



Holistic Flexibility for Deploying Systems Thinking as a Cognitive Skill

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Abstract

Considering Systems Thinking (ST) as a cognitive skill can create greater acceptability of and openness to the discipline from practitioners and researchers outside operations research and management science. Rather than associating ST with frameworks and methodologies, ST as a cognitive skill can help popularize and democratize the discipline. This paper highlights how the conceptual lens of Holistic Flexibility can help practitioners deploy ST as a cognitive skill without the application of any traditional systems methodology. Holistic Flexibility is defined as the dynamic interplay between a state of mind that has the ability to absorb systemic complexity and a state of practice that has the ability to embrace flexibility, both in intent and in form. Through two case-studies, discussions in this paper highlight how Holistic Flexibility can serve as a conceptual lens for systems practitioners. The case-studies demonstrate the importance of a practitioner's ability to seamlessly manage and work with multiple variables, stakeholders, and factors to deliver responsible outcomes with the aid of learning loops. The main contribution of this paper lies in the case-studies and analyses presented that provide use cases for Holistic Flexibility in ST, which will help address recent calls in the discipline for ST to be considered as a cognitive skill.

Keywords Systems Thinking · Holistic Flexibility · Cognitive skill · Systems Methodology

Introduction

Systems thinking (ST) in operations research and management science (OR/MS) is often associated with theories, frameworks, and methodologies to understand complex situations and design interventions to address them. Papers published and conferences conducted in traditional systems forums have a bearing on theoretical developments, conceptual advancements, and methodological applications of ST. However, use cases of ST as a cognitive skill that can be applied without traditional systems frameworks and methodologies are rare. A recent paper by Chowdhury (2022a) in *Systemic Practice and Action*

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Research presented a first-person narrative of the application of systems methodologies creatively and flexibly within an overarching management consultancy framework that is not commonly identified within the gamut of systems methodologies. In the same research, Chowdhury (2022a) talks about drawing inspiration from systems methodologies without directly deploying such methodologies. The case-studies were posited to substantiate recent arguments that call for ST to be considered as a cognitive skill without having to be methodologically bounded. This paper seeks to carry the momentum of this proposition further to argue that ST can be considered a cognitive skill by itself and how this skill can be given direction with the conceptual lens of Holistic Flexibility.

The paper will begin by introducing ST in OR/MS, followed by a critique of the same. Next, the importance of considering ST as a cognitive skill will be presented, which helps in building the argument to overcome the critiques presented in the previous section. Next, Holistic Flexibility will be presented along with a discussion on how it can equip practitioners apply ST as a cognitive skill. Two case-studies will be presented that bring to life this argument. Reflections on the cases, in light of Holistic Flexibility, will follow and an argument presented on how the discussions help in advancing ST. Avenues for future research will be presented before the paper is concluded.

The main contribution of this paper lies in the case-studies and analyses presented that provide use cases of Holistic Flexibility in ST, which will help address recent calls in the discipline for ST to be considered as a cognitive skill.

Systems Thinking (ST) in OR/MS

ST is an overarching term that refers to concepts, frameworks, approaches, methodologies, and interventions that enable the understanding of interrelationships between the constituent parts in a context that give rise to emergent behaviors in the overall system. ST draws inspiration from various disciplines under natural sciences, social sciences, psychological sciences, and critical and complexity studies.

Midgley (2000, 2003), followed by Cabrera and Cabrera (2019), chart out the journey of systems thinking in terms of what they call waves. The first wave was influenced by developments based on the belief that social reality can be improved and managed with a functionalist mindset (LeLeur 2014; Mooney et al. 2007); this saw the rise of hard systems thinking. Methodologies in the first wave include Systems Analysis (Miser and Quade 1988; Optner 1973; Quade and Boucher 1968; Quade et al. 1978), Systems Engineering (Hall 1962; Jenkins 1969), System Dynamics (Forrester 1961), and Organizational Cybernetics and Viable System Model (Beer 1959, 1966, 1981). The first wave faced criticism for its emphasis on prediction and control with systems thinkers positioned as experts (Rosenhead 1989) and neglect of human agency (Burton and Midgley 2003; Checkland 1981; Flood and Romm 1995; Jackson 2000; Lleras 1995; Schecter 1991). Criticism of the first wave led to the rise of the second wave through the works of scholars such as Ackoff (1981), Checkland (1981), Checkland and Scholes (1999), and Churchman (1979). These scholars emphasized on interpersonal relationships, intersubjectivity, learning, and a spirit of open dialogue and accommodation and created what came to be known as soft systems thinking. Methodologies associated with this wave include Strategic Assumption Surfacing and Testing (Mason and Mitroff 1981), Soft Systems Methodology (Checkland 1981; Checkland and Poulter 2006; Checkland and Scholes 1990), Interactive Planning (Ackoff 1981; Ackoff et al. 2006), Interactive Management (Warfield 1994; Warfield and

Cárđinas 2002) and Structured Dialogical Design (Christakis and Bausch 2006; Laouris and Michaelides 2018). Although the second wave sought to address the shortcomings of the first wave, it soon faced criticism from scholars for its inability to address issues of power and hidden dynamics, most popularly articulated by Jackson (1987). Several scholars (Clarke and Lehaney 1999; Mingers 1984, 1992; Oliga 1988; Rajagopalan 2020) talked about power-based ideological frames that create false consciousness among stakeholders that the soft systems tradition fails to address. Criticisms of the second wave gave rise to the third wave in systems thinking that had a focus on liberation and emancipation (Burton and Midgley 2003) and employed developments from complexity theory (LeLeur 2014). This wave came to be known as critical systems thinking (CST). The principle tenets of CST were characterized in its foundational methodologies – Critical Systems Heuristics (CSH) (Ulrich 1983, 1987, 1988, 1994, 1996, 2005), Methodological Pluralism (Flood and Jackson 1991a,b; Jackson 1987, 1990, 1991, 2019; Jackson and Keys 1984), and Systemic Intervention (Midgley 2000).

Jackson and Keys (1984); Jackson (2019), however, is critical of the wave approach and proposes the System of Systems Methodologies (SOSM) as a framework to understand the strength and weaknesses of the plethora of systems methodologies. The SOSM aligns different systems methodologies in two axes: nature of the system (y-axis) and the relationship between participants (x-axis); see Fig. 1.

The SOSM presents six “ideal-types”. In the x-axis, if participants have shared values and understanding, they are in a unitary relationship. If they have differences to the extent that they are still able to stand in unison for the system to function as a cohesive entity, they are in a pluralist relationship. If participants display divergence and power dynamics that are irreconcilable, they are in a coercive relationship. Coming to the systems dimension, if the parts of the system are limited, easily identifiable and has predictable interactions, it is a simple system. If there are multiple parts, outcomes of interactions of which can still be predicted and planned for, it is a complicated system. In case the elements increase

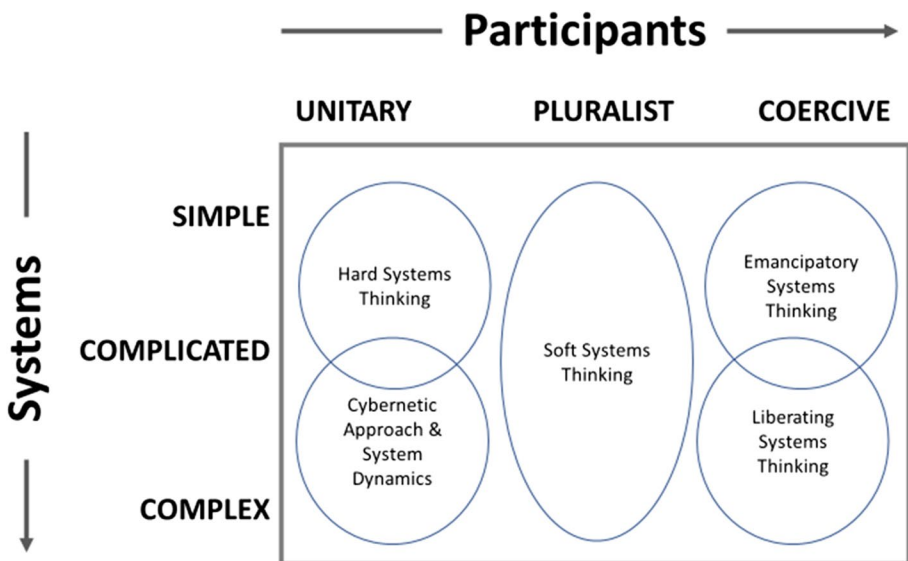


Fig. 1 System of Systems Methodologies (adapted from Jackson 2019; p. 757)

multifold and give rise to complex interactions and unpredictable consequences, it is as a complex system. Depending on where a problem tends to lie, a specific methodology or a combination of methodologies can be applied guided by the SOSM. Jackson (2022), therefore, prefers the SOSM rather than the waves concept as the latter can be misleading as it lumps together specific methodologies under respective waves when the methodologies can themselves be very different and drawn from separate philosophical traditions. Several scholars have proposed what has come to be known as “meta-methodologies” that take a more holistic view of problems and help bringing in several methodologies together. Such meta-methodologies include Total System Intervention (TSI) (Jackson 2000, 2019), Flexible Systems Methodology (FSM) (Sushil 1994, 1997), Participatory Appraisal of Needs and Development of Action (PANDA) (Taket and White 1996), Systemic Intervention (Midgley 2000), and Explore Produce Implement Check (EPIC) (Jackson 2020).

Having talked about the journey of ST in OR/MS, the next section offers a critique of the same.

A Critique of ST in OR/MS

A critique of ST in OR/MS is provided under three categories – philosophical, methodological, and practical:

- **Philosophical:** Rajagopalan (2020) raises fundamental questions on the philosophy underpinning the development of ST in the West, which is, he claims, based on a biased assumption that intentionality is the foundation of human consciousness. Other scholars (Boyd et al. 2004; Fuenmayor 1991a,b,c; Georgiou 2007; Midgley 2000, 2011, 2020) have surfaced similar concerns. Rajagopalan (2020) argues that the Western tradition of ST predominantly ignores considerations of the state of ‘being’ of a practitioner and emphasizes on the intentionality of creating change in an objective manner. He further draws from Heron and Reason (1997) to argue that Western management traditions are limited as it focuses mainly on propositional knowledge and practical knowledge largely ignoring experiential knowledge and presentational knowledge. Similarly, Chowdhury (2022b) highlights the lack of an integrative approach in the Western tradition of ST. Picking up a different thread, Midgley (1996) says that CST is based on Habermas’ Knowledge Constitute Interest (KCI), which is itself like a metaparadigm. By virtue of being a (meta)paradigm, KCIs can pose the danger of sidelining other paradigms. They have a tendency of embodiment of their own assumptions as a result of which, a universal and pluralistic application of systems methodologies is limited and, even, isolationist.
- **Methodological:** The evolution of ST saw a rush of methodologies championing pluralism and greater experimentation within and between methodologies. However, this “Cambrian explosion” of methodologies, as Cabrera (2020) would say, has the tendency of containing variety and diversity within their own boundaries offering little room for bold moves for practitioners outside their prescribed models of interventions. Cabrera (2020) says that the growing diversity and debates between systems methodologies “made it necessary to revert to silos, tribalism and isolationism within certain disciplines to decrease the cognitive dissonance associated with method-overload”. He further argues that this poses a real danger of methodologies being cannibalized and a resultant threat to the value of ST itself

at a time the world needs it the most. In another critique, emanating from the philosophical challenge of ST being grounded on Western traditions, prevalent methodologies are driven by practical and propositional knowledge (Rajagopalan 2020). They emphasize on purpose and action of the change agent and lack of true immersive character that can delve into second-order reflexivity of the stakeholders who are involved and affected. A lack of critical subjectivity is lacking in systems methodologies that are driven by a rational analytical mindset that strives towards truth-oriented inquiry (Rosenhead 1989; Rosenhead and Mingers 2001). What is missed is the power of experiential knowledge that one goes through as they interact with and experience the world and presentational knowledge in the rich forms of art, poetry, sculpting, theatre, dance, mimicry, etc. (Rajagopalan 2020).

- **Practical:** Practitioners may face a variety of issues emanating from the philosophical and methodological challenges highlighted above, five of which are highlighted below.

First, using traditional systems methodologies creatively may be challenging. Someone using TSI may be interested in insights from MM but may not be able to find a coherent way of integrating the two although synergies can be drawn between the two methodologies; or someone using PANDA may be interested in insights from FSM but may not be able to find a coherent way of integrating the two although synergies can be drawn between the two methodologies. Hence, although several discussions exist that support the combination of methodologies, the practical application of such propositions may be challenging.

Second, the choice of a methodology itself may not always be need/situation-dependent but may be influenced by a variety of factors such as the practitioner's familiarity, philosophical commitment, cultural inclination, and institutional affiliation (Mingers and Brocklesby 1997). For instance, Munro and Mingers (2002), in their study of the use of systems methodologies in the UK, found that "people associated with Strathclyde University tend to use cognitive mapping alone or with other methods; those from Hull use TSI together with systemic methods such as VSM; and those associated with Lancaster use SSM" (p. 375).

Third, interventions in fields outside OR/MS such as management consultancy, organization development and business effectiveness (notwithstanding the fact that such fields also often embrace OR/MS methodologies) find it difficult to integrate systems methodologies due to the boundaries that the methodologies set for themselves and the complexity that such methodologies (discussed in the next two points) pose. Practitioners working in fields outside OR/MS often need to work with methodologies within their own disciplines due to reasons such as familiarity with theories in their own disciplines, prescriptions of certain methodologies by their employers or clients (in case of consultants), and due to a sense of alienation posed by terms and techniques of systems methodologies.

Fourth, the issue of unfamiliar language in systems thinking (Chowdhury 2019a; Cordoba-Pachon 2010). Terms and phrases used in systems literature are distinct and are not used in general management. For someone not used to the systems research, such terminologies can be alienating. As Cabrera (2020) notes, different concepts and terms from a variety of philosophical underpinnings in ST may result in a "cacophony of voices" that discourage practitioners from other fields to adopt systems methodologies.

Fifth, systems methodologies are in-depth, detailed and involve multiple stakeholders. While this is what is what is required for the commitments of ST, practition-

ers, especially consultants, are often under pressure from their clients and/or funders to complete projects and produce results within short time periods. In such situations, the complexity of systems methodologies may pose limitations as they can be lengthy and complex. What is often required is a heuristic approach that can pragmatically cater to on-ground realities.

Challenges such as those highlighted above have led to the limited adoption of systems thinking in the industry beyond OR/MS research. The next section will talk about what it means to consider ST a cognitive skill and how this consideration can lead to greater adoption and integration of systems concepts in the industry.

ST as a cognitive skill

Associating ST with methodologies can be limiting as discussed in the previous section. It may also pose challenges for greater adoption of ST in the industry as various methodologies, accompanied by jargon-laden concepts and theories, can keep it away from practitioners who work outside the realm of OR/MS research. Cabrera (2006, 2013) calls for the need for ST to act as a bridge between the physical and the cognitive worlds; he further believes that systems science has a great deal to learn from recent advances in cognitive sciences. Drawing from various traditions, Cabrera et al. (2021) say that ST is informed by studies of cognitive systems, especially metacognition, neuroscience, psychology, development, etc. Several other scholars have posited similar arguments to regard ST as a cognitive skill (Chowdhury 2019a, 2022a; Evagorou et al. 2009; Hmelo et al. 2000; Somme 2005; Tang 2020; Verhoeff 2003; Verhoeff et al. 2018). Going by this line of argument, Levy and Wilensky (2008) and Eilam and Reisfeld (2017) talk about “higher-order systems thinking”, where ST is not to be learned step-by-step as a methodology, but rather to be regarded as a way of perceiving and appreciating complex systemic characteristics. Greene and Papalambros (2016) note: “Systems thinking — like all thinking — is at its core an exercise in cognition, and relies upon high-order cognitive skills and a knowledge of why, when, and how to utilize them” (p. 1). Henning et al. (2012) argue that systems thinkers act in a certain way because of a set of cognitive styles, competencies, and/or preferences that they possess. A combination of both genetic (i.e., innate in some way) and environmental factors (such as parental training, formal education) come into play to shape such cognitive capabilities required for ST. Henning et al. (2012) draw from cognitive psychology and cognitive neuroscience, to argue that there is increasing evidence to show that the way in which different regions of the brain process information has a huge impact on how one perceives of the world, contexts, and problems. Other factors such as sex, gender identity, life experiences, and neurodiversity play a role in how one processes information and makes decisions (Baron-Cohen et al. 2001; Everatt et al. 1999; Reed et al. 2011). Cabrera and Cabrera (2019) and Cabrera (2020) draw inspiration from works of Bateson, Maturana, Midgley, Prigogine, Gell-Mann, Capra, Bertalanffy, Forrester and many others to propose that ST need not be about methodologies but about how one can make Distinctions, organize Systems, recognize Relationships, and arrive at Perspectives, DSRP, in short.

Frank (2000) attributes ST to distinct personality traits, drawing from which, he identifies sixteen cognitive competencies of successful systems engineers, which are directly mapped to concepts in cognitive psychology. These attributes are (borrowing from Greene and Papalambros 2016): understand the whole system and see the big

picture; understand interconnections; understand system synergy; understand the system from multiple perspectives; think creatively; understand systems without getting stuck on details; understand the implications of proposed change; understand a new system/concept immediately upon presentation; understand analogies and parallelism between systems; understand limits to growth; ask good (the right) questions; (are) innovators, originators, promoters, initiators, curious; are able to define boundaries; are able to take into consideration non-engineering factors; are able to “see” the future; are able to optimize.

Several works also argue that ST must be rooted in human consciousness as the ability to have an integrated view of the world is deeply rooted in one’s understanding and realization of the position of one’s own self in the wider scheme of existence (Chowdhury 2022b; Pushkar and Potrashkova 2008). In a similar vein, Henning et al. (2012) consider ST as an ethical imperative “as all of us live within systems, rely upon them, and interact with them for our survival and pleasure, any decision or action we take for our own good will impact others – for others, too, share the systems in which we live, on which we rely, with which we interact” (p. 9). They argue that ST brings in considerations of responsibility into one’s actions as we are now in the realm of “profound relatedness”, where one has a morally responsible role of purposive human activity in the natural, economic, cultural, etc. worlds. Drawing inspiration from Eastern mysticism, Chowdhury (2022b) argues that the understanding of consciousness can lead systems practitioners make decisions with mental clarity and responsible goals. A conscious awareness can go a long way in helping systems managers drop their ego, display emotional balance, and work in unison with the universal forces of existence. Even in the toughest situations, consciousness will allow managers to stay calm and undertake a journey that is fulfilling for the self and the society. Chowdhury (2022b) calls for systems practitioners to invest in greater self-awareness and to look inwards to engage with organizations and societies in a more responsible manner creating an intimate connection between themselves and the larger whole.

Drawing from the above deliberations, ST can be regarded as a “state of mind” or a worldview that is based on one’s cognitive frame. Chowdhury (2019a) undertakes a detailed study of applied ST projects and highlights how a systemic “state of mind” can help understanding and approaching complex problems and craft satisficing approaches to address them with or without the use of systems methodologies. Burge (2015), similarly, talks about ST as a “state of mind” that helps grappling with complexity. Henning et al. (2012) talk about the “worldview” of ST. They draw from the work of Laszlo (1996) and highlight that “The systems view perceives connections and communications between people and nature, and emphasizes community and integrity on both the natural and the human world” (p. 10).

Considering ST as a cognitive skill can create greater acceptability of and openness to the discipline from practitioners and researchers outside OR/MS. Chowdhury (2019a) argues that considering ST as a “state of mind”, rather than associating it with frameworks and methodologies, will help popularize and democratize the discipline. Cabrera et al. (2021) say that such an approach can be associated with the fourth wave of ST as it creates greater approachability and maturity, and universality of the discipline. Deliberation on a proposed fourth wave of systems thinking is beyond the scope of this paper.

With this context, the next section will introduce Holistic Flexibility, a conceptual lens in ST that can help practitioners to move beyond methodologies and apply ST as a cognitive skill.

Holistic Flexibility

Holistic Flexibility is defined as the dynamic interplay between a state of mind that has the ability to absorb systemic complexity and a state of practice that has the ability to embrace flexibility both in intent and in form (Chowdhury 2019a). Holistic Flexibility argues for a pragmatic stance in ST emphasizing on a practitioner's ability to seamlessly manage and work with multiple variables, stakeholders, and factors to deliver responsible outcomes with the aid of learning loops. Holistic Flexibility is not a methodology; rather, it is a conceptual lens for practitioners that can offer them intellectual, emotional, and tactical elasticity in systems practice. Holistic Flexibility makes an appeal to practitioners to be open to making use of various types of thinking, reasoning, and doing; of anticipating, creating, and negotiating; of managing, enabling, and facilitating; of investigating, modelling, and analyzing.

The five main building blocks of Holistic Flexibility are holistic thinking, flexibility, learning, responsible outcomes, and pragmatic practice. A brief description of each of these building blocks is provided below:

- **Holistic thinking:** The ability to transcend a modular approach to problems by approaching systemic boundaries critically and considering them to be contextual and in a state of evolution. Further, the interrelationships between the various sub-systems within the evolving system are also dynamic and evolutionary. This leads to the emergence of a situation as a continual representation of perceived reality from one state to another progressively.
- **Flexibility:** Holistic thinking has a consummate relationship with flexibility. As a system evolves with its dynamic boundaries, a practitioner needs to display three kinds of flexibility to adapt to it: cognitive flexibility (ability to think flexibly), formulative flexibility (application of a variety of methodologies that enable flexible and adaptive practice), and substantive flexibility (access to resource alternatives that can bring flexible practice to life).
- **Learning:** A practitioner and the context of intervention must continually learn and adapt to changing circumstances, expectations, and complexities. Learning is central to the dynamic interplay between holistic thinking and flexibility. Learning can be typified as single-loop learning (are we doing things right?), double-loop learning (are we doing the right things?), and triple-loop learning (why are we doing what we are doing?).
- **Responsibility:** A practitioner must aspire for systemic value addition – social, economic, and environmental – in their area of work. Additionally, they must endeavor to emancipate the situation of stakeholders through practices that are inclusive, participatory, and empowering. Finally, they must provide solutions that are sustainable.
- **Pragmatic practice:** A practitioner must pragmatically bring together the above four building blocks with focus, dedication, direction, and practice. They must hone certain demonstrable behaviors that include being open to challenge, questioning conventional paradigms, being ready to embrace diversity, and shifting between thinking and acting with seamlessness and tenacity.

The above building blocks were crystallized and articulated as principles of Holistic Flexibility in the author's most recent research on the subject (Chowdhury 2022b). It is important to note that Holistic Flexibility does not mean that a practitioner has to

abandon systems methodologies. Rather, training in systems approaches and methodologies is essential as it exposes one to the philosophical underpinnings and practical intent of such methodologies. This understanding, further, can enable a practitioner to apply Holistic Flexibility with greater awareness and sensitivity to the origins of this conceptual lens itself. Holistic Flexibility was developed by Chowdhury (2019a), who is himself trained in the systems tradition and has dedicated extensive years to the application of systems methodologies, before he created Holistic Flexibility as a conceptual lens in ST as a means to pragmatize the discipline.

In the following discussion two case-studies will be presented where Holistic Flexibility served as a conceptual lens to deploy ST as a cognitive skill in two projects.

Prelude to the case-studies

Two consultancy case-studies, that were based in India, will be presented. The case-studies will demonstrate how Holistic Flexibility served as a conceptual lens for the deployment of ST as a cognitive skill. For the sake of client anonymity, the organizations, where the projects were based, have been called Potential Earthmovers (for which, the project was carried out during the year 2011) and Potential Technologies (for which, the project was carried out during the year 2014 to 2015). The former project lasted for three months and the latter, for a year. For the first project, the author played the role of the lead consultant, and for the second project, he was the lead for research and strategy. He was affiliated to two separate consultancy firms during the time the two projects were carried out. For both the case-studies, only methodological discussions, relevant to the context of this paper, will be provided. For a detailed narration of the first case-study, see Chowdhury (2019b), and for the second case-study, see Chowdhury (2019c). This is the first time, both the cases have been brought together to present a retrospective understanding how Holistic Flexibility was brought to life. The intent of presenting two projects from completely different spheres is to highlight that ST as a cognitive skill is industry and solution agnostic as long as it is guided by certain core principles (such as those articulated for Holistic Flexibility).

Case-studies

Potential Earthmovers

About the Company

Potential Earthmovers was a leading British manufacturer of earthmoving and construction equipment. Its India headquarters were located in Delhi National Capital Region (NCR). The company manufactured world-class equipment in three state-of-the-art factories in India. The factories also operated as the global manufacturing hub, with products being exported to over 50 countries. The company had 3500 employees. Potential Earthmovers had a vision of continuing to provide unparalleled shareholder value. To this end, it realized that it had to stay competitive to respond to changing market requirements and higher customer expectations. They were under pressure to constantly innovate and explore newer markets and solutions. They were focusing on building new products and had built a parallel organization for new lines of businesses.

Project Mandate

As the organization was building up preparing from transformative growth, the management realized that its employees were its key asset and that the HR interface was crucial in navigating employee relationships and engagement. A mindset of passion and energy, and team synergy were identified as the key focus areas for Potential Earthmovers to stay competitive. Despite being the market leader, the management wanted to continually learn and evolve without letting complacency setting in the organization. The top management wanted to create a workplace that would constantly challenge its people, set evolving benchmarks, and reward high performers. The management wanted a team with enthusiasm and pride that would be difficult to replicate. It realized that employee engagement lay at the core of everything it wanted to do. The project mandate entailed that the consulting team undertook a detailed employee engagement survey and recommend improvements in people-related systems and processed based on the learning from the survey.

Methodology

A collaborative employee engagement study design was adopted that began with an objective setting workshop with the HR team followed by individual interviews with the CEO and the heads of the departments at Potential Earthmovers. The consultants critically reflected, with the respondents, on certain assumptions that the management had with regards to how they thought the company had to be managed and what drove engagement. This helped to align the project design to the business vision. This was the first step that was meant to set the tone for the study. Key Result Areas (KRAs), that the CEO would expect at the end of the project, were identified along with understanding the opportunities and challenges of a refreshed employee engagement strategy for the company. The discussions helped in understanding the levels and nuances in the organization structure that, in turn, was taken up later to decide how the study would be structured, the sample size to be studied, and the criteria for inclusion and exclusion of respondents. Six engagement drivers were identified that needed to be studied and each driver had their own respective sub-drivers: (1) Quality of life – job security, safety, work-life balance; (2) Work – empowerment/autonomy, sense of accomplishment, work-tasks; (3) Company practices – communication, diversity and inclusion, enabling infrastructure, performance management, customer focus, innovation, talent and staffing; (4) People – senior leadership, departmental leadership, collaboration, supervision; (5) Total rewards – brand/reputation, pay, benefits, recognition; (6) Opportunities – career opportunities, learning and development.

It was not common for the consulting team to conduct engagement surveys with factory workers as most of the surveys that the consulting company carried out were with office bearers, where data collection was carried out in English language. However, in Potential Earthmovers, due to the nature of the industry, it was essential to include workers in the study. It was agreed that for workers, a manual pen-and-paper survey would be carried out and for this, the survey questionnaire would need to be translated to Hindi, the language that is predominantly spoken by workers in the NCR. This decision presented its own challenges as apart from translations and facilitating a manual response process, every response had to carry a unique code so that they could be analyzed anonymously as per the desired data cuts. When it involves large-scale studies, chances of errors are high and meticulous planning need to be carried out to avoid such errors.

The survey administration was planned with the following success factors in mind: clear communication to respondents regarding the objectives and importance of the survey; maximize response rate; ensure respondent confidentiality; ensure reliability and validity; and ensure shop-floor workers' participation. Once responses were received, these had to be manually fed into the online system as the overall analyses were carried out with the help of a software. Several respondent cuts were created to slice-and-dice the data so that in-depth understanding about the organization could be arrived at. Some of these cuts included gender, performance level, function, grade, education qualification, age, tenure, location and online versus pen-and-paper.

Due to the complexity of the survey outcome and the various data cuts that had to be incorporated, the consultants conducted a series of Focus Group Discussions (FGDs) with selected employee cohorts to further understand team behaviors and obtain more in-depth insights. This step was undertaken to ensure that the consultants did not just stop with the numbers but understood what they meant in a human context. Critical levers were identified for the selected cohorts to delve into why certain results were obtained and the specific nuances that they carried. Human interest stories were collected to place the numbers in context and perspective. Immersive interaction with employees also helped the consultants understand pre-set assumptions and mental models held by employees. This understanding was later used for the recommendations that were made to the company's management on how to improve engagement.

The overall engagement score for Potential Earthmovers was 69%, which placed the company in the "high performance" range. However, there was a significant opportunity to increase engagement because 21% of people were "nearly engaged" and 2% of employees were "completely disengaged". These employee groups could be negatively impacting the engagement of their colleagues.

The process unraveled several nuances of the organization. Aspects that led to high employee engagement and those that triggered concerns were analyzed and categorized under the engagement drivers. The project report and recommendations were presented to the top leadership of the company identifying specific action areas. Having collected insights from the HR workshops, leadership interviews, surveys, and the FGDs, a range of recommendations were made to Potential Earthmovers to enhance employee engagement, some of which are indicated in the next section.

Outcome

The analyses enabled the consulting team to create an engagement linkage model based on studying how the engagement drivers impacted each other by their mutual interconnections. These analyses displayed the interrelationships (statistical modelling) between the engagement drivers to help identify where the primary sources of engagement existed. The statistical linkage display suggested that the strongest roadmap to enhance the overall engagement at Potential Earthmovers lay in considering recognition, brand alignment and senior leadership as focus. The organization needed to work on creating a robust recognition program as a priority, supported by objective role clarity, goal setting and performance management system. This could enable the strong external brand to be translated into an employee-friendly internal brand for its people. This needed to be driven at the highest level by the top management. These findings were presented in the form of an immersive workshop with the company's top management, where critical questions were asked, assumptions surfaced, and value systems explored.

Detailed recommendations were made along six priority engagement drivers with a change management plan. These drivers were recognition, brand alignment, innovation, career opportunities, departmental leadership, co-workers, and performance management. Performance management emerged as a critical driver and recommendations centered around bringing greater clarity and transparency in the performance management system.

Manager relationship came up as a critical link in driving engagement. The analyses surfaced a direct bearing on how managers could drive the recommendations made. With this in context, a specific solution on Manager Scorecards was offered to Potential Earthmovers. Manager Scorecards gave a score to identified managers respective to the drivers indicated above. The scores were presented in context of industry benchmarks and the average/highest/lowest scores at Potential Earthmovers.

Potential Technologies

About the Company

Potential Technologies was a leading American company that specialized in the field of commercial aerospace, defense, mobility, climate control, and building industries. The company's India headquarters were located in Delhi NCR and it had four other locations across the country where its business units (BU) were housed. It was a leading contributor to India's nation building efforts. It had partnerships with several state governments to support the design and execution of people-centered sustainable solutions. To enable the same, it created strong collaborations with stakeholder groups, citizens' groups, government agencies, and other companies to create a symbiotic ecosystem for people and businesses to succeed in a manner that is financially viable, socially responsible, and environmentally sustainable. It endeavored to create a single integrated solution from complementary technologies to increase efficiency and enhance effectiveness to deliver both technology and customer value.

Project Mandate

In the years preceding this intervention, there were significant policy interventions and industry interest in sustainable urbanization. Cities in India were beginning to adopt best practices in sustainable development. India was witnessing an upsurge in social enterprises working in the field of sustainable urbanization. The rapid pace of growth of urban centers and the rapidly gaining momentum of sustainable development practices presented a significant opportunity for Potential Technologies to contribute, with its technology and business expertise, to a wide spectrum of areas ranging from energy, conservation, mobility, housing, zoning, community, and regeneration, among others. This, in turn, was also a business opportunity for the company, as its future largely depended on progressive urbanization. Potential Technologies and sustainable urbanization needed a mutually symbiotic relationship. The company realized that it had to take communities alongside in this new reality so that it continued to enjoy the popular support and goodwill that it always prided itself of.

With the above context in mind, Potential Technologies invited the consulting team to create a campaign that would involve and empower communities in the path to sustainable urbanization. The management offered an open space to the consulting team to come up with a strategy that would be innovative and pioneering for India. Funds were committed

to support the strategy creation, project design, program implementation, public relations (PR), and impact evaluation. The geography and city for the project was left open to be assessed and finalized by the consultants.

Methodology

The project started with a creative deliberation between the consultants and the project team identified by Potential Technologies that comprised of one BU head, the finance head of the same BU, and the corporate PR head. The consultants facilitated a series of creative deliberations to identify the purpose of the program to be crafted, its stakeholders, its alignment to the company's business expertise, desired impact, and branding. As the consultants started working and presenting the work-in-progress strategy and plan, several implementation challenges and disagreements on the design emerged. It was known from the beginning that the program would require a robust multi-stakeholder working model. The lead for research and strategy (the author of this paper) undertook travel to meet stakeholders, who could be potential partners, in the cities of Delhi NCR, Bengaluru and Mumbai, and to determine the city for the proposed program. Learning from these meetings were consolidated and incorporated in the creative deliberation process. The city of Bengaluru, in South India, was finally chosen for the program, considering several factors. Bengaluru is the capital city of Karnataka, a progressive state in South India. It was also one of the fastest growing cities in India that is expected to be more than 50% urbanized by 2030 (MGI 2010). It had, over the years, successfully emerged as a cosmopolitan city that people from different parts of India had preferred to call home. Compared to other cities, Bengaluru presented a great degree of receptiveness to stakeholders who took a keen interest in civic issues and housed several proactive citizens' bodies, businesses, education institutions, subject matter experts, and influencers in the national and international stage.

After several rounds, it was agreed that the project would have the following drivers: Upgradation (a framework to identify areas of sustainable urbanization with the vision to upgrade the living conditions in an urban center); Involvement (an approach to establish citizens directly to involve them and make them owners in the change process); Transformation (implementation of selected projects by citizens over a period of time to transform their neighborhoods with the support of grants and technical incubation provided by Potential Technologies); and Celebration (to recognize the good work and highlight the potential that citizens could bring to change in their own lives if they are given the right opportunity).

The creative deliberations led the consulting team to map out the company's business and technological expertise to those that would be required for the project. Apart from funding commitment, specific teams within the company were identified to offer technical support for respective intervention areas during the project execution. This exercise helped to create greater business alignment for the project where intervention areas for sustainable urbanization would not be chosen in isolation, but were aligned with the business drivers for the company.

A two-pronged strategy was articulated: (1) Deficit mapping of Bengaluru; and (2) Neighborhood Improvement Program, which would be the actual project:

- **Deficit Mapping of Bengaluru:** Although there were several progressive initiatives and projects that were being undertaken by the local government in Bengaluru, the city lacked a clear deficit map. The project was well-timed with another major initiative by the government that had recently commissioned a Netherlands-based organization to

undertake the task of developing a master plan for Bengaluru. However, there were no defined measures to incorporate citizens' voices in that master plan. Following discussions with the Bengaluru civic authorities, the consultants decided to conduct the deficit mapping, as part of the project, to capture citizens' voices and feed back the insights from this exercise into the master plan. The deficit mapping report would spell out first-hand what citizens would desire to see in their own city and would also help the consultants identify the intervention areas. An expert agency that worked in urbanization research was identified and mandated to carry out this work. 1500 residents of Bengaluru were reached out to for a primary study. This was also a way to appreciate multiple worldviews and not get restricted to theoretical analyses and relying solely on what existed on official plans for the city.

- **Neighborhood Improvement Program (NIP):** The NIP was formulated to enable citizens to be custodians of their own futures. It was designed to provide an opportunity to community members to work along with civic bodies and urban planners to improve their neighborhoods through grants given out by Potential Technologies. Six intervention areas were identified – mobility, waste management, environment and water, public spaces, public safety, and off- the-grid power – for which, citizens were invited to submit bids for improvement in those areas in their neighborhoods. The intervention areas were further expanded to show their interrelationships and overlaps. The program was branded *Citizens for the City* (C4C). Adopting a multi-stakeholder approach, the NIP was launched at a public event in Bengaluru. The media was leveraged to amplify the message across the city along with social media initiatives to achieve maximum reach. A website was created that served as the central repository of all information pertaining to the initiative. Community members including civil society organizations were encouraged to apply for the grants to improve their neighborhoods. The following criteria were laid out as the basis for applications to be considered for evaluation: innovative idea; impact on quality of life in the neighborhood; implementation, considering governmental compliance; execution timeline of nine months; visibility within the defined neighborhood; and replicability. A jury, consisting of leaders and experts from various walks of life, was constituted to assess the applications. A prominent civic organization was partnered with to extended support to the applicants through the application process. This support was required as the application form had several technical details that had to be completed. It was made sure that everyone who was deserving had the adequate support to have a fair opportunity. A framework to capture outcome-focused metrics was created that could align with Bengaluru's master plan; this would help in conducting an impact assessment using a Theory of Change (ToC) approach.

A steering committee was constituted to monitor and guide the project that had representation from key stakeholders and senior management of Potential Technologies. There were several challenges to address during the program including myopic vision and self-interest among the members of the working committee themselves. The consultants employed various intervention tools to bring the members together, ideate on issues, surface assumptions, and prioritize what needed to be done.

The project demonstrates how a sustainable urbanization model can be created based on three archetypes – mechanistic (addressing efficiencies), cultural (addressing participation and cultural nuances) and transformative (addressing power-relations) – highlighting important learning to address challenges posed in citizens' participation in urban planning.

Outcome

More than 150 applications were received and 90 proposals were qualified after the first round of evaluation. Finally, 14 most deserving proposals were selected to be supported over a period of nine months. None of the projects were meant to be moonshots, but ones that could be managed locally and have local impact. Through the implementation, it was realized that external expertise was also required to support the winning projects for implementation and to mobilize government support for which specific agencies were onboarded on a commercial basis, costs for which were additionally borne by Potential Technologies. The program created opportunities for the employees of Potential Technologies to be involved with the projects in a voluntary manner to lend their technical expertise. At time when the initiative was concluded, the importance to sustain it was realized. To this end, Potential Technologies rolled out the C4C program to other companies to partner, fund, and sustain it beyond its first year.

The next section will present how the journey of the projects, discussed above, can be understood in the light of Holistic Flexibility.

Reflections

Case-studies in the light of Holistic Flexibility

Holistic Flexibility was presented earlier in this paper as a conceptual lens in ST that calls for greater flexibility and creativity in the discipline. Tables 1 and 2 present how the five building blocks of Holistic Flexibility were reflected in the cases of Potential Earthmovers and Potential Technologies, respectively.

The next section will highlight how the discussions, presented, help in advancing ST.

Advancing systems thinking

The case-studies covered demonstrate that, although the overall thinking that drove the interventions were based on a systemic mindset, no systems methodology was used directly. ST was deployed as a cognitive skill guided through Holistic Flexibility as a conceptual lens. Inspiration was drawn from the principles of Social Systems Design (Churchman 1979) that brought together a range of stakeholders, embraced diverse skills-sets, challenged established thinking, and empowered the core target groups – employees, in the case of Potential Earthmovers, and citizens, in the case of Potential Technologies. Openness and flexibility were the hallmarks of both the interventions. Additionally, when there are multiple stakeholders with varying levels of understanding, introducing formal systems methodologies may confuse or complicate the process and Holistic Flexibility, in such cases, offers a conceptual lens to design and execute complex programs with a systemic mindset. The interventions brought Holistic Flexibility to life and have helped label the emerging unconventional deployment of ST by practitioners. This was also highlighted by Dr Luis Sambo (Jackson and Sambo 2020) who spoke about how ST helped him navigate the on-ground complexities of the Ebola epidemic

Table 1 Reflection on the Potential Earthmovers project in light of Holistic Flexibility

Holistic thinking	<ul style="list-style-type: none"> • Challenging traditional boundaries of employee engagement as primarily related to fun and outing initiatives, a wide range of dimensions were taken into consideration. Boundaries were renegotiated and shop floor workers were included in the study. • Various data-cuts were considered based on employees' gender, age, department, location, and level to understand interrelationships. Interrelationships were further explored with the help of a statistical linkage modelling between the key engagement drivers • Emergent patterns were appreciated and acted upon, both in terms of methodology (starting with individual meetings to design of the survey instrument to analyses and recommendations were based on emergent understanding of the problem situation), and data analyses and reporting (overall recommendations were provided based on statistical linkage modelling and immersive conversations with leadership and cross-sectional teams).
Flexibility	<ul style="list-style-type: none"> • Cognitive flexibility was displayed in the consultants' ability to shift thinking on traditional engagement models and engagement survey approaches. • Methodological flexibility was displayed in the crafting of new tools to incorporate a manual survey into an automated one in a different language • Substantive flexibility was displayed in the ability to use resources in a way that could cater to the changing needs of the study methodology in terms of support and adaptation in data collection methods.
Learning	<ul style="list-style-type: none"> • Single-loop learning was displayed in the ensuring that the survey was efficiently conducted, in spite of new demands, and in the timely completion of the project. • Double-loop learning was displayed by incorporating required changes in the survey methodology so that the right voices were captured and in introducing FGDs to have a more comprehensive understanding of employee opinions • Triple-loop learning was displayed by the company on the very basis of mandating a project that would enable a better experience and future for employees. Additionally, the consultants' recommendation on providing Manager Scorecards can be seen as act of learning to create a normative framework for managers to improve engagement in their teams.
Responsibility	<ul style="list-style-type: none"> • Mandating the project was a sense of responsibility of the company towards its employees • The consultants displayed responsibility by taking on extra efforts to adapt the survey methodology to capture all voices. • Immersive dialogues through individual leadership interviews and FGDs with cross-sectional employee cohorts display responsibility in consultancy practice. • The consultants provided clear action areas that could create sustainable change for the betterment of employees.
Pragmatic practice	<ul style="list-style-type: none"> • The consultants displayed adherence to both engagement study best practices and the company requirements in an effective and seamless manner. • The consultants brought in a combination of positivist (numerical analyses of the survey), interpretive (interviews and FGDs), and critical (interactions that explored mental models) perspectives together to deliver on the project. This required the consultants to be comfortable with multiple data sets and cross-cutting insights, at several levels, to make sense of the emerging insights.

in West Africa and establish his leadership position in the World Health Organization without having to use systems methodologies in their pure sense.

Discussions presented provided evidence of how, through Holistic Flexibility, the following benefits can be accrued for ST that help in advancing and popularizing the discipline:

Table 2 Reflection on the Potential Technologies project in light of Holistic Flexibility

Holistic thinking	<ul style="list-style-type: none"> • The intervention challenged traditional boundaries of urban planning in India that lacked a multi-stakeholder approach and excludes communities. • Understanding and acting upon interrelationships at three levels: Company (mapping of technical expertise in the company to program outcomes to extend expertise); Solutions (identification of six areas for sustainable urbanization and appreciating how they connect); Stakeholders (creating synergies between diverse stakeholder groups to navigate the program). • A holistic approach focusing on multiple success imperatives – robust strategy, creativity and branding, subject matter expertise, and community involvement.
Flexibility	<ul style="list-style-type: none"> • Cognitive flexibility was displayed in the consultants' ability to shift thinking on traditional urbanization models in India. This was a bold shift and a strategy was crafted in a way that the initiative did not come as something opposed to government approaches, but something that would complement it. • Methodological flexibility was displayed in the continual evolution of the intervention not only in incorporating relevant stakeholders, but also in bringing in two important prongs for the program for execution of the company's vision. • Substantive flexibility was displayed by the company in their commitment to disburse funds and extend technical support in a way that was not pre-set as part of the project mandate, but that that was left to evolve with the program design. Further, the consultants brought in subject matter expertise from time-to-time throughout the intervention without letting prior plans come in the way.
Learning	<ul style="list-style-type: none"> • Single-loop learning was displayed in the ensuring that the program was efficiently conducted, in spite of stakeholder nuances, and having to work with government red tape and bureaucracy. • Double-loop learning was displayed by the program design itself where both the prongs – deficit mapping and NIP – were decided upon due to what would serve the purpose of sustainable urbanization at the neighborhood level. • Triple-loop learning was displayed by the company on the very basis of mandating a project that would enable sustainable urbanization by putting citizens at the heart of the program, who, otherwise, did not find a voice.
Responsibility	<ul style="list-style-type: none"> • Mandating the project was a sense of responsibility of the company towards a sustainable future for citizens • The consultants displayed responsibility by being patient with differing demands of the steering committee to ensure that the project remains on track and its vision is realized. • The consultants brought in external technical expertise to support deserving applicants with filling up their application forms for the NIP. • Opening up the program to other companies for funding ensured its sustenance beyond its first year. • The program aligned to the United Nations Sustainable Development Goal 11 – Sustainable Cities and Communities.
Pragmatic practice	<ul style="list-style-type: none"> • The consultants displayed grit and commitment through the process to undertake an intervention design that was bold and was a first of its kind in India. • The consultants were able to blend inspiration drawn from different metaphorical archetypes to balance and deliver on a challenging project – mechanistic, cultural, and transformative.

1. Flexibility can mean openness to challenging conventional paradigms, and different kinds of flexibility can be identified.
2. Flexible approaches can lead an intervention towards meaningful outcomes and that inflexibility stands the danger of leading projects to limited impact.

3. ST can compel a consultant to look beyond short-term (commercial, timeline, etc.) considerations, consider a range of dimensions for intervention design, adopt empowering approaches and be responsible for implementation and capability building.
4. Systems methodologies do not, always, need to be used directly; however, drawing from systems principles can make interventions holistic, values-centric, and sustainable.
5. ST can be deployed creatively to work across mainstream consultancy and systems concepts in a seamless manner.

Discussions presented highlight the benefits that can be accrued by considering ST as a cognitive skill. This consideration also presents the possibility of leveraging alternative means of knowing in systemic methodologies such as metaphors (Chowdhury 2020), art (Acevedo 2011a,b), sculpture (Rajagopalan 2020), and indigenous practices (Yunkaporta 2021). However, such behaviors of a practitioner also bear a sense of responsibility and they need to understand the philosophical bases of ST, as argued earlier in this paper. Considering ST as a cognitive skill also helps in pragmatizing the discipline that will make it more accessible to practitioners working outside traditional OR/MS research. Greater industry adoption of ST will enable practitioners working in complex situations accrue the benefits of a systemic mindset. Ormerod (2021) makes mention of philosophical pragmatism as having a long history in OR; in his words:

Philosophical pragmatism has a long history in OR. Charles West Churchman (1913–2004) and Russell Ackoff (1919–2009), both with a background in philosophy, based their approaches to OR on pragmatist thinking as taught to them by the pragmatist Edward A. Singer, Jr. (1873–1954). Werner Ulrich, a doctoral student and research colleague of Churchman, drew on both Churchman and Jürgen Habermas (1929–) to develop his approach, critical systems heuristics (CSH). Habermas had built pragmatism into his own philosophy. Others who favoured Habermas were thus also drawing on pragmatism, perhaps unwittingly.

Discussions presented in this paper is a bold attempt to further the argument for pragmatism in ST. Holistic Flexibility (Chowdhury 2019a) is the first conceptual lens that brings together a range of dimensions – holistic thinking, flexibility, learning, responsibility, and pragmatic practice – to pragmatize ST as a cognitive skill and thereby represents an advancement in ST.

Future Research

Discussions presented in this paper open up a wide array of future research areas in the topic. Three research questions are of particular interest to the author:

1. Does Holistic Flexibility need a practitioner to be formally trained in systems methodologies so that they are able to draw the full benefit of ST as a cognitive skill, or can anyone operate with Holistic Flexibility as a conceptual lens?
2. Are there specific competencies required for a practitioner to practice ST as a cognitive skill? If so, what are these?
3. Does training and regular use of ST concepts influence a practitioner's neural networks to apply ST as a cognitive skill even without having to think about it? (This point was

brought up by the author's PhD supervisor, Dr Amanda Gregory at the University of Hull, during discussions with the author during his doctoral studies).

Conclusion

Discussions presented in this paper make a call for the consideration of ST as a cognitive skill. To support this argument the conceptual lens of Holistic Flexibility was presented that pragmatizes ST by emphasizing on a practitioner's ability to seamlessly manage and work with multiple variables, stakeholders, and factors to deliver responsible outcomes with the aid of learning loops. Holistic Flexibility is not a methodology; rather, it is a conceptual lens for practitioners that can offer them intellectual, emotional, and tactical elasticity in systems practice. The paper began by introducing ST in OR/MS, followed by a critique of the same. Next, the importance of considering ST as a cognitive skill was highlighted. Holistic Flexibility was presented, next, along with a discussion on how it can equip practitioners apply ST as a cognitive skill. Two case-studies, based in India, were, then, presented that brought to life Holistic Flexibility in practice. This was followed by a reflection on how the interventions, covered in the case-studies, highlighted the application of ST as a cognitive skill. An argument was presented on how Holistic Flexibility advances ST as a discipline recognizing it as a cognitive skill. Avenues for future research were presented.

Data availability No datasets were generated during this research.

Declarations

Competing Interest No competing interests.

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