Design of Research for Systemic Design: Insights from an occupational safety study of sanitation workers in urban India

Gautam, Mamta

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Mamta Gautam

This paper draws on a systemic intervention in faecal sludge management in the Indian urban context. The study was undertaken in two urban locations in the state of Tamil Nadu to gain a deeper and clearer understanding of desludging operators' occupational practices and worker's safety. The paper discusses the scope, method and approach that was conducted for the Need Assessment Study (NAS) to draw insights for the design of research for culturally diverse contexts. Ethnographic frameworks have been helpful for contextual inquiry; however, with complex systems, the multiple dimensions to be understood pose a significant challenge. Several questions emerge. What is the right sample size? What is the right mix of quantitative and qualitative? What impact would cultural plurality have on the research process? When to stop probing further while conducting research?

Further consideration is given to whether complex systems require a nonlinear approach to conducting research and allow mixed methods. The design of research is acknowledged as a challenge. This case study draws upon broad considerations for conducting design research in pluralistic systems. Conducting and designing research with the awareness that complex social systems cannot be defined, mapped, or transformed without the participation of those whom the process and result will impact. The presentation considers the question of indigenous knowledge and how this could be leveraged.

KEYWORDS: design research, decolonisation, SDG 6, sanitation, participatory research

RSD TOPICS: Cases & Practice, Health & Well-Being Methods & Methodology, Sociotechnical Systems

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Presentation summary

Faecal sludge management (FSM) is emerging as a practical solution for scaling up urban sanitation in India. As implementation moves forward, practice-based knowledge is also growing. The occupational safety of de-sludging operators who clean onsite sanitation systems (OSS) is emerging as a critical issue in FSM. The Government of Tamil Nadu (GoTN) had signalled the state's commitment to Total Sanitation with a range of initiatives. To quickly and economically provide Fecal Sludge and Septage Management either as a complementary solution to network-based sewage systems or a standalone solution, the state issued the Operative Guidelines on Septage Management in 2014.

Safe collection, handling, and transport of faecal sludge is an integral part of septage management but has received limited attention so far. Motorised emptying and transport consist of a truck with a stand-alone or mounted vacuum pump and a storage tank used to empty and transport septage. In Tamil Nadu, these de-sludging trucks operate as an informal sector with limited official data available on their numbers, operations, coverage, and disposal practices. The study was undertaken in two urban locations in Tamil Nadu to gain a deeper and clearer understanding of desludging operators' occupational practices and workers' safety (Gautam et al., 2019). The presentation is an ongoing inquiry and continues the previous case study presentation, "From A Problem to the Problem System" (Gautam, 2022). This presentation discusses the design of the research and insights from the same, told from the point of view of the lead researcher for the Need Assessment Study.

Methods, approach, and duration

The study was approached through a system thinking lens; the focus was on understanding the underlying causal reasons for the persistence of safety concerns and not taking or accepting the design of PPE as the most viable solution. The methods

evolved from the issues the team observed on the ground, and the process was iterative. Findings from one set of methods fed into another. To uncover the mindsets, aspirations, and behaviour of the key stakeholders, defined as the de-sludging operators, analytical tools such as “5 Why” analysis were used to understand the underlying reasons for safety concerns instead of stopping at the most apparent ones (Gautam et al., 2019).

The study involved using a variety of methods, from process documentation to participatory approaches and field testing of the existing safety gear kits. These included desk research, stakeholder (desludging operators and workers) interviews, interviews with clients of desludging workers, interviews with public health, law, and occupational safety experts, and primary research and corresponding methods leading to behavioural insights about sanitation workers. The interviews with stakeholders were conducted over two months. Process observations further strengthened the interviews. Analysis was done iteratively, and field information was validated through secondary sources as well as by subject expert feedback through interviews.

The objectives of the study were to:

- Undertake in-depth analysis of current de-sludging practices (including measures for occupational safety) to understand resultant safety and health hazards for desludging workers.
- Understand the underlying reasons (knowledge, behaviour, etc.) for occupational practices and the existence of hazards.
- Understand the relevance and sufficiency of legally mandated Personal Protective Equipment (PPE) and the challenges for usage.
- Develop a preliminary set of recommendations for improvement of Occupational Safety Standards (OSS).

Insights and key findings

The following aspects of the research design contribute to the findings:

- Quantitative and qualitative research methods
- Observations, interviews, and participatory methods triangulated with external experts

- Design of participatory (Juan de la Rosa) tools
- Role of language in conducting research

These helped to understand the stakeholder's mindset and insightful perspective of safety while taking up the desludging task.

With an intent to decolonise design research, the study emphasised the know-how and evolution of the practice amongst the workers. The practice of desludging being Indigenous has evolved over a period of three decades. Workers have incrementally changed their practices to improve the efficiency of emptying and transportation while minimising direct contact with faecal sludge. Earlier, faecal sludge from OSS was emptied manually using buckets. At the next stage, emptying was still manual but filled in larger tanks and transported by carts. Subsequently, older trucks were retrofitted with tanks and suction equipment to enable emptying and transportation. In the two study cities, purpose-built suction trucks with varying capacities are under operation. Through the research phase, it became evident that the workers engaged over three decades have evolved safe practices, are aware of the hazards, and have evolved methods for navigating through these for their safety. Their technical acumen is at the core of their desludging operations. It includes strategies to navigate risks at critical decision-making stages where the hazards were high and corroborated with analysis of the research team, for example:

- Once at the site, workers check the location of an air vent. A well-placed air vent is the first step in determining whether a septic tank will have poisonous gas.
- Cockroaches are a sure indicator of no poisonous gases in the tank. It is safe to clean the tank. If workers do not see cockroaches, they check them with other methods.
- The other method to check poisonous gases is to observe the sedimentation layers on the slab. If the sediments are white in colour, it means that there are no poisonous gases. The yellow colour strongly indicates the presence of poisonous gases.
- If workers experience watering, irritation, burning eyes, or trouble breathing, they know there is poisonous gas. If still unsure about the presence of poisonous gases, the workers keep the tank open for about 15–30 minutes.

- The workers apply coconut oil on their feet and hands every morning and evening after showering. A thick layer of coconut prevents any sludge from getting in touch with their skin.

Informed by the design of research, analysis, and inferences, the study recommended the following way forward through the three thematic areas of:

- Mitigation to include Elimination and substitution
- Prevention to include administrative and engineering controls
- Protection across various tangents

The recommendations were drawn from learnings from the field and corroborated with occupational safety standards. The recommendations were drawn from stakeholders' process of desludging, ensuring not to be imposing or prescriptive in the implementation of occupational safety while ensuring no violation of standards is encouraged. This was proposed to be achieved through training of sanitation workers.

Conclusion

The design of the research not only allowed in-depth analysis but also revealed contrary to the prevailing narrative of sanitation workers being negligent about their safety. This does not hold on the ground. The research findings outline valid reasons for not using the existing PPE being provided. On the contrary, a few of the PPEs were found to be non-conducive and counterproductive to some, increasing the risk itself as the PPE is not designed for desludging operations. The study establishes that sanitation workers must be engaged as active participants and not as mere benefactors implying the design of participatory (Juan de la Rosa) research to be an instrumental tool . Their long decades of experience and tacit knowledge must be leveraged for process and product innovation. No measures should be foisted upon them with assumptions and preconceived notions.

How the systemic design framework developed for the global north can be used in the global south context has remained an ongoing inquiry while working with complex socio-cultural problems like sanitation. The system thinking framework of complex systems is attempted; however, it is yet to be validated for plural (Querejazu, 2016) cultural contexts like India.

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