instance, standards carry scientific, legal, and economic expectations into organizations, becoming durable decision premises (Knudsen, 2017). In official statistics, the same holds for quality frameworks, metadata policies, and legal statutes how (Radermacher, 2021). Our claim—again following (Nielsen, 2024)—is that such programs, when used reflexively, heighten organizational cognitive capacity and enable **indirect steering**: they orient future decisions without prescribing every move (Nielsen, 2024).

COMMUNICATION ABOUT CHANGE—NO "INSIDE ONLY": COUPLING WITH POLITICS, LAW, ECONOMY, MEDIA

Communication about organizational change is never purely internal. In functionally differentiated society, **every** major change topic resonates across power, law, money, science, and media codes (Luhmann, 2012a/2012b; Drepper, 2006). As Roth (2025) argues, organizations are multifunctional hybrids, so internal decisions are shaped by and shape their couplings to external function systems.

Practically, this implies that programs (e.g., quality frameworks) should be treated as **arenas for negotiation** among competing code expectations rather than as technocratic rulebooks (Van Assche & Verschraegen, 2008). In our domain, indicators and quality rules routinely become "boundary objects" across political and scientific publics (Radermacher, 2021), which is why second-order observation of how distinctions travel across contexts is central (Nielsen, 2024).

ORGANIZATION AND CONSULTANCY—REFRAMING ROLES UNDER OPERATIONAL CLOSURE

If organizations are operationally closed decision systems, neither "knowledge transfer" nor **direct steering** from outside is straightforward (Luhmann, 2006b; Knudsen, 2017). Consultants and researchers are **structurally coupled** observers with their own programs (economic, scientific, legal), not omniscient outsiders. The task shifts from prescribing solutions to **programming second-order observations** that help the client system generate its own decision premises (Nielsen, 2024).

In the presence of AI, this shift is amplified. Esposito shows that the core issue with algorithms is "not how the machine works, but how it communicates" (Esposito, 2021). We therefore conceptualize generative AI as an additional **communication partner** that injects generic knowledge and perturbations into organizational discourse, to be selected/ignored in line with the organization's programs (Esposito, 2017; Nielsen, 2024; Moeller 2023).

Cases – how to make programs work

INTRODUCTION — OPERATIONALIZATION VIA STRUCTURAL COUPLING AND DISTINCTIONS

We treat interventions not as "applications" of a ready-made method but as the installation of **new distinctions and observational schemes** that enable self-observation and new options for action (Luhmann, 2018; Besio & Pronzini, 2010). In Luhmann's vocabulary, cognition is generated by observation—including "the observation of observations" (Luhmann, 2006a)—so our interventions are designed to cultivate **both first-order observation** (observing practice) **and second-order observation** (observing how one observes) (Seidl, 2006; Luhmann, 2012a; Nielsen, 2024).

Methodologically, we stage **recursive self-observation** in situ: participants generate observations, then re-enter them as **decision premises** through plans, audits, and process maps—**second-order tools** that structure communication (Luhmann, 2018; Nielsen, 2024). Rather than presume tight steering, we assume **loose coupling** between decision premises and decisions and therefore privilege programming distinctions over command (Luhmann, 2018; Van Assche & Verschraegen, 2008). In short, **"research means theory-driven observation"** (Besio & Pronzini, 2010), and our case designs follow this maxim.

Finally, we scaffold sense-making across **temporal** (past→future), **factual** (internal↔external), and **social** (individual↔group) dimensions and sequence work from **individual ideation → small-group negotiation → plenary synthesis** to surface observations, negotiate meanings, and converge on shared solutions (Nielsen, 2024).

REFRAMING GAMSO AS A PROGRAM-CENTRIC, FUNCTION-ANALYTICAL FRAMEWORK

We recast The Generic Activity Model for Statistical Organization (**GAMSO)** (UNECE, 2019) as a **program architecture** rather than a catalogue of activities. In Luhmann's terms, **codes** remain invariant (e.g., true/false, legal/illegal), while **"the conditioning"** of their application is provided by **programs**—goal criteria and if–then rules that orient future decisions under uncertainty (Luhmann, 2012a, 2018).

Functional reframing. Each GAMSO area is read as a **function that solves a complexity problem** and thereby **reduces environmental uncertainty** (Knudsen 2010; John 2010; Simon, 2006; Baecker, 2006)

- **Strategy & leadership** selects priorities amid political, legal, and user expectations;
- **Capability management** transforms scientific and technological options into usable premises;
- **Corporate support** stabilises legal–economic couplings (finance, HR, IT);
- **Production** interfaces with data sources and user demands.

Decision-premise logic. On this reading, **each function uses** distinctions (e.g., **timely/not timely**, **fit for use/not fit**) that can be re-entered into operations as **quality criteria** and **process conditions** (Nielsen 2014; Scheytt, 2006). Programs coordinate without commanding by **indirect steering** (Nielsen, 2024; Van Assche & Verschraegen, 2008).

Dual observation built-in. Every function performs **first-order observation** (monitoring work) and **second-order observation** (monitoring its own and other functions) via audits, plans, and process maps—**"texts that coordinate memory performance"** and guide follow-on decisions (Luhmann, 2018; Nielsen, 2024).

Internal/external context. The model explicitly distinguishes **internal context** (organisational routines, resources) and **external context** (law, finance, users), making the **structural couplings** visible that tie the NSO to multiple function systems—hence the **multifunctional organisation** (Roth, 20205; Knudsen, 2017).

Payoff. This reframing turns GAMSO into a **living program**: a structure for **self-observation, learning, and adaptation** rather than a static checklist.

CASES — OVERVIEW AND METHOD

We present two practice-based cases that instantiate the program logic above. They are **not** controlled comparisons but **second-order observational settings** designed to let organisations **observe their own observations** while working with programs (quality frameworks, plans, process maps) (Besio & Pronzini, 2010; Luhmann, 2012a; Nielsen, 2024).

- **Case 1** (Bangladesh): a **10-day training** treating the cohort as an **interaction system** that reproduces itself through communication; quality frameworks are used as **distinctions** rather than checklists.
- **Case 2** (AI-enhanced consulting): a triadic dialogue **organisation ↔ experts ↔ generative AI**; AI is configured as an **artificial communication partner** that perturbs and enriches sense-making (Esposito, 2017, 2021).

Across both cases we follow the **three-lens scaffold** (temporal, factual, social) and the **three-stage sequence** (individual → group → plenary) to transform **generic knowledge** (standards, models) into **emergent knowledge** (contextualised meanings) and ultimately into **decision premises** (Nielsen, 2024).

CASE 1: BANGLADESH QUALITY TRAINING INITIATIVE

Context. In 2023, within a World-Bank-financed programme, Bangladesh's NSS sought to strengthen quality management using international frameworks (e.g., NQAF). We designed two **10-day interactive courses** with ~20 cross-department participants, treating the class as an **interaction system** and quality frameworks as **sense-making distinctions** (e.g., **timely/not timely**, **relevant/not relevant**) rather than audit checklists (Eurostat, 2022; Nielsen, 2024).

<u>Intervention design.</u>

- **Interaction system & resonance.** Activities were built to keep communication active (discussion, games, joint problem-solving), cultivating **resonance** between individual consciousness ("psychic systems") and group communication to manage **double contingency** (Luhmann, 2012b; Nielsen, 2024).

- **Integrating generic & emergent knowledge.** Generic standards were introduced briefly, then **re-entered** into participants' own practices to generate **emergent, context-specific meanings** (Nielsen, 2024).
- **Second-order tools. Audits, process maps, and quality-improvement plans** served as **second-order observations**—texts that "coordinate memory performance" and prepare **decision premises** (Luhmann, 2018; Scheytt, 2006; Nielsen, 2024).
- **Decision premises before decisions.** Simulated committee decisions were taken **only after** premises had been articulated (criteria, assumptions, observed gaps), underscoring that **decisions are as good as their premises** (Luhmann, 2018).

Process (three lenses; staged sequence).

1. **Framing** across **time** (past issues → future requirements), **factual** (internal processes ↔ external user needs), and **social** (individual reflections ↔ group consensus).
2. **Individual ideation** of improvement options with responsibilities and timelines.
3. **Small-group negotiation** to consolidate alternatives.
4. **Plenary synthesis** to select **three organisation-wide proposals** (Nielsen, 2024).

Results.

- **Concrete initiatives** with articulated rationales and feasibility considerations were produced.
- A **shared vocabulary** around quality (relevance, accuracy, timeliness) emerged, strengthening the **preparation of decision premises** (Nielsen, 2024).
- Participants **simulated change across time**.
- **Cross-departmental negotiation** improved capacity to converge under multiple stakeholder expectations (law, finance, IT)—an instance of managing **multifunctionality** (Roth, 2025).
- **Follow-up** indicated several ideas entered bureau action plans, evidencing **uptake**.

Analytic note. The training translated **generic quality frameworks** into **programs** that orient communication and coordinate decisions without prescribing particulars—**indirect steering** under **loose coupling** (Luhmann, 2018; Van Assche & Verschraegen, 2008; Nielsen, 2024). In effect, the class enacted **"the observation of observations"** (Luhmann, 2006a) and increased **organisational cognitive capacity** by expanding and stabilising relevant distinctions (Scheytt, 2006; Nielsen, 2024).

CASE 2: AI-ENHANCED CONSULTING WORKSHOP

Context. In 2024, a preliminary pilot was conducted with experts involved in helping a statistical organisation modernise the statistical production and experiment with **generative AI** as a **communication partner**. We configured **AI-CATCH for statistics** (Nielsen, 2025) with documents on statistical quality, the Generic Law of Official Statistics, and related best-practice materials (Nielsen, 2025) The workshop assembled **organisation experts, consultants, and AI** in a triadic dialogue.

Intervention design.

- **Three interacting components:** (1) representatives from the organisation organisation's team (domain knowledge, current assessments), (2) **AI-CATCH**

(generic knowledge retrieval, summarisation, drafting), (3) human experts/facilitators (contextualisation, second-order critique).
- **Cycle:** issue elicitation → AI analysis/drafting → human **second-order observation** of AI's observations → **iterative refinement** of prompts and proposals.
- **Role of AI:** not replacement but **irritation** and **amplifier**—it injects distinctions and examples on demand, to be **selected/ignored** by the organisation (Esposito, 2017, 2021; Nielsen, 2024). As Esposito stresses, the issue is **"not how the machine works, but how it communicates"** (Esposito, 2021).

Outcomes.

- **Enhanced cognitive capacity.** The communicative system considered **broader option spaces** more quickly; participants openly scrutinised AI suggestions (Nielsen, 2024).
- **Knowledge integration & emergence.** AI's generic pointers + expert anecdotes + local constraints yielded **novel, context-specific solutions**—updated SOPs, user-feedback channels, and a roadmap for embedding an AI assistant in routine assessments.
- **Empowered self-observation.** Feeding internal documents to AI created a **mirror** for observing one's own descriptions—**second-order observation** made practical (Luhmann, 2012a; Nielsen, 2024).
- **Governance of codes.** Discussions surfaced tensions among **power, law, money, science, media**; the workshop used **programs** (quality rules, legal clauses) as arenas to negotiate **code expectations** rather than wield "discourse weapons" (Luhmann, 2012b; Knudsen, 2017).
- **Human facilitation remained critical.** Experts translated generic AI outputs into feasible **decision premises** under local resource constraints—an example of **indirect steering** via programming distinctions rather than command (Van Assche & Verschraegen, 2008; Nielsen, 2024).

Analytic note. The AI-enhanced setting shows how **programs supported by AI** can **improve communication, decision-making, and quality management**: AI acts as **artificial communication** that perturbs and structures sense-making, while final selections remain organisational (Esposito, 2017; Luhmann, 2018; Nielsen, 2024).

CONCLUSION ON CASES

Across the two cases, programs (quality frameworks, plans, SOPs) functioned as second-order observers that stabilise distinctions and prepare decision premises under conditions of functional differentiation and loose coupling (Luhmann, 2012a, 2018; Roth, 2014).

The Bangladesh case shows how interaction systems can convert generic knowledge into emergent knowledge through staged sense-making (temporal/factual/social), while the AI-enhanced case demonstrates how artificial communication can amplify cognitive capacity without supplanting human judgement (Esposito, 2017, 2021; Nielsen, 2024).

Crucially, in both settings, standards worked best as distinctions for sense-making (e.g., timely/not timely) rather than as rigid checklists, and decisions improved to the extent that

decision premises were carefully prepared using second-order tools (audits, maps, plans) (Scheytt, 2006; Luhmann, 2018).

This confirmed our main claim: use of programs in the Luhmann sense—supported by AI where appropriate—can improve communication, decision-making, and quality management in statistical organisations by making programs active tools for self-observation and adaptation (Nielsen, 2024).

Discussion & implications

WHAT THIS PAPER CONTRIBUTES TO SOCIOLOGICAL SYSTEMS THEORY OF ORGANIZATIONS

Across the two cases, we showed that **programs**—quality frameworks, plans, SOPs—can be operationalized not as static rules but as **devices of second-order observation** that increase an organization's capacity to connect communications under uncertainty (Luhmann, 2018; Besio & Pronzini, 2010; Nielsen, 2024). In doing so, we extend systems-theoretical work that treats organizations as *autopoietic decision systems* by demonstrating a concrete, replicable way to convert **generic knowledge** (standards, global models) into **emergent knowledge** (context-specific distinctions) through structured communicative processes (Nielsen, 2024; Scheytt, 2006). Methodologically, we side with the view that "research means theory-driven observation" (Besio & Pronzini, 2010), and we stage change as observation design rather than instruction.

Two broader payoffs follow for sociology: first, a clarification of **how** indirect steering works in complex public organizations—through programming distinctions that orient decisions without command (Van Assche & Verschraegen, 2008; Luhmann, 2018; Nielsen, 2024). Second, a concrete account of **technology's place** in systems theory: AI can enter as *artificial communication* that perturbs and scaffolds sense-making without replacing human understanding (Esposito, 2017; 2021).

PROGRAMS AS SECOND-ORDER OBSERVATION: FROM CHECKLISTS TO COGNITIVE DEVICES

The dominant "implementation" stance treats frameworks as compliance checklists. Our cases suggest a different semantics: **programs as texts that organize organizational memory and attention**. As Luhmann writes, cognition is "manufactured by operations of observing … [including] the observation of observations" (Luhmann, 2006a).

When programs are used to **observe prior observations**—audits reading audits; plans rewriting plans—they stabilize distinctions (e.g., *timely/not timely*, *fit for use/not fit*) that can be re-entered as decision premises (Luhmann, 2018; Radermacher, 2021b).
In Bangladesh, the training reframed quality criteria from external demands into **locally meaningful distinctions** and sequenced them across *temporal, factual,* and *social* lenses, converting generic guidance into feasible proposals.

In the AI workshop, programmatic texts (quality rules, legal clauses) became **negotiation arenas** where competing expectations were made explicit and revised. This confirms that organizational improvements follow not from more rules but from **better premises** for decisions—prepared communicatively and circulated as programs (Luhmann, 2018; Nielsen, 2024).

AI AS ARTIFICIAL COMMUNICATION: AUGMENTING COGNITIVE CAPACITY WITHOUT DISSOLVING CLOSURE

Rather than automating judgment, the AI in Case 2 served to **inject distinctions on demand** (summaries, contrasts, exemplars) that the organization could select or reject—precisely *because* it remains operationally closed (Esposito, 2017; Luhmann, 2006b; Nielsen, 2024).

As Esposito notes, the problem is "not how the machine works, but how it communicates" (Esposito, 2021). Configured as a conversational partner seeded with domain programs, AI amplified **cognitive capacity** by widening the option space, accelerating cross-referencing of generic materials, and **de-personalizing** contentious topics (Scheytt, 2006; Nielsen, 2024). Crucially, **final selections stayed human and local**, evidencing closure and avoiding the fiction of external steering.

This reframing also nuances current AI discourses in organizations: the value is not only efficiency but **reflexivity**—a mirror that makes the system's self-descriptions discussable in real time (Luhmann, 2012a; Nielsen, 2024).

GOVERNING MULTIFUNCTIONALITY: NEGOTIATING COMPETING CODES VIA PROGRAMS

Statistical organizations are **multifunctional hybrids**: they simultaneously couple to politics (power), law (legal/illegal), economy (pay/non-pay), science (true/false), and media (attention/not) (Roth, 2014; Luhmann, 2012a; 2012b).

Our cases show that programs can **domesticate code conflicts** by translating them into shared distinctions and conditional rules. In both settings, disagreements about priorities (e.g., timeliness vs. accuracy, transparency vs. confidentiality) were **re-formatted** as program choices (goal criteria; if–then conditions), allowing decision premises to be negotiated rather than fought as "discourse weapons" (Knudsen, 2017; Radermacher, 2021b).

This is indirect coordination under **loose coupling**: programs orient without dictating, and decisions retain room for localized interpretation (Luhmann, 2018; Van Assche & Verschraegen, 2008).

OBJECTIONS AND ALTERNATIVE EXPLANATIONS

Alternative 1: Hierarchy and incentives alone. One might argue that the observed effects could be produced by stronger hierarchy or incentive realignment. Our materials suggest otherwise. Where hierarchical signals appeared, they enabled but did not determine outcomes; what changed practice was the **circulation of distinctions** that participants could appropriate locally (Luhmann, 2018; Nielsen, 2024).

Alternative 2: "AI novelty effect." Gains in Case 2 could be a novelty artifact. We mitigated this by organizing **iterative critique of AI outputs** and by retaining human facilitation. The core mechanism—the **program-guided conversion of generic into emergent knowledge**—operated before and after AI steps; AI accelerated but did not originate it (Esposito, 2017; Nielsen, 2024).

General comments: Effects weaken when (a) programs lack legitimacy or shared semantics, (b) code conflicts are weaponized without a mediating arena, or (c) AI is introduced without **semantic anchoring** in the organization's programs, risking noise or overload (Andersen 2000).

LIMITATIONS AND FUTURE RESEARCH

Our evidence is **short-horizon and qualitative**; we did not track long-term metric shifts in quality or coordination. The researcher-facilitator role may have **amplified resonance** (Hawthorne-like effects). Case transferability is **context-dependent** (Besio & Pronzini, 2010). Future studies should:

1. Combine second-order interventions with **quasi-experimental** designs to observe downstream effects on timeliness, revisions, and user trust.
2. Compare **AI-mediated** vs. non-AI program work across matched units to identify incremental effects attributable to artificial communication (Esposito, 2021).
3. Trace **longitudinally** how distinctions stabilized in programs **migrate** across units and couple to law/finance/IT (Roth, 2025; Knudsen, 2017).
4. Specify **failure modes**: when does added irritation exceed absorptive capacity, and how can programming reduce overload (Luhmann, 2006b; Nielsen, 2024)?

In addition, future research should examine the design and implementation of information systems, including AI, from the perspective of multifunctional organizations. The various organizational codes often compete with one another and are shaped by decisions regarding the technical implementation of these systems. This includes choices about the knowledge and algorithms embedded in AI, who has access to the systems, who finances them, and who operates them (Besio, 2024). A study on establishing the Central Business Register in Denmark in the 90's illustrates this complexity: alongside economic, legal, and political considerations, the design of the system and the assignment of responsibility for information in the system were found to play a critical role (Nielsen, 1997).

PRACTICAL IMPLICATIONS FOR STATISTICAL ORGANIZATIONS AND PUBLIC POLICY

For National Statistical Organisations:

- Treat quality frameworks as **living programs**: install explicit distinctions and **second-order tools** (audit templates, decision-premise canvases, program change logs) to make observation of observation routine (Luhmann, 2018; Nielsen, 2024).
- Institutionalize a **three-lens scaffold** (temporal/factual/social) in reviews and committee work; require all proposals to state decision premises before decisions (Scheytt, 2006; Nielsen, 2024).

- Deploy **AI as a program-aware communication partner**: seed with local programs and constraints; use it to surface options, precedents, and tensions; keep **human moderation** to calibrate irritation (Esposito, 2017; 2021; Porter & Heppelmann, 2019).

For coordination and policy:

- Recognize multifunctionality explicitly in national statistical legislation and governance: design **programs as negotiation arenas** where political, legal, scientific, and economic expectations are translated into operational distinctions (Roth, 2025; Luhmann, 2012a; Radermacher, 2021b).
- Shift donor and oversight practice from prescribing solutions to **programming observation**: fund **semantic infrastructure** (shared vocabularies, cross-unit program reviews, AI literacy) rather than only tools (PARIS21, 2021; 2022).
- Expect **indirect steering**: success indicators should include the **quality of decision premises** (completeness of distinctions, transparency of trade-offs), not merely end-state metrics (Van Assche & Verschraegen, 2008; Nielsen, 2024).

WHY THIS MATTERS FOR SOCIOLOGY

The findings complicate action-theoretic and instrumental accounts by showing how **communication architectures**—programs and AI configured as *communication*—mediate organizational learning and change under functional differentiation. They thus reaffirm the utility of systems theory for modern public organizations while **updating it** with a workable account of **AI as artificial communication** that augments reflexivity without erasing closure (Esposito, 2017; Luhmann, 2012a; 2018).

"Organizations are clearly non-calculable, unpredictable, historical systems … that can observe themselves and others" (Luhmann, 2018). Designing programs and AI to *organize those observations* is the actionable step this paper proposes.

Conclusion

PURPOSE

This study examined how programs—understood in Luhmann's sense as decision premises—can be configured, and AI enlisted as artificial communication, to improve communication, decision-making, and quality management in statistical organizations operating under functional differentiation (Luhmann, 2012a; Luhmann, 2018; Nielsen, 2024).

CORE INSIGHTS

First, programs work when treated as devices of *second-order observation* rather than as compliance checklists. They stabilize distinctions (e.g., timely/not timely; fit for use/not fit)

and “coordinate memory performance,” thereby orienting follow-on decisions under uncertainty (Luhmann, 2018; Nielsen 2024).

In other words, cognition in organizations is “manufactured by operations of observing … [including] the observation of observations” (Luhmann, 2006a). The Bangladesh training showed how generic quality criteria can be re-entered into local practice through staged sense-making, generating emergent knowledge and more explicit decision premises (Nielsen, 2024).

Second, AI contributes when configured as *artificial communication*—a communicative partner that injects distinctions and cross-references generic materials, to be selected or ignored by the organization in line with its programs (Esposito, 2017; Esposito, 2021).

In the AI-enhanced workshop, triadic dialogue (organization ↔ experts ↔ AI) widened the option space, accelerated cross-referencing, and de-personalized contentious topics without dissolving operational closure; judgment and selection remained organizational (Nielsen, 2024).

Third, governing *multifunctionality* requires turning programs into negotiation arenas for competing code expectations (power, law, money, science, media) rather than “discourse weapons.”

Reframing GAMSO as a program architecture made these structural couplings visible and governable, enabling indirect steering via goal and conditional programs under loose coupling (UNECE, 2019; Roth, 2014; Van Assche & Verschraegen, 2008; Luhmann, 2018; Nielsen, 2024).

CONTRIBUTION TO THEORY AND PRACTICE

To systems theory, the paper operationalizes a concrete pathway for transforming *generic knowledge* (standards, models, frameworks) into *emergent knowledge* (context-specific distinctions) through structured communication—thus specifying how organizations, as autopoietic decision systems, increase cognitive capacity by upgrading decision premises (Besio & Pronzini, 2010; Scheytt, 2006; Nielsen, 2024).

We also clarified the place of AI: not as cognition or understanding, but as an additional communication stream whose value turns on how it is *integrated* into programmatic observation (Esposito, 2017; 2021).

To practice, we showed how statistical quality frameworks, plans, and SOPs become living programs when coupled to routine second-order tools (work shop design, decision-premise canvases) and sense-making scaffolds across temporal, factual, and social dimensions (Nielsen, 2024).

Indirect steering becomes measurable as the quality of decision premises rather than only as end-state indicators (Van Assche & Verschraegen, 2008; Luhmann, 2018).

OUTLOOK: AI-SUPPORTED PROGRAMS AND THE NEXT RESEARCH STEPS

Two trajectories follow.

Design: Build *program-aware* AI assistants seeded with local frameworks and constraints so that AI can surface distinctions, precedents, and tensions on demand while remaining selectable noise for the organization (Esposito, 2021; Nielsen, 2024).

Evaluation: Pair second-order interventions with longitudinal tracking of how distinctions stabilize and travel across units and couplings (law/finance/IT), and compare AI-mediated versus non-AI program work on timeliness, revisions, and user trust (Roth, 2025; Nielsen, 2024).

Preconditions remain salient: effects weaken when semantics are not shared, when code conflicts are weaponized, or when AI is introduced without anchoring in extant programs (Andersen, 2000; Knudsen, 2017).

FINAL TAKEAWAY

"Organizations are clearly non-calculable, unpredictable, historical systems … that can observe themselves and others" (Luhmann, 2018).

When programs are treated as those observations—and when AI augments them as artificial communication—statistical organizations increase cognitive capacity, coordinate across competing codes, and decide better under uncertainty.

Ultimately, programs serve as the bridge between organizational self-observation and practical action, enabling complex systems to navigate change more effectively (Besio & Pronzini, 2010; Esposito, 2017; Luhmann, 2012a; Luhmann, 2018; Nielsen, 2024).

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NOTE: Annex A in this paper contains Key concepts and their definition. These are extracted from the 2024 paper. For details look into the paper.

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