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Systems Theory Towards a New Interpretive Paradigm: From the Concept of Component to the Concept of Action

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This paper explores a transformative shift in Systems Theory, moving from traditional Newtonian ontologies prioritizing static objects to a contemporary understanding emphasizing dynamic interactions and change. In this new interpretive paradigm, the functionality and organizing principles of systems take precedence over their structural components. The theory posits that truth is found at higher levels of abstraction, defined by the relationships and positions among components rather than their isolated identities. Consequently, the agent's role is redefined to focus on the agency inherent in actions rather than on the agents themselves. The concept of "state" emerges as crucial, representing the context within which actions occur and highlighting the relational dynamics between agents and events. This framework characterizes contemporary systems through three interrelated elements: agents, states, and actions, emphasizing dynamic processes over static entities. Actions serve as the ontological basis, with agents acting as executors that can be replaced without disrupting the overall system. This collective and distributed nature of action contributes to system resilience against disturbances. The research asserts that any agent can perform the same action as another, reinforcing the notion that agents play a secondary role while actions remain primary. The theory applies universally, encompassing systems from elementary particles to complex societies, where the common denominator is the concept of action. Additionally, it introduces a temporal dimension associated with states, contrasting with the spatial dimension of agents. As a result, the focus shifts from seeking truth in fixed components to understanding it through evolving actions. Ultimately, this paradigm shift redefines our understanding of existence and knowledge acquisition, moving from reductionist frameworks to transdisciplinary, holistic methodologies. The implications of this new ontology challenge traditional notions of essence and secondary characteristics, paving the way for a more comprehensive understanding of complex systems. This shift opens new horizons for philosophy, redirecting the focus from mere understanding and interpretation to the proactive design of systems, which is particularly relevant in the context of rapid scientific advancements and the rise of artificial intelligence. The study suggests that system design methodologies should be viewed as universal frameworks applicable across various domains, transcending specialized interpretations and fostering a more integrated understanding of complex systems.

Keywords: *Systems Theory, action ontology, Agent, State, Action, Complexity, Transdisciplinary Approach, Systems Design.*

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Introduction

Systems theory emerged in the mid-20th century as an interdisciplinary framework aimed at understanding complex phenomena across various domains, including biology, sociology, and engineering. 'Observed phenomena in the natural and human-made universe do not come in neat disciplinary packages labeled scientific, humanistic, and transcendental; they invariably involve complex combinations of fields, and the multifaceted situations to which they give rise require a holistic approach for their solution' (Laszlo & Krippner 1998). Ludwig von Bertalanffy[1] is often credited with laying the groundwork for general systems theory, emphasizing the importance of viewing systems as wholes rather than merely aggregations of their parts. This holistic perspective challenges reductionist approaches that dominate many scientific disciplines. By transcending reductionist paradigms and embracing a holistic vision of existence, systems theory provides a valuable framework for exploring complexity in all its manifestations, offering fresh insights into the nature of matter and the interconnectedness of life.

Historically, systems theory has evolved from various academic disciplines over time. Its origins can be traced back to the contributions of several key figures.[2] Norbert Wiener, a mathematician and philosopher, played a pivotal role in developing this field through his foundational work on cybernetics. 'His two main ideas—communications and control—rely on feedback of operational properties and transmission of this information' (Adams 2012). Following Wiener, Gregory Bateson broadened the application of systems thinking within anthropology by investigating the intricate patterns and relationships found in ecosystems and human cultures. He highlighted the significance of context and interconnectedness in these systems (Bateson 1972). Other influential scholars contributed to the evolution of systems theory; for instance, Jay Forrester advanced the concept of system dynamics, while Humberto Maturana made significant strides in understanding biological systems.

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[1] Ludwig von Bertalanffy (1901–1972) was the originator of general systems theory. His original work was in organismic system theory where he studied the thermodynamic equilibrium of steady state in living organisms as open-systems. His research culminated in the notion of a general systems theory where he states: The formal correspondence of general principles, irrespective of the kind of relations or forces between the components, leads to the conception of a 'general systems theory' (9) as a new scientific doctrine, concerned with the principles which apply to systems in general. [Bertalanffy, (1950), p.28] Authors note: The (9) refers to Bertalanffy (1949) Bertalanffy continued to espouse general systems theory, and in 1954, he and his colleagues Kenneth Boulding, Anatol Rapoport, and Ralph Gerard founded the Society for General Systems Research (SGSR). The aims of society, captured in its bylaws were: 1 to investigate the isomorphy of concepts, laws, and models from various fields, and to help in useful transfers from one field to another 2 to encourage development of adequate theoretical models in fields which lack them 3 to minimise the duplication of theoretical effort in different fields 4 to promote the unity of science through improving communications among. (Adams, 2012. p: 210)

[2] General Systems Theory includes Bertalanffy (1949, 1950, 1968) and Boulding (1956). Living Systems Theory is represented by Miller (1978), while Mathematical Systems Theory features Mesarovic (1964), Wymore (1967), and Klir (1968). Cybernetics has contributions from Rosenblueth et al. (1943), Wiener (1948), and Ashby (1947, 1952, 1956), and Social Systems Theory includes Parsons (1970, 1979, 1991) and Luhmann) (1995,2012). (Adams, 2012. p: 210)

Together, these pioneers helped establish systems theory as a comprehensive multidisciplinary framework (Adams 2012).

As we note, these figures have contributed to the development of systems theory within their respective fields of expertise. However, the overarching goal is to establish a unified interpretive context that is applicable across all specialized domains. The common thread among the theories proposed by these scholars is their emphasis on analogous organizational structures across different systems, a notion explicitly articulated by Ludwig von Bertalanffy in his General Systems Theory. Nevertheless, a more comprehensive approach offers an integrated ontological perspective that draws significantly from the works of influential thinkers such as Valentin Turchin and Belgian cyberneticist Francis Paul Heylighen[3]. These theorists advocate for a view that prioritizes action over the actor, thereby enabling the application of the same approach to all types of systems, irrespective of their components, as transdisciplinary. Their contributions encourage a reorientation of philosophical inquiry from traditional dialectics toward practical endeavors in designing and simulating real-world systems, particularly in light of contemporary technological advancements. This contribution aims to emphasize two crucial aspects—transdisciplinary methodology and systems design—in the advancement of systems research.

The significance of this research lies in its potential to contribute a novel ontological perspective on existence by linking systems theory with the actions produced by their components. Thus, the application of systems theory extends beyond individual disciplines into an interdisciplinary methodology where the same approach can be applied universally. This perspective highlights the capacity for self-organization while emphasizing contextual factors and organizational similarities among diverse systems. It is not a traditional approach, but rather a design-based approach. In doing so, it opens new horizons for philosophy, moving from understanding and interpretation to design—particularly relevant in light of rapid scientific advancements and the rise of artificial intelligence.

From this discussion, the central question of this paper emerges: What are the dimensions and methodological implications of the new explanatory paradigm arising from the ontological perspective provided by systems theory, which prioritizes action over components? This inquiry invites an exploration of how this paradigm shift influences our understanding of knowledge formation, the role of agency within systems, and the methodologies employed to study complex interactions. It also encourages a reevaluation of our approaches to complexity, advocating for a design framework that is applicable across diverse systems rather than merely seeking to explain them. Such a perspective enriches our understanding of both theoretical and practical applications across various fields.

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In this paper, we review the literature that has shaped the development of systems theory, distinguishing between the traditional perspective articulated by researchers from multiple disciplines—of which general systems theory is the apex—and the new ontological perspective advanced by scholars such as Turchin and Heylin, which serves as the focal point of this study. We examine their innovative ontological conception of existence, which emphasizes action and regards the agent primarily as a facilitator. Furthermore, we differentiate between the collaborative approach championed by proponents of the traditional view and the transdisciplinary approach inherent in the new ontological perspective, highlighting the challenges associated with implementing both methodologies. We propose that systems design can effectively embody a multidisciplinary approach suitable for various types of systems. Finally, we synthesize the key findings presented by this new interpretive paradigm and engage in a discussion and critique, employing a predominantly historical-critical approach throughout this paper.

General System Theory (GST)

The German biologist Ludwig von Bertalanffy established the General Systems Theory when he first presented his ideas on the theory in 1937 at the University of Chicago, but the first article was published twelve years later in 1949[4] (Drack & Apfalter 2007). This theory is not a single explanation that reduces everything to one framework; rather, it serves as a new intellectual or methodological framework that provides a comprehensive view without overlooking particulars. According to Lotfi Zadeh, the main task of system theory is to study the general characteristics of systems without considering their material details and to develop an abstract foundation of concepts and frameworks for studying various behaviors of different types of systems (Lin 2002). Furthermore, Bertalanffy noted that 'it is a logico-mathematical discipline, which is in itself purely formal, but applies to all sciences concerned with systems' (Bertalanffy 1950).

General System Theory (GST) represents a new perspective on the nature of systems by comparing different systems to identify common patterns and functions, ultimately seeking to establish fundamental characteristics applicable across all types. As von Bertalanffy notes, 'the concept of 'system' constitutes a new 'paradigm,' in

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[4] This theory soon evolved and expanded, and with its growing significance, the Society for General Systems Research, Bertalanffy continued to espouse General Systems Theory. In 1954, he and his colleagues Kenneth Boulding, Anatol Rapoport, and Ralph Gerard founded the Society for General Systems Research (SGSR). The aims of society, captured in its bylaws, were [31]: 1. To investigate the isomorphy of concepts, laws, and models from various fields, and to help in useful transfers from one field to another; 2. To encourage the development of adequate theoretical models in fields which lack them; 3. To minimize the duplication of theoretical effort in different fields, and 4. To promote the unity of science through improving communications among specialists." [Adams, K., Hester, P., Bradley, J. M. (January 2013), p. 2]. The philosophical aspects of General Systems Theory were addressed by Ervin Laszlo in 1972, who called for "seeing things as a whole" and perceiving the world as an interconnected and continuously evolving field unto itself (Chen 1993, p. 450). This indicates that there is an interconnection and integration among concepts and laws across all fields, which leads us to transfer concepts and laws from one domain to another.

Thomas Kuhn's phrase, or a 'new philosophy of nature" (Bertalanffy 1972). Unlike the analytical causal mechanical model, which restricts itself to studying material systems as the sole representatives of real systems, GST also encompasses conceptual and abstract systems (Chen 1993). Although these systems may differ in their components, they share similar organizational structures.

Consequently, GST marginalizes the individual components while focusing on the overarching system applicable to all types. It posits that a system consists of something more than structure: it is a structure with certain properties; when the structure is understood from the perspective of its properties, it is understood as a system; we speak of the 'solar system' rather than solar composition (Spirkin 1983). This shift in understanding from structure to function renders research into components secondary to exploring the overall purpose of the system. Thus, the division of systems based on their components—such as material and organic systems—becomes irrelevant. Instead, GST introduces a teleological dimension, indicating that 'system elements are rationally connected" towards a shared purpose' (Mele et al. 2010). This suggests that the system has an aim it strives for, with its constituent parts working collaboratively to achieve it, marking a departure from previous scientific views that transcended teleological explanations.

However, the teleology proposed by GST is distinct from Aristotelian teleology; it is grounded in internal interpretations occurring within the system rather than in a transcendent goal pursued by the system. In essence, GST shifts the research focus from a reductionist view concerned with individual parts to a holistic view centered on the system as a whole. The properties of partial components differ when considered within the context of the entire system. Consequently, 'Systems theory is an interdisciplinary theory about every system in nature, in society and in many scientific domains as well as a framework with which we can investigate phenomena from a holistic approach' (Mele et al. 2010). This interdisciplinary nature arises from the organizational similarities among structurally diverse phenomena.

As a result, there has been an ongoing search for a methodology applicable across all types of systems; 'system theory emphasized the organization of parts into wholes and maintained that the same principles of organization, such as negative feedback, would be found applicable in physics, chemistry, biology, the social sciences, and technology' (Kuipers 2007). Rather than reducing various disciplines to physics alone, GST applies consistent organizational principles across different fields, fostering a more integrated understanding of complex systems.

The organizational similarity between systems and self-organization has led some researchers to propose a more profound ontological perspective within systems theory. This perspective offers a unified ontological framework for diverse systems, thereby justifying not only a collaborative approach but also a cohesive transdisciplinary methodology.

The Ontological Implications of Systems Theory in the New Interpretive Paradigm

Systems theory has shifted towards a more dynamic understanding of systems, emphasizing actions and processes rather than static components. This perspective moves from a focus on structure and the laws governing that structure to an emphasis on function, internal organization, and self-organization within systems. Instead of examining components, one can consider the functions they serve, which are similar across all systems regardless of their components. For instance, there is a parallel between the growth of ecological systems and human development, as well as between the regulation of body temperature in humans and mechanisms of power maintenance in political systems (Weckowicz 2000). As Heylighen (2006) notes, 'Its internal structure or substance can be considered wholly irrelevant to the way it performs that function'. Therefore, what matters is the observable and goal-directed behavior of the system, not its material components.

This transformation reflects a shift in the ontological understanding of existence. As noted by Heylighen (2011), 'the most fundamental components of reality are actions and agents'. While Newtonian ontology regarded 'Objects as primary, change as something secondary' (Turchin 1993), contemporary ontology views objects as secondary and change as primary. The functions or actions performed by a system are deemed more fundamental than the structure itself. Consequently, it is emphasized that 'it is not the 'essence' of the described entities that matters, but their organizing principles' (Turchin 1977). This perspective justifies the pursuit of truth at higher levels, considering it unachievable through mere knowledge of constituent parts. Thus, components no longer hold paramount importance; rather, the configurations and relationships among them express their identity.

The role of the agent is now limited to agency for action; thus, agents share similarities in terms of agency. The space in which action occurs is expressed through the concept of state. Therefore, 'some prefer to treat actions as relationships between agents and events' (Stanford Encyclopedia of Philosophy 2020). Action is the agent's choice of a state among an infinite number of possible states. From this standpoint, systems are composed of three interrelated fundamental elements: agents, states, and actions.

Agents

The components of complex systems are typically referred to as agents, including 'Typical examples of agents used in complex system models are people, firms, animals, cells, computer programs and molecules' (Heylighen 2013). Despite the differences in complexity among agents, they are treated within the same context due to their shared organizational mechanisms. Bertalanffy, in his theory of organisms, posited that matter has multiple levels of complexity; there is no division between organic and inorganic levels, as Descartes had suggested before him. Furthermore, it does not reduce organic matter to the framework of inorganic matter as Newton did; rather, each represents a level of the system that is more or less complex. 'They become more complex and adaptive, and therefore more 'mind-like' and less 'matter-like" (Heylighen 2013). Thus, while agents exhibit similarities in organization, they differ in degrees of complexity.

Action serves as the ontological foundation, with the agent executing the action by choosing one of the available states. As R.M. Hare states, "To be an agent is to be capable of intentional action" (Hare 1981). Although the agent does not vanish with the action's cessation—'an agent can be seen as a cause or producer of actions that does not vanish after the action' (Heylighen 2011)—we do not perceive the agent itself; we only observe the action emanating from it (Turchin 1993). Therefore, 'any individual agent can be eliminated or replaced without damaging the resulting structure. The process is truly collective, i.e., parallel and distributed over all the agents. This makes the resulting organization intrinsically robust and resistant to damage and perturbations' (Heylighen 2008). This indicates that the agent plays a secondary role within the system while the action assumes primary significance.

General systems theory can be applied to various types of agents ranging from elementary particles and atoms to molecules, living organisms, minds, societies, languages, and cultures' (Bertalanffy 1969). The common denominator among these systems is the concept of the agent. This understanding may elucidate the self-organization exhibited by systems based on decentralization; there is no central hierarchical authority dictating what components should do; rather, each agent makes its decision based on what is most suitable for its local conditions.

States

The state of a system, also referred to as the subsystem, carries a temporal dimension, contrasting with the agent, which embodies a spatial and structural dimension. As Turchin (1977) states, it directly depends on our temporal intuition and can only be defined by reference to experience. When we say that something has changed in some respects, we mean that it has transitioned to a different state. Thus, the state describes the agent at different temporal moments, reflecting changes in the world. Turchin further argues that if the world were static, the concept of state would not arise. In those fields where the world is viewed as static, for example in geometry, there is no concept of state. Consequently, there is no room for multiple states from which the agent can choose. However, the agent can indeed select one of the available states, such that 'a state of a part of the world is the set of actions that are possible in this state, with their probabilities' (Turchin 1993). This leads us to face a vast number of possible states, each serving as a starting point for many other potential states.

Each state presents a unique set of potential actions, which agents can select based on their goals and contextual factors. For instance, consider a biological organism in an ecosystem: its state—defined by factors such as available resources and environmental conditions—determines its possible actions, such as foraging for food or seeking shelter. This interplay between agents and states leads to a vast number of possible configurations, each serving as a starting point for myriad other potential states. As agents interact with their environment, they not only respond to changes but also actively shape the trajectory of those changes through their actions. For example, in social systems, individuals (agents) may alter their behaviors based on shifts in societal norms or policies (states), thereby influencing the overall dynamics of the community.

Actions

In the ontology of systems, action is regarded as the fundamental truth, to the extent that '(the word fact itself comes from the Latin facere, which means to do or to make)' (Turchin 1993). Thus, the search for the truth of reality is connected to the exploration of changing actions rather than focusing on components associated with a specific time and place. 'This can be seen as an indication that action should have a higher existential status than space, time, or matter' (Turchin 1993). From this perspective, action is a primary process or simply a change: a transition from an initial state (cause) to a subsequent state (effect) (Heylighen 2011). This distinction highlights the difference between studying processes and examining structure; while processes refer to changes affecting the system, structure denotes the relatively fixed set of interconnections (Heylighen, 2011). 'Which considers change ('becoming') as more fundamental than static existence ('being')' (Heylighen 2011). Therefore, 'the action approach is concrete and practical, as it is concerned with the actions that we as subjects perform in the real world' (Heylighen 2011), rather than being metaphysical inquiries into foundational essence'.

The term "action" is frequently employed in various philosophical contexts, from ethics to metaphysics. However, its definition can vary significantly across different theories. As philosopher Elizabeth Anscombe notes, “an action is something that is done intentionally” (Anscombe 2000). "Action is a fundamental ontological construct that encompasses not only physical movements but also intentional behaviors, decisions, and interactions." (Smith 2020) A rigorous definition of action must account for intentionality, causation, and the distinction between voluntary and involuntary actions. This understanding of action as intentional aligns with the notion that change ('becoming') is more fundamental than static existence ('being') (Heylighen 2011). Therefore, "the action approach is concrete and practical, as it is concerned with the actions that we as subjects perform in the real world" (Heylighen 2011), rather than being metaphysical inquiries into foundational essence. "Understanding systems requires a focus on actions that drive change and evolution rather than merely analyzing their constituent parts." (Heylighen 2011)

The transformative potential of this understanding becomes particularly evident when examining the parallels between different systems. Weckowicz (2000) highlights significant similarities between ecological growth and human development, as well as between physiological regulation and political power maintenance. Such comparisons illuminate the idea that “its internal structure or substance can be considered wholly irrelevant to the way it performs that function” (Heylighen 2006). Consequently, what truly matters in this framework is the observable and goal-directed behavior of the system rather than its material components.

However, it is crucial not to treat agents in the same context while ignoring the varying actions they produce. Although all agents tend to choose the best option among potential choices that bring them closer to their goals, the 'freedom' of a particle or molecule is of course very limited when compared to more complex and intelligent decision-making agents such as bacteria, organisms and people (Heylighen 2011). Therefore, there must be a distinction between mental events (such as John's decision to wear shoes) and physical or physiological events (like the firing of neurons related to that decision) (Stanford Encyclopedia of Philosophy, "Events"). Our actions are characterized by being voluntary and mentally controlled; humans possess introspection and prior intention for action, meaning that actions differ based on the human agent who decides on a particular state among available options. This choice is conditioned by our minds, as we do not perceive external things in the same way. The causal theory of action asserts that what distinguishes intentional action is the agent's intentions or perhaps their beliefs and desires that appropriately cause their behavior (Stout 2005).

This raises questions about the ability to consider actions as similar, as well as the possibility of a transdisciplinary methodology that can be applied to all types of Agents. Such a methodology would need to account for the complexity of these Agents and the margin of freedom they have to choose their actions.

The Methodological Dimensions Emerging from the New Ontological Interpretive Paradigm Offered by Systems Theory

Systems theory has emerged as a critical response to the challenges posed by complexity, instability, and unpredictability. It aims to foster interdisciplinary collaboration by reconnecting disparate fields of study. This approach addresses complex phenomena from multiple perspectives, transcending reductionist analytical methods that confine phenomena to a singular viewpoint. By doing so, it mitigates the risk of generating new crises in other disciplines while attempting to resolve specific issues within a particular domain.

The new ontological perspective proposed by systems theory posits that action is more fundamental than the agent, necessitating a novel methodology that can encompass all systems based on their actions. In this context, a transdisciplinary methodology has been suggested. While the collaborative approach faces significant challenges, it remains a viable option; conversely, the implementation of a transdisciplinary approach presents greater difficulties.

However, this transdisciplinary methodology can be realized through a fundamental shift in methodological thinking: rather than prioritizing understanding, explanation, and description, we can pivot towards design. Design can be applied across various systems due to the inherent similarities in their mechanisms of action, thereby functioning as a cohesive transdisciplinary methodology.

Interdisciplinary Methodology

Opinions have diverged regarding the nature of the interdisciplinary approach. While some consider that this approach eliminates and consolidates specific disciplines within a single framework, others argue that it aims to enhance collaboration among them. In this context, Margaret Boden distinguishes between two fundamental types of interdisciplinary perspectives: collaborative interdisciplinary methodology and synoptic interdisciplinary methodology. (Alvargonzal 2011). 'Klein and Newell would argue that simply adding together disciplinary insights is just multidisciplinary, while integrating these is necessary for interdisciplinarity.' (Szostak 2007) Consequently, Klein and Newell's concept of collaboration among disciplines aligns with Boden's perspective, while their notion of integration points to a comprehensive methodology for disciplines according to their vision.

The fundamental problem with the specialized approach lies in specialists in a specific field being unaware of the scientific output from other disciplines. As a result, 'similar concepts, models and laws have often appeared in widely different fields, independently and based upon totally different facts' (Bertalanffy 1969). Consequently, their colleagues in other fields remain unaware of these laws. From this perspective, Edgar Morin argued that we must redesign our educational programs and policies (Morin 1999) to meet the need for connecting dispersed knowledge. This ensures viewing the system in its interconnections and from all its aspects; thus, our knowledge becomes closer to reality rather than being simplified to ease our minds.

Therefore, the importance of interdisciplinary theory is manifested in its ability to transcend the specialized view, which constitutes a limited perspective on the studied problem and leads to the creation of more severe issues in other areas. According to Morin, 'the fragmentation of knowledge prevents from linking and contextualizing.' (Morin 2005). Failing to see things in their entirety and from all angles diverts us from observing the general context in which they occur; thus, it becomes challenging to find solutions. Numerous examples can be cited; for instance, the construction of the Aswan Dam in Egypt was aimed at economic and organizational goals. However, 'it resulted in obliged the farming population to desert the fields and overpopulate large metropolises like Cairo' (Morin 2005). Therefore, development cannot be localized but must be comprehensive, as problems and phenomena should be viewed and assessed as interconnected elements within a holistic system. This highlights the weakness in development processes in third-world countries, which we believe remain far from a systemic vision and are trapped in a localized partial view that leads these countries to accumulate and entangle problems, making development nearly impossible. In another example, ‘By adopting a food systems perspective, researchers can better understand the complex relationships between agricultural practices, dietary patterns, and environmental health, leading to more effective policies for sustainable food security.’ (Paine 2015). This interdisciplinary approach not only enriches the analysis of food systems but also highlights the necessity of collaboration across various fields, including sociology, economics, and environmental science.

The collaborative approach between disciplines is being implemented despite the inherent difficulties it faces, and there are calls to strengthen this collaboration. However, the transdisciplinary approach presents significant challenges that complicate its realization. Boland illustrates this issue by identifying the problem as one of dispersion and a lack of mutual awareness among specialists from different fields, along with the difficulties associated with crossing disciplinary boundaries (Kaiser et al 2014). Furthermore, researchers trained in specific research methodologies often struggle to acquire skills outside their expertise; instead of acquiring such non-standard skills, it may be easier for a researcher to ask someone from another field for support regarding a particular method (Lang et al 2017). Consequently, it is frequently more feasible to assemble a group of specialists to collaborate on a specific issue than to establish a comprehensive methodology applicable across all disciplines.

Moreover, this proposed methodology tends to overlook the uniqueness and interests inherent to each discipline. As noted, each field has its typical types of research goals and typical types of questions that interest it (Lang et al 2017). Therefore, each discipline possesses methodologies best suited to its particular needs. Some fields necessitate a deductive approach employing qualitative language, while others require an inductive approach utilizing quantitative language (Lang et al 2017). Additionally, the specific terminology used varies significantly from one discipline to another; for instance, the terminology employed in psychology differs from that used in brain physiology (Alvargonzalez 2011). Each discipline may address the same subject matter but from distinct perspectives: For example, while legal studies often focus on the relationships between legal texts, philosophy is concerned with the ethical level even when both discuss the same topic (Lang et al 2017).

Thus, the comprehensive methodology rooted in the new ontological perspective proposed by systems theory suggests that action is more fundamental than the agent, highlighting a fundamental similarity among systems. However, implementing this approach proves challenging due to the difficulties of transcending the unique methodologies inherent to each discipline. The obstacles encountered stem from the methodological nature of this perspective, which is grounded in interpretation and shaped by the distinct interpretive frameworks of various fields. This underscores the need for innovative methodologies that can bridge these interpretive divides. In this light, systems design emerges as a promising avenue for realizing a genuinely transdisciplinary methodology, capable of integrating diverse perspectives and fostering trans disciplinarity.

Systems Design

The shift in methodology brought about by systems theory has transformed the focus from merely studying systems and seeking their truths to designing artificial systems. This transition involves transferring organizational structures from natural systems to artificial systems. The act of designing is a form of inquiry that leads to new understandings. (Schön 1983). This transition involves transferring organizational structures from natural systems to artificial systems. The shift in methodology brought about by systems theory has transformed the focus from merely studying systems and seeking their truths to designing artificial systems. This transition involves transferring organizational structures from natural systems to artificial systems. This transition is exemplified by the emergence of cybernetics, where thinkers like Norbert Wiener emphasized feedback loops and communication within complex systems (Wiener 1961). Additionally, complexity science, explored by philosophers such as Ilya Prigogine, highlights how order emerges in dynamic systems, moving away from static interpretations (Prigogine Stengers 1984). Moreover, technology ethics emphasizes the practical implications of design over abstract theories (Verbeek 2011), There for designers must consider the ethical implications of their work, recognizing their role in shaping society. (Friedman et al.

2006) while ecological design reflects a commitment to sustainability by recognizing the interconnectedness of all life (Capra 1996). Systems philosophy advocates for understanding the interrelatedness of different domains (Laszlo 2003), further highlighting the importance of these shifts in perspective.

Design thinking has further contributed to this shift by prioritizing user-centered solutions and practical problem-solving (Buchanan 1992). emphasizes that "design is a way of thinking that transcends the traditional boundaries of disciplines". This perspective highlights how design thinking integrates diverse fields to address complex challenges. Consequently, systems theory is closely linked to applied sciences in its perception of reality and understanding of truth, rather than being confined solely to a theoretical framework. 'Systems Engineering, i.e., scientific planning, design, evaluation, and construction of man-machine systems; Operations research, i.e., scientific control of existing systems of men, machines, materials, money, etc.;' (Bertalanffy 1969). Thus, systems theory transcends the ongoing debate between explanation and understanding by attempting application; it does not limit itself to description, comprehension, or interpretation but also strives for the design of systems.

This change in perspective is logical and has been necessitated by technological and informational acceleration. As machines have evolved and gradually taken over roles traditionally held by humans, our understanding of truth has also changed. Baudrillard articulated this notion, stating: 'Our systems of signs are no longer anchored in the real world; they float on our screens and multiply in our computers and databases. There is no longer a ‘real’ and an ‘imaginary’ (the interpreted meaning of the real); everything has collapsed into the level of signs and their interactions' (Cilliers 1998). This has led to the emergence of information as a fundamental component of systems, making it more crucial than the physical equipment itself.

Designing systems enables us to comprehend complex real-world situations and provides an effective foundation for problem-solving. 'Better models can give scientists a much firmer grasp on the complexities encountered in economics, biology, medicine, psychology, sociology, law and politics, to name but a few.' (Cilliers 1998). Through modeling phenomena and simulating them via computers, 'actual laboratory experiment can be replaced by computer simulation, the model so developed then to be checked by experimental data.' (Bertalanffy 1969). This allows us to select optimal solutions instead of conducting numerous costly and time-consuming experiments. We can tailor designed systems to maximize benefits; "Products and services can be developed efficiently and effectively, solving human societal problems.

The design process involves employs a collaborative methodology that integrates specialists from the humanities with their counterparts in the natural sciences. This approach facilitates addressing the increasing complexity imposed by technological advancements and allows us to make timely decisions (Laszlo 2009). For example, when dealing with designs for rockets, airplanes, and new building materials, we need collective effort to combine many different aspects of knowledge; these aspects intertwine to form a giant and complex system consisting of people, machines, and many other components (Lin 2002). This aims to reconcile machine design with human needs (Laszlo 2009), allowing for the modeling of human and social realities through natural sciences. Therefore, Ontology can be set aside, allowing for the pursuit of models applicable to any system, irrespective of its ontological components, based on the premise that organizational behavior is consistent and that action is more fundamental than components.

On the other hand, design models often serve as simplifications that risk overlooking critical variables and interactions, which can lead to misleading conclusions. As McNamara (2002) notes, “Models are inherently simplifications of reality, and their utility is contingent upon the accuracy of their assumptions”. This reliance on models can create a “false sense of certainty” in decision-making processes, particularly in fields where human behavior is unpredictable. According to Taleb (2007), “The problem with models is that they are often based on historical data and fail to account for unforeseen events”. In social sciences, this can be particularly problematic, as “human behavior is complex and often defies quantification” (Giddens 1991). Consequently, decision-makers may find themselves relying on flawed models that do not adequately capture the intricacies of real-world scenarios.

In light of these connections, the design of systems emerges as a manifestation of the transdisciplinary approach. This perspective allows for a unified design framework that can be applied across diverse systems, emphasizing a transcendent interpretation of both design and organizational mechanisms. By moving beyond a narrow focus on individual components, this approach advocates for a more holistic understanding of complex interactions. Consequently, this research may pave the way for the development of universally applicable designs that transcend disciplinary boundaries and enhance our comprehension of various systems on a global scale. But on the other hand, it risks oversimplification and neglecting details.

Results

This ontological shift in understanding existence, as articulated through the relationship between systems theory and action ontology, encompasses several significant philosophical implications:

1. A New Vision of Reality: This perspective offers an innovative understanding of reality grounded in organizational structure. It moves beyond the traditional notion of essence, emphasizing the actions performed by agents, their functions, and the relationships among them.
2. Action Over Agent: The concept of action takes precedence over that of essence, highlighting the role of the agent who acts, selects from available options, and considers the choices of other agents. In this framework, any agent can replicate the actions of a previous agent, positioning the agent within a secondary role in the system while elevating action to primary importance.
3. Shifting Philosophical Focus: This theory redirects philosophical inquiry from the dialectic of understanding and interpretation to a new focus on system design, simulation of real-world systems, and the construction of novel systems. This shift resonates with contemporary technological advancements.

4. Changing Perspectives on Systems: There has been a transformation in our understanding of systems, moving from a traditional view—where external structures and laws govern organization—to a concept of self-organization that recognizes systems as emerging from within, organizing themselves in a decentralized manner
5. Consciousness, Teleology, and Intentionality: The theory prompts exploration of consciousness, teleology, and intentionality, suggesting that components may exhibit a form of "awareness" regarding the overarching goals of the system. This awareness can lead to conflict or cooperation among agents.
6. Evolving Epistemological Approaches: Our approaches to knowledge have evolved; understanding is no longer the primary guide for human thought but rather application. This shift acknowledges the complexity of systems and our challenges in isolating or defining their boundaries. Consequently, we move away from epistemological debates concerning the primacy of subject versus object or the relativism versus absolutism of truth, toward a new dimension focused on system design and the application of organizational structures across diverse systems.
7. "Design" serves as a synoptic interdisciplinary methodology applicable to all systems, transcending their ontological components. It emphasizes the primacy of action and interaction in shaping outcomes across diverse contexts.

Discussion

The applicability of the methodology provided by systems theory prompts critical inquiries regarding its significance in advancing human thought. Is it a genuine progression aimed at fostering organization, or does it merely represent another attempt to impose structure upon complexity? Does systems theory offer a pragmatic vision that seeks to transcend metaphysical dilemmas while simultaneously providing comprehensive explanations of existence? If so, can we reconcile this with the possibility that it reflects a reductive perspective, despite its claims of holism?

The actions of agents striving for self-organization may indeed suggest novel metaphysical interpretations. What mechanisms enable these agents to remain conscious of their own goals, the purposes of others, and the overarching objectives of the system? Are there underlying laws that govern this organization—laws that may not necessarily signify self-organization but could instead indicate an imposed order dictated by yet undiscovered principles or perhaps a novel form of regulation?

Moreover, is there potential for applying the same organizational structure across diverse fields, such as the humanities and natural sciences? Can we transcend the fragmentation of disciplines by establishing connections through a transdisciplinary methodology?

This inquiry evokes the relentless pursuit within science for a singular theory that explains everything. Does this methodology represent yet another manifestation of the drive toward a singular explanation, reflecting a cognitive bias towards simplification? Or does it embody a new approach that aligns with contemporary perspectives on organized complexity, seeking to observe and analyze complexity from multiple angles and perspectives?

Can design be understood as a legitimate methodology for navigating complexity, or is it merely an ad hoc response lacking a formal legal framework? What implications does this distinction hold for our understanding of design's role in various disciplines?

We must consider whether this theory presents philosophy with a new role that transcends its traditional functions of understanding and interpretation. Traditionally, philosophy has focused on conceptual analysis, but the emergence of systems-oriented methodology may prompt a shift toward more active engagement in system design. This new role involves philosophical inquiry into the principles and values that underpin system designs.

Philosophers could play a crucial part in shaping methodologies, addressing ethical considerations, and exploring the implications of system interactions. This engagement bridges the gap between theoretical understanding and practical application, fostering a dialogue that enriches both philosophy and science.

Ultimately, this approach does not render philosophy irrelevant; rather, it invites philosophers to actively participate in scientific practices. The interplay between philosophy and science in system design can lead to a deeper understanding of complexity, ensuring that philosophical insights inform scientific endeavors while allowing philosophical thought to evolve through practical engagement with real-world complexities. This nuanced exploration of their interrelationship underscores the importance of continued discourse on their respective contributions to our understanding of complex phenomena.

Conclusion

The contemporary viewpoint provided by systems theory introduces an innovative understanding of existence, emphasizing the notion of action. This perspective advocates for a novel methodological approach that theorists strive to adopt, despite the inherent challenges associated with a transdisciplinary framework applicable to diverse system types. However, these challenges can be addressed by progressing towards the design of systems that are universally applicable across various domains.

The epistemological implications arising from the ontological framework provided by systems theory extend beyond merely describing the world or seeking to understand and explain it. Instead, these efforts encompass the creation of new worlds and the reengineering of existing systems. The objective is to accurately represent reality and develop innovative systems that address the growing needs of humanity, as well as the profound complexities and challenges we face. This endeavor reflects the spirit of our age, characterized by technological advancement and the information revolution, amid our struggle with the unknown.

Rather than simplifying systems, we embrace their complexity, allowing us to model them and entrust our machines with the task of navigating these intricacies. This shift may grant philosophy a new role that transcends its traditional functions of understanding and explanation, enabling us to usher in the age of artificial intelligence.

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