Complex Adaptive Systems and Generative Organization Development: A Conceptual Integration for Enhancing Organizational Adaptability

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Abstract: This manuscript offers a conceptual integration of complex adaptive systems theory and generative organization development. While generative organization development has often been described as rooted in complexity science, the relationship between Complex Adaptive Systems (CAS) and Generative Organization Development (OD) has not been explicitly articulated in existing literature. This paper positions generative OD as a practical mechanism through which organizations sustain non-equilibrium conditions necessary for adaptation in complex environments. Specifically, the paper makes three contributions. First, it reframes generative OD not merely as a dialogic intervention, but as an organizing mechanism that enhances organizational adaptability within CAS. Second, it clarifies how generative image functions as attractors that help organizations engage in enduring paradoxes such as innovation versus productivity—within adaptive spaces. Third, it articulates leadership-as-host as an enabling leadership practice that intentionally shapes conditions for self-organizing and emergence, offering clear implications for OD practitioners and leaders.

Keywords: Complex adaptive systems, generative organization development, generative image, adaptive space, leadership-as-host

Introduction

The rise in global volatility and the VUCA environment have heightened the complexity and uncertainty of the business environment to an unprecedented degree, requiring organizations to shift away from past practices and traditional ways of thinking and to become more creative and generative. Complex Adaptive Systems (CAS) and Generative Organization Development (OD) provide theoretical and practical frameworks for realizing this shift.

Although there are many similarities between CAS and generative OD, the relationship between the two has yet to be explicitly described. This paper summarizes the similarities between the two and discusses how generative OD contributes to adaptive systems in organizations. Specifically, generative OD is considered to contribute to the organizational adaptability as a CAS, not to bring about equilibrium through organizational problem solving, but through dialogue over generative image, the building of new relationships, and experimental action and learning. Generative image will help transform the paradoxes that CAS must deal with into a new image of the organization and help bring about new ideas and relationships. Leaders need to design their organizations to allow for experimental actions by members and to connect people with common interests.

This paper makes three contributions to the Organization Development and complexity literature. First, it offers a conceptual integration of CAS theory and generative OD, positioning generative OD as a practical mechanism for enhancing organizational adaptability rather than merely a dialogic intervention. Second, it reframes the concept of adaptive space by demonstrating how generative image enables organizations to engage with

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enduring paradoxes between innovation and productivity, order and disorder. Third, it articulates leadership-as-host (McKergow, 2020) as an enabling leadership practice that actively shapes conditions for self-organizing and emergence in complex organizational systems.

Methodological Approach

This study is not an empirical study but rather a conceptual study aimed at theoretical and conceptual integration. In this paper, we adopt a conceptual integration approach that bridges the two theoretical domains of CAS theory and generative OD based on a review of the existing literature. Specifically, we focused on the ontological and epistemological premises common to both theories—namely, a social constructivist worldview, nonlinearity, and emergence from interaction—and compared and organized how these theories conceptualize organizational change and adaptation.

Building on this, by theoretically linking the adaptive processes in CAS with the role of generative imagery emphasized by generative OD, we present an integrated framework for enhancing organizational adaptability.

Thus, this study aims to provide a new theoretical perspective by clarifying the conceptual affinity and complementary relationship between the two theoretical frameworks.

Organization as a Complex System

According to Dooley (1997), management theory in the 19th and early 20th centuries was based on the core principles of reductionism, determinism, and equilibrium, and in fact, all the social sciences were influenced by these paradigms. Reductionism holds that phenomena can be understood by breaking them down into their various components and examining them. Scientific management, for example, has led to the standardization of work methods and tools by breaking down the various actions of good workers (Taylor, 1911). Determinism holds that the future of a system can be predicted by understanding the interactions of the elements that make up the system. Equilibrium holds that the natural state of a system is equilibrium, and non-equilibrium leads to decay. These ideas are highly compatible with the “machine metaphor” (Morgan, 1986), which views organizations as precise machines. For example, the discussion of bureaucratic organizations, the early management process school, or the emphasis of strategic management on analysis, planning, and rules are thought to be based on these ideas.

On the other hand, a new science has emerged that proposes a worldview different from that portrayed by these traditional sciences, and it is having a significant impact on management theory. The assumption that successful systems, whether individual organizations or entire populations, are driven by negative feedback processes toward a predictable state of adaptation to the environment is being questioned by various scientific disciplines. These assumptions, which originated in Newton's physics and Darwin's theory of evolution, are being challenged by a set of interdisciplinary approaches to nonlinear network feedback systems called “science of complexity”. According to Stacey (1995), organizations are also nonlinear network feedback systems, so we should pay attention to what the science of complexity has to offer. In an organization, multiple people influence each other, and a circular interaction occurs in which one person's actions cause the other person to react, which in turn affects him or her. It is also a nonlinear system in which small triggers lead to large movements through such interactions. Based on science of complexity, an organization should be understood as a set of interactions or relationships that include feedback and should not be understood through linear causality or elemental reduction. Also, the system does not necessarily move toward an equilibrium state but may bring about a non-equilibrium state through positive feedback. However, non-equilibrium is the source of self-organization and creativity, and the source of new order. This new order is neither deterministic nor predictable.

Adaptive Mechanisms of Complex Systems

A complex adaptive system (CAS) is a complex system that endogenously generates, discards, and edits learning mechanisms, or schemas (Gell-Mann, 1994). A schema is a prescription for members to behave appropriately within an organization. In organizational settings, schemas do not merely prescribe behavior; they also shape what organizational members attend to, how they interpret situations, and which actions they consider legitimate or even conceivable. As such, adaptation in a CAS requires not only behavioral variation, but shifts in the underlying cognitive schemas that organize sensemaking and interaction.

For an organization to adapt to its environment, it must change its own behavior, i.e., generate or change its own schema. For this reason, the findings of CAS have provided much inspiration for organizations to adapt to their environments; Uhl-Bien and Arena (2018) have organized and synthesized various studies on organizations adapting to dynamic and complex environments (ambidextrous management, dynamic capability, innovation and networks, and complexity) and argued that organizational adaptability can be characterized as a tension between "innovativeness" and "productivity" (Figure 1).

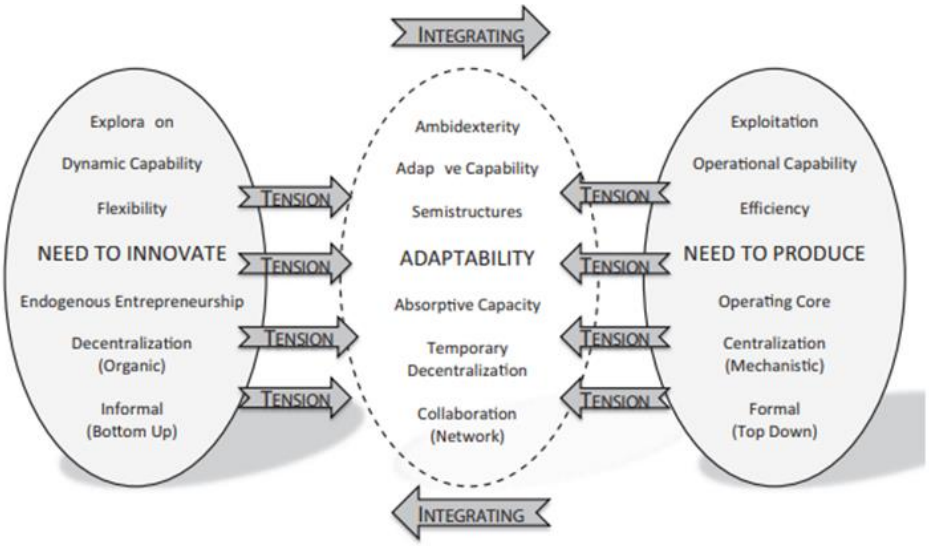

Figure 1. Theoretical Perspectives on Organizational Adaptability (Uhl-Bien and Arena, 2018, p.97)

On the left side of the diagram are the elements necessary for an organization to generate new actions and outputs. For example, entrepreneurship, bottom-up and decentralization are necessary conditions for organizations to innovate. However, this pursuit of creativity and innovation creates a state of disorder in the organization. On the right side of Figure 1 are the factors necessary for an organization to increase productivity and efficiency. For example, operations, top-down, and centralization are necessary conditions for eliminating waste, preserving effective routines, and increasing profits. However, the pursuit of productivity and efficiency also risks making the organization rigid and reducing its adaptability to the environment. The adaptive capacity of an organization is said to be demonstrated by integrating the tension between these two demands.

Other researchers have argued that organizations need to manage such tensions and paradoxes to function as CAS. For example, Stacey (1992) argues that the job of managers is to allow political forces to challenge their own sources of power and control, and that the tension between the mechanistic management of the status quo and the organic management of a learning organization allows the system to flourish. Lee et al. (2003) also state that not only seemingly positive elements such as autonomy and competence but also values such as tolerance of failure. They also state that new knowledge creation requires interaction

between new knowledge and old routines.

To integrate the conflicting demands of innovation and productivity, Uhl-Bien and Arena (2018) present the concept of "adaptive space". An adaptive space is a space that integrates conflicting demands through ambidexterity of exploration and utilization, semi-structured organization, and collaboration through networks. Through adaptive space, organizational adaptability is fostered. Many organizations are designed to achieve stability and order and have a propensity toward equilibrium. Therefore, in the adaptive space, conflicting ideas need to be engaged and connected to move them forward to introduce ideas into the system that will lead to a new adaptive order.

We argue that generative OD could contribute greatly to the adaptive capacity of organizations as complex adaptive systems. Generative OD has the potential to help create adaptive spaces, integrate conflicting organizational demands, sublimate conflicts, and generate experimental initiatives.

Generative Organization Development

Organization Development (OD) emerged in the 1960s as a field of practice that included action research, survey research, T-groups, humanistic psychology, open systems theory, team building, and process consultation. Various theories and approaches have since been proposed in this field, but since the 1980s there has been a convergence toward a form of OD that differs in important ways from earlier OD theories and practices. This recent development has been named "dialogic OD" and its differences from traditional data-based "diagnostic OD" have been discussed (Bushe and Marshak, 2009; 2014). Dialogic OD and diagnostic OD share the same basic values of OD, such as democratic, humanistic, and collaborative exploration. However, they differ in important ways. Diagnostic OD is based on open systems theory, emphasizes the integrity of the various elements that make up the organization, and includes a phase of diagnosis to identify organizational problems. Thus, diagnostic OD is considered to have a high affinity with the equilibrium-based and element-reduction philosophy. Dialogic OD, on the other hand, is based on the science of complexity and social constructionism, in which an organization is a complex phenomenon in which people think and act in an ongoing process of meaning making and emergence. Change is not necessarily accompanied by diagnosis, as change is thought to result from "changing the conversation" that shapes everyday thinking and behavior.

This does not mean that dialogue is not important in diagnostic OD. In fact, according to a study of 79 change projects (Hastings and Schwartz, 2022), two out of three would have failed if they did not also include a dialogue-based strategy. Furthermore, in 90% of the cases where leaders utilized a dialogical mindset, they were successful. The critical difference between the two, however, is that in diagnostic OD, dialogue is a democratic means for members to participate, whereas in dialogic OD, dialogue is both a means of change and the subject itself.

Generativity is one of the new trends in OD research (e.g., Castillo and Trinh, 2019; Colwill, 2022; Cooperrider et al., 2013). Hoogendijk, Hicks and Wilderom (2023) clarify the concept of generativity in OD based on an extensive survey of existing literature. They define organizational generativity as an organization's future-forming potential, manifest as seven qualities of processes that are enacted by the members and stakeholders of the organization: Idea-giving, Relational, Actionable, Transformational, Procreative, Future-focused, Disruptive.

Although research on generative OD is still in its infancy, Bushe and Lewis (2023) distinguish between two types of dialogic OD: high engagement OD and generative OD. According to them, there are two critical differences. First, in high engagement OD, all this activity happens within a relatively defined space. An overall plan or desired outcome already exists. On the other hand, in generative OD, the plan or desired outcome is not

necessarily clear in advance. Second, in high engagement OD, those decisions are implemented within the everyday organizational decision-making and authorization process. On the other hand, generative OD encourages "learning by doing". Leaders need to frame the issue and identify the guardrails any acceptable solution must meet, but then get out of the way, while encouraging self-initiated pilot projects from all stakeholders.

Figure 2 shows a generative change model that illustrates the process of generative OD (Bushe, 2020). This model reflects the idea that, to manage complexity, it is necessary to try small experiments, called "probes" (Snowden and Boone, 2007), and see what works. According to Bushe (2020), the generative change process creates a more adaptive, agile organization, better able to tackle increasing complexity and produce far more change far more quickly than anyone familiar with planned change would consider reasonable.

The generative change model can be understood as a dynamic process through which adaptive space is created and sustained. Generative images function as attractors that bring together divergent values and interests, while experimental probes provide localized variation from which new organizing patterns can emerge.

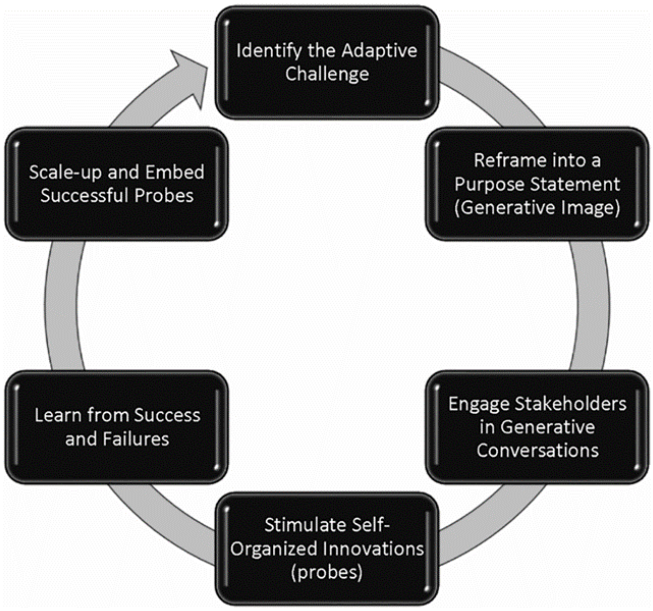

Figure 2. The Generative Change Model (Bushe, 2020, p.13)

As shown in Figure 2, the generative change process begins by identifying the "adaptive challenge". Contrary to technical problems, where the parties involved can identify cause and effect, adaptive challenges, where many factors, including the parties themselves, are involved, and cause and effect are complex, are difficult to define or agree on (Heifetz, Linsky and Grashow, 2009). They typically require managing paradoxes or polarities. So, successfully managing the adaptive challenge requires doing things that seem to be contradictory.

It is the generative image that makes the difference between success and failure in generative OD. The identified adaptive challenge needs to be reframed into a generative image. Indeed, Bushe and Kassam (2005) found a generative image at play in all cases of Appreciative Inquiry that had a transformative effect. Bushe (1998; 2020) has shown that generativity is supported when people discover, create, and/or are presented with an image that allows them to experience their work, and a generative image influences how people think and their decisions and actions.

An effective generative image has three properties (Bushe, 2020): it is a combination of words that present the change challenge in a new way, is initially ambiguous, yet it is attractive and compelling to those who must engage in the change process. For example, the generative image of "sustainable development" opened a space for conversation between environmentalists and those in business where there had been no conversation at all (Bushe, 2018). The image of "stress-free-customer service", where the "stress-free" part played to the desire for increased standardization, predictability, and control, while the "customer service" part played to the desire to be able to say "yes" to any request, could facilitate generative conversations in the Material Supply group at Consolidated Construction (Bushe, 2020). Thus, effective generative image generates new conversations between participants and can help create a dialogue between people who have not previously been in dialogue and stimulate their creativity and facilitate their innovative thinking and experimental action.

From a CAS perspective, this generative power can be understood as operating through shifts in organizational schemas. Generative image functions as cognitive reframing devices that disrupt taken-for-granted categorizations and invite participants to see their work, relationships, and challenges through new interpretive lenses. Rather than directing specific solutions, they alter the conditions of sensemaking from which new patterns of interaction and action can emerge.

Similarities between CAS and Generative OD

Both CAS and generative OD share an issue of how organizations adapt to unpredictable, dynamic, and complex environments. As noted above, CAS draws much of its inspiration from the science of complexity, the study of nonlinear network feedback systems. Schein (2015) proposes that dialogic OD emerged because leaders face more complex, adaptive challenges than before and is better suited to addressing them. And generative OD is based on a view of organizations of social constructionism and complexity science (Bushe, 2000; Bushe and Marshak, 2014; Bushe and Lewis, 2023).

They also share an emphasis on the effectiveness of self-organizing processes rather than hierarchies, planning, or strong, visionary leadership to adapt to such an environment. For example, Stacey (2015) states that the core concepts of complex adaptive systems are emergence and self-organizing. He calls the local interactions of people self-organizing and the unplanned patterns that emerge from them emergence. This self-organizing and emergence do not emerge from a state of complete disorder but are influenced by how participants interact with each other.

In generative OD, self-organizing is also considered an important condition for being generative. As shown in Figure 2, participants engage in conversations based on new images, and experimental attempts (probes) are made to connect people with shared interests. As a result of learning through such attempts, new inclusive patterns emerge (Bushe, 2020; Bushe and Lewis, 2023). Although it is impossible to predict in advance what interactions, actions, and patterns will emerge, they are not entirely accidental or random. Generative image is not only a source of new and unprecedented interactions, ideas, and actions, but also serves to broadly orient them. Leaders can also influence the direction of emergence by framing the problem and selecting acceptable actions. At the same time, leaders need to promote self-organizing by organizing events that allow interested people to meet each other across organizational hierarchies and departments. In addition, leaders are responsible for recognizing the desired results that emerge from small experiments and spreading new patterns within the organization (Bushe and Lewis, 2023). Thus, the process of acquiring new patterns of behavior through learning is the very pattern of adaptation in CAS.

A third common thread is the importance of dealing with contradictions and tensions. As mentioned earlier, in CAS, new order is created through “adaptive space”. As seen in Figure 1, the adaptive space lies between innovation and productivity, between order-disrupting and order-maintaining functions. In CAS, emergent order emerges from the simultaneous

presence of a disturbing element that directs the system toward chaos and a stabilizing element that directs it toward order (Chiles, Meyer and Hench, 2004). Without the disturbing element, the system cannot move out of equilibrium. Without the stabilizing element, on the other hand, the system would descend into chaos. A state of balance between order and disorder is sometimes called dynamic equilibrium, and Brown and Eisenhardt (1997) argue that organizations that respond fluidly to change create their own dynamic equilibrium.

Adaptive spaces are places between order and chaos, where conflicts and tensions arising from the conflicting demands of both sides are addressed and new order is created. Uhl-Bien and Arena (2018) argue that the role of leaders in enabling adaptive spaces is to integrate conflicting ideas and combine various people, information, resources, and technologies, and so on. They call these leadership as enabling leadership.

The source of generative conversation in generative OD is generative image. As noted earlier, generative image often consists of a combination of conflicting words. Schemas in complex adaptive systems tend to operate through habitual and largely unreflective sensemaking. For this reason, adaptation often requires moments in which existing schemas can no longer be applied automatically. Paradoxical generative image creates such moments by producing cognitive tension: they suspend dominant interpretations without immediately replacing them with new ones. This interruption encourages experimentation, reflection, and the exploration of alternative meanings, through which new schemas can gradually emerge in interaction. Leaders bring to light adaptive challenges that organizations needs to address. However, adaptive challenges are difficult to resolve from the thought patterns that created them (Heifetz, Linsky and Grashow, 2009). Generative image helps address adaptive challenges by generating new dialogues and ways of thinking through its anew, paradoxical representations. At the same time, generative image can be helpful in creating conversation among groups with different values. The leader plays the role of host rather than facilitator (Bushe, 2020; McKergow, 2020). The leadership-as-host needs to fulfill six roles (Initiator, Inviter, Space creator, Gatekeeper, Connector, Co-participator) to make the dialogue space generative (McKergow, 2020). The leadership-as-host could be considered to have much in common with enabling leadership in terms of planning a space that invites a variety of people and allows for generative dialogue.

However, it should be noted that tension does not always lead to adaptability. Certain types of tension can create a double-bind situation and risk paralyzing people. The likelihood of falling into a double-bind is particularly high when people find themselves in a state from which they cannot irreversibly escape, and when they are unable to discuss that state. Hosting must maintain a space that allows for meta-conversations about tension and tolerates small, reversible attempts, so that the tension arising from a state of imbalance does not turn into a double-bind.

From a CAS perspective, generative OD can be understood not simply as a dialogic change approach, but as a set of practices that intentionally sustains non-equilibrium conditions necessary for adaptation. In this sense, generative OD operationalizes how new orders emerge in organizations facing complex adaptive challenges.

Conclusion

This paper argues that generativity is not merely a desirable quality of change processes, but a necessary condition for organizational adaptability in complex environments. It has often been argued that generative OD is based on a view of organizations as CAS (Bushe and Lewis, 2023; Bushe and Marshak, 2009; 2014). In this paper, we have attempted to make the relationship between the two more specific and explicit. As we have discussed, both share an issue of how organizations can adapt to dynamic and complex environments, and both share an emphasis on order formation through self-organizing and the formation of spaces to deal with conflicting demands. We believe that generative OD may be effective in enabling adaptive spaces to generate adaptive capacity. Generative OD may offer a more

practical prescription for the formation of adaptive spaces by presenting the concepts of generative image and leadership-as-host. Viewed this way, generative images are not merely communicative devices, but key cognitive mechanisms through which complex adaptive systems renew the schemas necessary for ongoing adaptation. However, tension does not always lead to adaptability. As mentioned above, tension can sometimes create a double-bind, and there is a risk that it may hinder adaptability. Leadership-as-host is expected to play a role in maintaining a space for adaptation so that the tension arising from a state of imbalance does not lead to maladaptation.

Finally, we would like to discuss the relationship between generativity and adaptability. As noted above, generativity is defined as an organization's future-forming potential, manifested as seven qualities of processes that are enacted by the members and stakeholders of the organization: Idea-giving, Relational, Actionable, Transformational, Procreative, Future-focused, Disruptive (Hoogendijk, Hicks and Wilderom, 2023). The more generative the OD is, the more adaptive the organization is thought to be to its environment. In other words, generativity may be positioned as a condition for new order formation necessary for adaptability to a fluctuating environment. While diagnostic OD and high engagement OD (Bushe and Lewis, 2023) play a role in solving problems in the organization and closer to equilibrium, generative OD is thought to have the effect of creating non-equilibrium within existing order to enhance organizational adaptability.

For OD practitioners, this perspective suggests a shift in focus from solving organizational problems to hosting conditions for generative conversations. Rather than striving for alignment or consensus, practitioners are invited to surface adaptive challenges and introduce generative image that can hold organizational paradoxes productively.

Leadership-as-host implies that leaders do not manage change by directing outcomes, but by framing issues, inviting diverse participation, and protecting spaces where experimentation can occur. Importantly, this also requires knowing when not to intervene, allowing self-organizing dynamics to unfold.

While this paper provides conceptual integration, future research could examine how generative image function across different organizational contexts or empirically trace how adaptive spaces evolve over time. To achieve this, it will likely be necessary to employ analytical methods capable of tracking temporal changes in phenomena (e.g., longitudinal case studies or social network analysis).

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