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# A systems *Weltanschauung* of open, distance, and digital education (ODDE)

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## Abstract

This article develops a macro-level theoretical framework for understanding Open, Distance, and Digital Education (ODDE) through the lens of systems theory, with particular emphasis on Niklas Luhmann's theory of social systems. While existing ODDE models draw primarily on functionalist and techno-instrumental perspectives, they offer limited insight into how ODDE evolves within broader societal, technological, and organizational environments. This paper proposes a systems *Weltanschauung* that situates ODDE not merely as a coordinated set of operational subsystems, but as a dynamically differentiated and communicatively constituted part of the education system. After outlining foundational ideas from *General Systems Theory* and Luhmann's concepts of communication, autopoiesis, evolution, and functional differentiation, the article applies these to ODDE to illuminate how its subsystems – design, delivery, interaction, student support, and institutional management – emerge, co-evolve, and stabilize through communicative processes and structural coupling with their environments. The analysis highlights the importance of historical contingency, ecological interdependence, and societal complexity for understanding ODDE's development, particularly in light of digitalization and artificial intelligence, which increasingly blur boundaries between distance and campus-based provision. Building on this theoretical discussion, the article introduces an *Integrated Systems Model of ODDE* that connects techno-functionalist, socio-critical, and ecological paradigms into a coherent multilayered framework. This model emphasizes the interplay among functional operations, reflexive critique, and adaptive responsiveness as core dynamics shaping ODDE's evolution. The paper concludes that adopting a systems-theoretical perspective offers a valuable orientation for future research and for conceptualizing ODDE's role within wider societal transformation.

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## Keywords

open, distance, and digital education; systems theory; Luhmann; communication; evolution; history



...es gibt Systeme [there are systems]  
(Luhmann, 1984, p. 31)

## 1 Introduction

This special issue focuses on the terminology and conceptualization of “open” and “distance” education in a “digital” world, that is, on Open, Distance, and Digital Education (ODDE). In the editorial of its inaugural issue, the editors of the *Journal of Open, Distance and Digital Education* (Zawacki-Richter et al., 2024) outlined the rationale for adopting this name, emphasizing both the historical roots of open and distance education (ODE) and the contemporary developments of digital education within the mainstream of higher education.

The professional field of ODDE as an academic discipline builds upon more than 50 years of research and practice (Zawacki-Richter & Naidu, 2016). As Xiao (2023) emphasizes, historical knowledge should inform evidence-based practices in digital education, ensuring that the integration of emerging technologies draws upon the extensive body of knowledge already established in the field. New technological developments and innovations have always driven the transformation and evolution of distance education systems, often referred to in terms of different generations (see Garrison, 1985; Nipper, 1989; Taylor, 2001). Distance education depends on educational technologies and media that bridge the distance between learners, instructors, and the teaching institution. Mishra (2025) notes that: “[...] definitions of ODE are largely based on the modality approach rather than the conceptual foundations or the theoretical underpinnings” (p. 4).

Tait (1999) recognized early that online learning and increasing digitalization in higher education would lead to blurring boundaries between distance and campus-based education. Today, distance education is no longer a distinguishing feature of open or distance universities; they are under increasing competitive pressure (Olcott, 2024) as almost all universities do offer, to a greater or lesser extent, digital learning opportunities in the form of blended learning or even fully online degree programs. Digital education has entered the mainstream and confronted traditional universities with the challenge of developing appropriate support structures using educational technologies.

In earlier stages, distance education research has been the subject of consistent critique (Bernard et al., 2004; Moore, 1985; Saba, 2000), and has even been described as “atheoretical and predominantly descriptive” (Perraton, 2000, p. 1). This may apply to many published (empirical) studies that often emerged from practice. However, there are both original and borrowed theoretical approaches and foundations for describing and reflecting on the practice of this young discipline (for an overview, see Jung, 2019). Evans and Jakupsek (2023) describe Otto Peters’ *Theory of Distance Education as an Industrialized Form of Education* (Peters, 1965, 1983), Börje Holmberg’s *Theory of Guided Didactic Conversation* (Holmberg, 1983), and Moore’s *Theory of Transactional Distance* (Moore, 1973, 1993) as classics of fundamental importance for defining distance education as a subdiscipline of education (Delling, 1971). A more recent theoretical model, initiated by the rise of computer-mediated communication, is the *Community of Inquiry Framework* proposed by Garrison et al. (1999, 2001).

The theories of Holmberg, Moore, and also Garrison et al. address the functional core of ODDE, i.e., the micro-level of teaching and learning through text-based and digital media. Peters, on the other hand, focused on the meso-level, emphasizing organizational and technological aspects to explain distance education operations through comparisons of distance teaching institutions (Zawacki-Richter, 2019). However, at the overarching systemic macro-level, there is as yet no model or theoretical framework that situates or integrates ODDE within the broader context of

its environment in relation to the wider educational system and other social systems of the society. In an increasingly interconnected and complex world, ODDE cannot be reduced to its functional core. This raises the need for broader conceptual approaches that situate ODDE within its wider societal, technological, and ecological contexts. A holistic view is necessary in order to respond to unforeseen events and disruptions and to navigate an uncertain future.

In this article, I will engage with abstract theoretical foundations of the ODDE system in reference to its environment in relation to other social systems. These are framed under the concept of *systems theory*, whose intellectual origins stem from biology, cybernetics, and communication theory. Bertalanffy (1968) was the creator and chief exponent of a *General Systems Theory* (GST) with an attempt to formulate common laws that apply to virtually every scientific field. Luhmann (1987, 1997, 2012, 2013) was strongly influenced by ideas from GST. He developed a system–environment theory, which he expanded into a theory of autopoietic systems of society. According to this theory, society differentiates into functional systems, among them the education system.

Luhmann’s complex theoretical framework remains largely unknown within our ODDE community<sup>1</sup>. A rare example is the study by Heurich and Lukács (2023), who applied Luhmann’s systems theory to the open science system. They conclude:

System theory not only provides a theoretical framework with broad reach and abstraction, but also offers a foundation for establishing a robust theoretical basis for openness that inherently acknowledges and embraces inherent differences and paradoxes from the outset. (p. 742)

That being said, this article seeks to explore whether, and in what ways, systems theory, especially Luhmann’s theoretical considerations, can be aligned with the structures, levels, and operations of ODDE to contribute to its conceptual development. Of course, within the scope of this article, a holistic systems theory of ODDE cannot be presented – this might be a project for the coming years. What is proposed here is the introduction of new terminologies and a conceptual idea, a systems *Weltanschauung* (world view) of ODDE. This perspective is intended as one contribution among multiple possible frameworks, in which systemic and historical perspectives complement each other and extend beyond the functional core and organizational layer of ODDE operations.

Positionality statement:

Before I changed to education, completed my doctorate, and spent the past 25 years pursuing an academic career in the field of ODDE, including experience as a professor and also administrator at a campus-based university, I studied biology and earned a master’s degree in ecology. In ecology, there are various systems adapted to environmental conditions, undergoing evolution, from a single cell and its components to an entire eco-system. What fascinated me most was the Miller experiment from the 1950s, which demonstrated how organic molecules and eventually living systems can emerge from inorganic matter and energy, the self-organisation of life. In recent months, I have been reading extensively about systems theory, especially the works of Luhmann, and also Maturana, and Bertalanffy, whose ideas are grounded in biological foundations. My native language is German, so I had the advantage of reading Luhmann’s books

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<sup>1</sup> A search in the Scopus database yielded only one result with the following search string (26 October 2025): Bertalanffy OR Luhmann AND system theory AND (distance education OR open education OR digital education OR online learning OR e-learning OR distance learning).

and ideas, which I am trying to introduce here, in the original language<sup>2</sup>. I do not wish to adopt the theory uncritically or without reservation and would describe myself, following Schimank (2003, p. 8), as a “critical sympathizer”. In his theory of society, Luhmann also described the education system. This is where I begin, considering ODDE a functional differentiation within the education system and its evolution. In this way, things come full circle for me.

## 2 Structural elements of ODDE systems

The structural elements and functional areas for the organization and operation of ODDE have been described as systems in the distance education literature. However, these refer primarily to institutions such as open universities, where operational structures have been established to offer distance education at scale to enable mass higher education (Daniel, 1996). They cannot be directly transferred to the institutional structures and operations of campus-based universities, where, for example, print-based study materials were not produced for teaching and learning.

Rumble (1979) developed a systemic model of distance education based on Miller and Rice (1967), who describe organizations as open socio-technical systems that must manage the interaction between their *task system* (the formal structure focused on accomplishing work) and their *sentient system* (the social and emotional life of its members). They argue that effective organizations maintain a dynamic balance between these two subsystems by clearly defining and managing their boundaries, where systems interact internally and with the external environment.

According to Rumble's model, a distance education system consists of two operating systems and two supporting systems. The operating systems are the *materials subsystem* and the *student subsystem*, within which different processes take place. In the materials subsystem, these processes include the design, production, and distribution of study materials. In the student subsystem, they include marketing, student advising, enrollment and administration, as well as the organization of tutorials, examinations, and assessments. These processes are supported by the logistical and regulatory subsystems. The *logistical subsystem* provides the resources necessary to maintain the distance education system (input from the external environment). This includes, among other things, personnel, maintenance of buildings, as well as the recruitment, training, and payment of tutors. The *regulatory subsystem* is responsible for the planning and management of the entire distance education operation. All components are interdependent and influence one another.

Guided by the foundational theories of Peters, Holmerg, and Moore, and influenced by Keegan's work (1986) on the fundamentals of distance education, Moore and Kearsley (1996) published the book *Distance Education: A Systems View*. They describe the distance education system as a coordinated set of interdependent elements involving a complex organization of multiple processes, people, and technologies that together make effective teaching and learning possible when teachers and learners are separated by time and/or space.

Moore and Kearsley (1996) identify several subsystems that together make up an effective distance education system. The first is the *design subsystem*, which includes the planning and creation of programs and courses, the instructional design, learning activities and assessment, and learning materials development. The second subsystem is the *delivery subsystem* that refers to the media, technology, and digital tools that carry the instruction, such as print materials, audio

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<sup>2</sup> His major works have also been published in English by Stanford University Press. In this article, I will cite his texts in the original German but will provide the English sources where possible.

or video recordings, or learning management systems. Moore and Kearsley carefully distinguish between media (the technological tools) and design (the pedagogical method), because technology alone does not ensure learning.

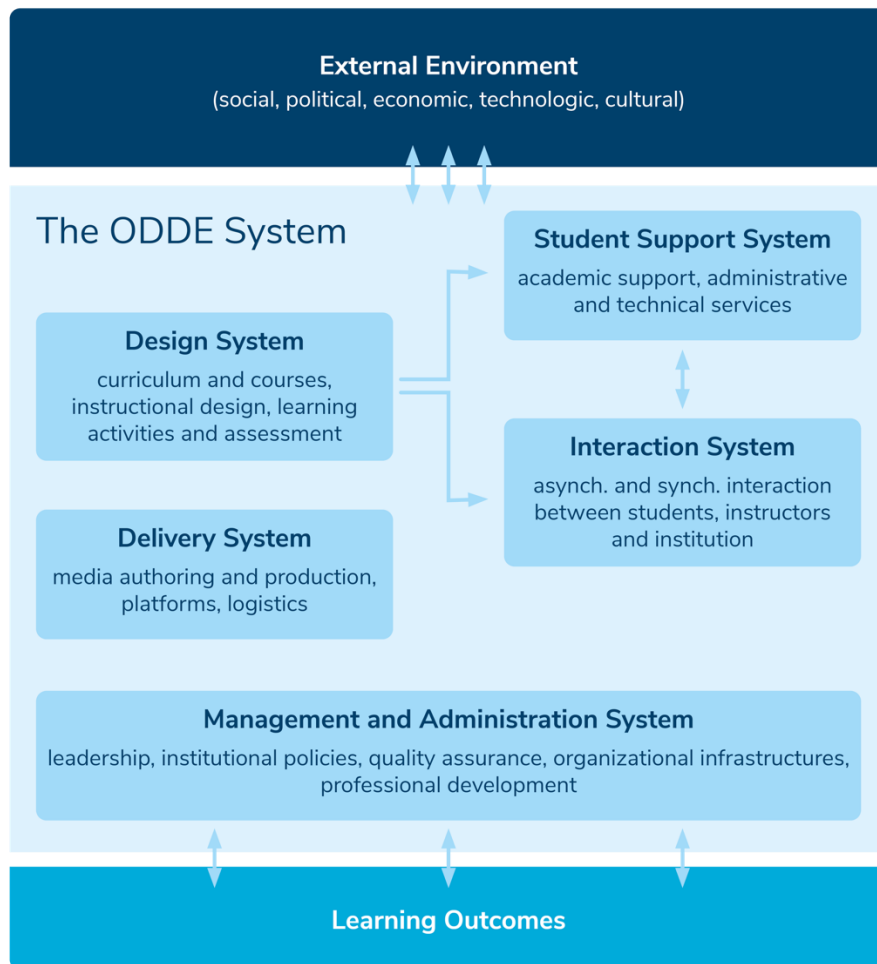
A third subsystem is *communication and interaction*. This includes all synchronous and asynchronous channels through which learners, instructors, and tutors communicate, such as video conferencing or online discussion forums. Interaction is a central concept in Moore's broader theory of transactional distance. It is through these communication processes that learning, feedback, and motivation occur.

Another key subsystem is *learner support*, which covers all the services and assistance provided to help students succeed, such as academic advising and counselling, technical support, tutoring, library access, or career services. Because distance learners often face isolation and time-management challenges, these supports are essential in distance education.

Finally, the *management and administration* subsystem includes institutional planning, overall coordination, budgeting, scheduling, and institutional policies. It handles human resources, quality assurance and evaluation, and professional development for faculty and staff.

**Figure 1**

*Composite model of constituent elements of the functional core of an ODDE system*



The system also includes inputs and outputs. Inputs are the characteristics that learners, technologies, and the broader environment bring into the system. Outputs are the results of the system: student learning, satisfaction, and social or economic outcomes. By including the external environment as part of the model, Moore and Kearsley emphasize that distance education exists within a larger social, technological, and economic context.

Building on Rumbles' and Moore and Kearsley's considerations in the open and distance education literature, the elements of an ODDE system and its subsystems can be summarized as illustrated in Figure 1. All these subsystems are seen as interdependent, meaning that changes in one (for example, adopting new technology) have implications for all others (pedagogy, support, assessment, etc.).

While such systems approach conceptualizes distance education as an assemblage of interrelated components that must be coordinated to achieve educational goals, Luhmann's systems theory provides a fundamentally different epistemological foundation for understanding educational systems. Moore and Kearsley primarily operate within a functionalist and design-oriented frame in which systems are conceptualized as purposive structures that can be coordinated and improved through deliberate design. In contrast, Luhmann understands social systems, including education, as systems constituted through communication, operationally closed yet structurally coupled with their environments or other subsystems (e.g., the design and delivery system). From this perspective, distance and digital education are not simply configurable subsystems but communicative orders that reproduce themselves through meaning-making processes (e.g., by making instructional design decisions, or negotiating new institutional AI policies), irrespective of external intentions or managerial control. Emphasizing this distinction strengthens the rationale for applying a Luhmannian lens: it moves the analysis beyond questions of design and effectiveness toward a deeper examination of how open, distance, and digital education emerge, differentiate, and stabilize themselves as communicative systems within broader societal complexity.

To develop a holistic understanding of ODDE on a macro level in relation to the environment and society in which it functions and operates, the following section first explores GST and introduces Luhmann's theory of social systems with its key concepts and terminology, which will then be applied to the ODDE system in the next chapter.

It is important to distinguish between earlier uses of the term "system" in the distance education literature and later developments in systems theory. In foundational ODDE models (see above), systems are typically conceptualized as coordinated sets of functional components designed to achieve educational goals. In contrast, GST and, more radically, Luhmann's theory of social systems introduce an epistemological shift: systems are no longer understood primarily as designed entities, but as self-referential, communicatively constituted orders that reproduce themselves through ongoing operations. At the same time, the earlier models do recognize the importance of interaction, communication, and environmental context, particularly in relation to learner support and institutional organization. However, communication is not conceptualized as the constitutive operation of the system itself. This distinction is central to the argument developed in this article.

### 3 Systems theory and ODDE

#### 3.1 General Systems Theory

It is important to emphasize that a single, unified systems theory does not exist; rather, there are different approaches and schools of thought emerging from various disciplines. The German-

Canadian biologist and philosopher Ludwig von Bertalanffy (1901–1972) was the creator and chief exponent of a GST. In 1956, he, among others, founded the *Society for General Systems Research (SGSR)*, which continues today as the *International Society for the Systems Sciences (ISSS)*<sup>3</sup>.

Bertalanffy's diagnosis in the 1940s led him to the realization that a new science, or even a new *Weltanschauung* (worldview), would be needed to address complex social problems (de Zeeuw, 2009). GST is based on the view that the world is a large organization, hierarchically structured into interactive systems and subsystems. Each level has its own structure and rules, yet all levels are interconnected and interdependent (von Bertalanffy, 1968).

A key idea in GST is the concept of *open systems*. Unlike closed systems, which are isolated from their environment, open systems continuously exchange energy, matter, and information with their surroundings – their boundaries are permeable. For example, living organisms maintain their structure and function through this constant interaction. This idea contrasts with classical physics, which often assumes closed systems that tend toward equilibrium. Bertalanffy argued that living systems maintain a steady state through ongoing exchange, a process called *dynamic equilibrium* or *homeostasis*.

Bertalanffy's goal was to create a unified theory that could apply across disciplines. He believed that the same general principles (such as feedback, regulation, growth, and adaptation) govern biological, social, and even mechanical systems. GST, therefore, serves as a common language for studying complex, interrelated processes in any field, from biology to sociology to engineering.

While von Bertalanffy's theoretical considerations laid the groundwork for thinking about systems as open, dynamic, and interrelated wholes, later theorists, most notably the German sociologist Niklas Luhmann (1927–1998), took these ideas in a new direction.

### 3.2 Luhmann's theory of social systems

Luhmann built on the systemic tradition but redefined its foundations and applied them to the study of *social systems*. In contrast to von Bertalanffy, Luhmann described social systems as operationally closed but cognitively open and loosely coupled. For him, systems do not exchange operations directly with their environment; instead, they reproduce themselves through their own operations; in the case of society, through *communication*.

Luhmann transformed systems theory from a general framework about organization and exchange into a theory about how society itself operates as a network of self-producing communications, marking a shift to a sociological, autopoietic conception of systems (Luhmann, 1987, 2005).

Shortly before he died in 1998, Luhmann published his *opus magnum* – a theory of society on which he had worked for 30 years (Luhmann, 1997, 2012, 2013). In developing it, he pursued unconventional theoretical paths. His fundamental assumptions are based on “a radically anti-humanist, a radically anti-regionalist, and a radically constructivist concept of society” (Luhmann, 1997, p. 35). The basic premise is that society consists of communication; in this radical view, human beings are psychic or organic systems that belong to their environment. The “world society” represents a global system defined by communicative reachability. Also, it must be recognized that the observation and analysis of society take place within the scientific system, which constructs its own version of society.

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<sup>3</sup> <https://www.iss.org/>

His thinking was shaped by the concept of self-organization and the interdisciplinary discourse of radical constructivism (see Schmidt, 1987), which explored cognition, self-reference, and self-organization across fields such as biology, psychology, and sociology. Key figures in this discussion included Heinz von Foerster, who emphasized the spontaneous self-organization of systems, and the Chilean biologists Humberto Maturana and Francisco Varela, who introduced the concept of *autopoiesis*. Luhmann explicitly adopted and reformulated this concept for the analysis of social systems, thereby transferring a biologically grounded theory of self-production into a sociological framework.

Luhmann distinguishes three levels of social systems (Schimank, 2003). The lowest level of social system formation is interaction, which arises when at least two psychic systems perceive one another. The intermediate level consists of organizations that are constructed through the decisions of their members to participate in the organization. The highest level is that of a single global communication system, i.e., the world society.

In addition, he connects three core components within his theory of society (Luhmann, 2009, p. 329 ff.): communication theory for the social dimension, evolutionary theory for the temporal dimension, and differentiation theory for the factual (content) dimension. Communication, evolution, and differentiation – these components serve as the basis for introducing Luhmann’s systems theory here, which will then be applied to ODDE in the remaining part of this article.

### 3.2.1 Communication

For Luhmann, the basic element of society is not the individual or action, but communication. Society consists of networks of communications that are recursively connected to one another. Individuals (conscious minds or psychic systems) are not part of society as such. They belong to the environment of the social system. Communication is a synthesis of three selections: an utterance, information, and understanding. Only when all three come together does communication occur, and this communication can then be linked to other communications, forming chains and networks. Through these linkages of communication, society reproduces itself.

This idea resonates with the concept of *autopoiesis*, borrowed from biology. Autopoietic systems are self-producing; their elements are generated by the system itself. According to Maturana (1981), such systems are “networks of production of components that recursively, through their interactions, generate and realize the network that produces them and constitute, in the space in which they exist, the boundaries of the network as components that participate in the realization of the network” (p. 21). Schmidt (1987) summarizes the core idea of the theory of autopoietic systems as follows: “Living systems are self-producing, self-organizing, self-referential, and self-maintaining – in short: autopoietic – systems. The critical variable of their autopoietic homeostasis is the organization of the system itself” (p. 22). In living organisms, autopoiesis means that “all components of the system constantly repair and replace one another” (Roth, 1987, pp. 263), as is the case, for example, with the repair mechanisms of our genes (DNA).

In Luhmann’s terms, communications produce communications; society, as the encompassing social system, is autopoietic and operationally closed, even though it remains open to influences from its environment (see *structural coupling* below). He distinguishes between so-called *symbolically generalized communication media* (i.e., power, money, or knowledge) and *dissemination media* (i.e., language, writing, printing, radio, or computer networks). Dissemination media are evolutionary achievements that play a decisive role in the development of modern (information) society.

From the perspective of ODDE, these dissemination media are not merely technological tools but central conditions for the possibility of educational communication across distance. The historical shift from print-based correspondence to networked digital communication, and more recently to AI-mediated interaction, can be interpreted as transformations in the media through which educational communication is produced, distributed, and stabilized. In this sense, the evolution of ODDE is closely tied to the evolution of communication media in Luhmann's terms.

### 3.2.2 Evolution

Evolution marks the historical development of social systems over time. Luhmann's Neo-Darwinist understanding of evolution is based on the interplay of variation, selection and restabilization. If a system faces a conflict or environmental change, it is confronted with a range of options (variation), from which one must be chosen (selection) and integrated (restabilization).

In contrast to classical evolutionary theory, which understands selection from variation (mutation) as adaptation to environmental factors, systems theory assumes that autopoietic, self-referentially closed social systems can be irritated by disturbances from the environment but cannot be forced to adapt. Although society is open to its environment, it is not the environment that determines social evolution. As a result, social evolution may lead society to detach itself from its own natural foundations of existence. Luhmann (1985) pointed this out in the context of the ecological debate, in the context of the environmental movement in Germany, acid rain and forest dieback (*Waldsterben*), and the founding of the Green Party in the 1980s. Current social developments in many parts of the world in response to perceptions of climate change give little reason for optimism.

This perspective can also be applied to the historical development of ODDE. For example, the emergence of online and digital learning environments in the 1990s and 2000s can be understood as an environmental *irritation* of the educational system. Rather than being directly determined by technological change, higher education institutions responded through processes of variation (e.g., experimentation with online courses and blended learning formats), selection (e.g., institutional adoption of specific platforms and pedagogical models), and restabilization (e.g., the integration of digital learning into mainstream provision). In Luhmann's terms, these developments do not represent simple adaptation to external conditions, but internally generated responses to environmental complexity, shaped by the system's own structures and communicative operations.

The evolutionary process of the social system also leads the division into partial sub-systems and communication areas, which is addressed in Luhmann's third core component, the theory of differentiation of social systems.

### 3.2.3 Differentiation

In Luhmann's view, modern society is functionally differentiated, unlike premodern ones hierarchically structured. Modern society has distinct functional subsystems and communication areas, such as science, education, politics, economy, law, religion and art, with a high level of autonomy. In doing so, he departs from the idea of the division of labor as the basis of social differentiation in the tradition of the French positivist Émile Durkheim.

Also, in contrast to von Bertalanffy, Luhmann insists that subsystems are *operationally closed*: they reproduce their own communications based on their own code and cannot directly adopt operations from other systems. However, they are *structurally coupled*, meaning they develop interfaces and dependencies that allow them to co-evolve. Each system interprets external irritations according to its own binary code with positive and negative variants, e.g. legal/illegal

(law), payment/non-payment (economy), true/false (science). Within this framework, inclusion and exclusion describe how individuals are positioned in relation to these systems: inclusion occurs when a person can participate in a system's communications, while exclusion occurs when such participation is not possible.

The environment is always more complex than the system that draws a boundary and thereby limits the possibilities of variations within it. The formation of subsystems enables the system to deal with complexity. The evolution of subsystems does not imply an increase in complexity, but rather a change in structure. The communication codes enable subsystems to process complexity by providing clear distinctions that guide communication. Importantly, no subsystem has primacy over the others; they are again operationally autonomous, though structurally coupled. For example, politics and law interact closely but cannot be reduced to one another.

Functional systems relate to problems that need to be solved within society. They form organizations in which professional work is structured, and behavior can be regulated. The educational system of society can operate only through pedagogical communications: "All communications that are carried out with the intention of educating within interactions are to be regarded as education" (Luhmann, 2002, p. 54). Its binary code is teachable/not teachable (*vermittelbar/nicht-vermittelbar*).

Applied to ODDE, functional differentiation highlights that core subsystems—such as design, delivery, interaction, student support, and management—operate according to their own internal logics while remaining structurally coupled. For example, instructional design follows pedagogical criteria, whereas delivery is shaped by technological infrastructures. Although operationally autonomous, these subsystems depend on one another through interfaces that enable coordination and co-evolution. Changes in one subsystem (e.g., introduction of AI tools in delivery) can "irritate" others (e.g., design or assessment), prompting adjustments within their own structures. Thus, ODDE can be understood as a differentiated system in which no subsystem has primacy, and coherence emerges through structural coupling and communication.

#### 3.2.4 Criticisms and limitations

Luhmann's work has sparked controversial debates. His theory has often been characterized as overly abstract and complex, with critics suggesting that he constructed an almost labyrinthine theoretical edifice architecture. Indeed, his systems theory is marked by a high degree of internal complexity, encompassing a dense network of concepts and cross-referential structures (Baraldi et al., 2022). Moreover, it challenges basic empirical intuitions by asserting that it is not human beings but communication itself that communicates, and that humans are not constituents of society, which consists solely of communication. Consciousness systems (minds) and social systems (communications) are distinct but interdependent. Individuals participate in society by making contributions to communication, yet society itself consists only of communications. Such antihumanistic claims, largely incompatible with modern thought, have been met with considerable critique and resistance (Nassehi, 2003).

In a critical analysis, Šubrť (2019) emphasizes that social system integration, i.e., in Luhmann's terminology, the structural coupling of subsystems, remains underexplored. Another point is the problem of empirically translating the theory due to its high complexity and abstractness. Šubrť (2019) formulates this as follows: "The problem with Luhmann's theory is how it can face the live reality, i.e., how hypotheses can be deduced from it for empirical research" (p. 613). Luhmann responded to such objections by referring to Weaver (1948), arguing that the complexity of social

systems can never be represented through empirical methods, leading to a general theory of society.

Moreover, Luhmann's theory stands in contrast to other influential approaches to communication in social theory, most notably Jürgen Habermas' theory of communicative action. While Habermas emphasizes communication oriented toward mutual understanding and rational consensus, Luhmann conceptualizes communication as an autopoietic process that operates independently of actors' intentions. This fundamental theoretical divergence has been the subject of well-known debates in German sociology (Habermas & Luhmann, 1971) and highlights differing normative and analytical perspectives on communication.

Undoubtedly, however, Luhmann's theory of social systems represents one of the most comprehensive theoretical frameworks in sociology, providing ample reason for a thorough engagement with his work (see, for example, Giegel & Schimank, 2003). In the remaining part of this section, I will attempt to describe the 'live reality' of ODDE using the language of Luhmann's systems theory. From this perspective, ODDE can be understood as a self-organizing system that operates within, and is structurally coupled to, highly regulated institutional environments, such as funding regimes and quality assurance frameworks, which shape but do not determine its internal communicative processes. Against this background, the following section takes these conceptual foundations as a starting point and explores how Luhmann's theoretical framework can be translated into an analysis of ODDE.

### 3.3 A systems-theoretical analysis of ODDE

The following analysis remains grounded in Luhmann's theory of social systems as the overarching conceptual framework. Other perspectives, such as ecological models (e.g., Bronfenbrenner), are incorporated as complementary lenses that help to operationalize and illustrate specific dimensions of systemic interrelations.

Building on Luhmann's conceptualization of social systems, ranging from interaction to organization and world society, it is possible to explore how these levels may be interpreted in the context of ODDE. If ODDE is understood as a communicatively constituted system, its operations consist of ongoing processes of educational communication that reproduce the system over time. Concepts such as autopoiesis and operational closure suggest that ODDE does not simply respond to external demands, but processes environmental "irritations" (e.g., technological change, policy shifts, or societal expectations) according to its own structures and codes. Functional differentiation highlights how distinct subsystems emerge to cope with complexity, while structural coupling explains how these subsystems, and ODDE as a whole, remain interconnected with other social systems such as politics, economy, and technology. From this perspective, ODDE appears not as a designed system, but as a dynamically evolving communicative order shaped by internal operations and external complexity.

Against this theoretical background, the 3M-level model (Zawacki-Richter & Bozkurt, 2023) can be used as an analytical heuristic to relate Luhmann's abstract categories to established perspectives in ODDE research (Zawacki-Richter, 2009).

The micro level concerns communication within teaching and learning processes, particularly communication taking place in digital networks, and how this communication can be facilitated through instructional design that accounts for the needs and characteristics of the actors involved. It therefore encompasses the *Design System*, the *Student Support System*, and the *Interaction System* (see Figure 1). At the institutional meso level, in the *Management and Administration System*, the focus lies on governance, organization, and management within higher education institutions, as well as on supporting the production processes of the *Delivery System*. The *Student Support System*

operates across both the micro level of teaching and learning (including academic support and tutoring) and the meso level, particularly in relation to the provision of institutional services such as library access or student advising and counseling. Finally, the macro level extends beyond the operational functions of the ODDE system and is interlinked with its environment and with broader societal impact and technological developments.

Every system distinguishes itself from its environment through the concatenation of its operations. A system is formed as a chain of operations; it is defined by its difference from the environment and maintains itself through operations that reproduce this distinction – communication follows upon communication. The distinction between system and environment can be reproduced within a system, leading to the differentiation of smaller (sub-)systems within a larger system. The higher education system is part of the broader education system, while distance education systems represent a specific organizational type within the higher education system, and so forth. The sub-systems of the ODDE system represent the functional core of ODDE. The term “function” here refers to the fulfilment of a particular purpose, to solve specific problems within a subsystem.

Structures are established through operations. The structural development of a system or functional subsystem depends on the influences exerted upon it by the environment through structural coupling. The term *structural coupling* refers to the relationship between a system and its environmental conditions that enables the continuation of its autopoietic operations. In this sense, systems are adapted to their environment; they develop interfaces and dependencies that allow them to co-evolve. For example, the *design system* and the *delivery system* are interdependent and mutually shape one another. The technical possibilities of media production can impose limits on the instructional design. Conversely, media production would be meaningless without the content dimension of learning materials.

This interpretation complements earlier systems-oriented models in distance education (e.g., Rumble, 1979; Moore & Kearsley, 1996), which conceptualize ODDE as a set of interrelated functional components, by reinterpreting these components as communicatively constituted subsystems.

From a historical perspective, the process of development and co-evolution can be observed repeatedly. New developments have often been triggered by technological innovations that transformed the ways in which teaching and learning are mediated by technology (Zawacki-Richter & Naidu, 2016). The ODDE system undergoes an evolutionary process: it is irritated by new environmental demands or technologies, which generate new options for operations that are subsequently selected and integrated. In this way, new forms and structures emerge.

A transformative innovation that marked a paradigm shift in learning and teaching within ODDE was undoubtedly the proliferation of the personal computer and the development of the Internet in the mid-1990s, which created entirely new opportunities for communication through learning management systems – first asynchronous and text-based, and later synchronous and audiovisual via videoconferencing. A similarly groundbreaking transformation is currently unfolding with the rapid advances in artificial intelligence applications.

The mission of ODDE to broaden access to higher education is directly related to the inclusion/exclusion dynamic. Within Luhmann’s framework, inclusion and exclusion describe how individuals are positioned in relation to functional systems: inclusion occurs when individuals can participate in system-specific communications, while exclusion refers to the absence of such participation. By removing traditional barriers of space, cost, and institutional selectivity, ODDE expands the conditions under which individuals can be included in the communications of the education system. In doing so, it seeks to reconfigure the boundaries of

inclusion, making the system responsive to more diverse social contexts and life situations. However, from a Luhmannian perspective, this effort does not eliminate exclusion; rather, it transforms its form. New exclusions can emerge through digital divides, technological literacy gaps, or institutional criteria for recognition and accreditation. The education system, in particular, exerts a profound influence on individual life courses, shaping biographies and determining future career opportunities. Thus, the ODDE's inclusivity mission can be viewed as a continual systemic negotiation, an attempt to move the boundary between inclusion and exclusion within the educational system in response to evolving social and technological environments.

Many of the distance teaching and open universities were established prior to the emergence of online learning and digital education in the late 1960s and 1970s. The rapid growth of the newly established open universities, often with more than 100,000 students, led to quality problems, which in turn caused research in the 1990s to focus on student support. This resulted in the differentiation of the *student support system* to cope with the complexity of its operations, which has become of central importance to the ODDE system (see Brindley & Paul, 1996). However, learning success depends on many internal and external factors that are often beyond the direct influence of the educational institution. The *student support system* is therefore an excellent example of the need to analyze the various influencing factors from a holistic perspective.

A recent study by Cefa (2025) provides a lucid analysis of the *student support system* (based on system ecology, Bronfenbrenner, 1979, and drawing on systems theory), which is a very good example of embedding a central functional subsystem of ODDE within the complex communication network of its environmental influences in an ecological model: *Learner Support as Communication in the Ecosystem* (LSCEM).

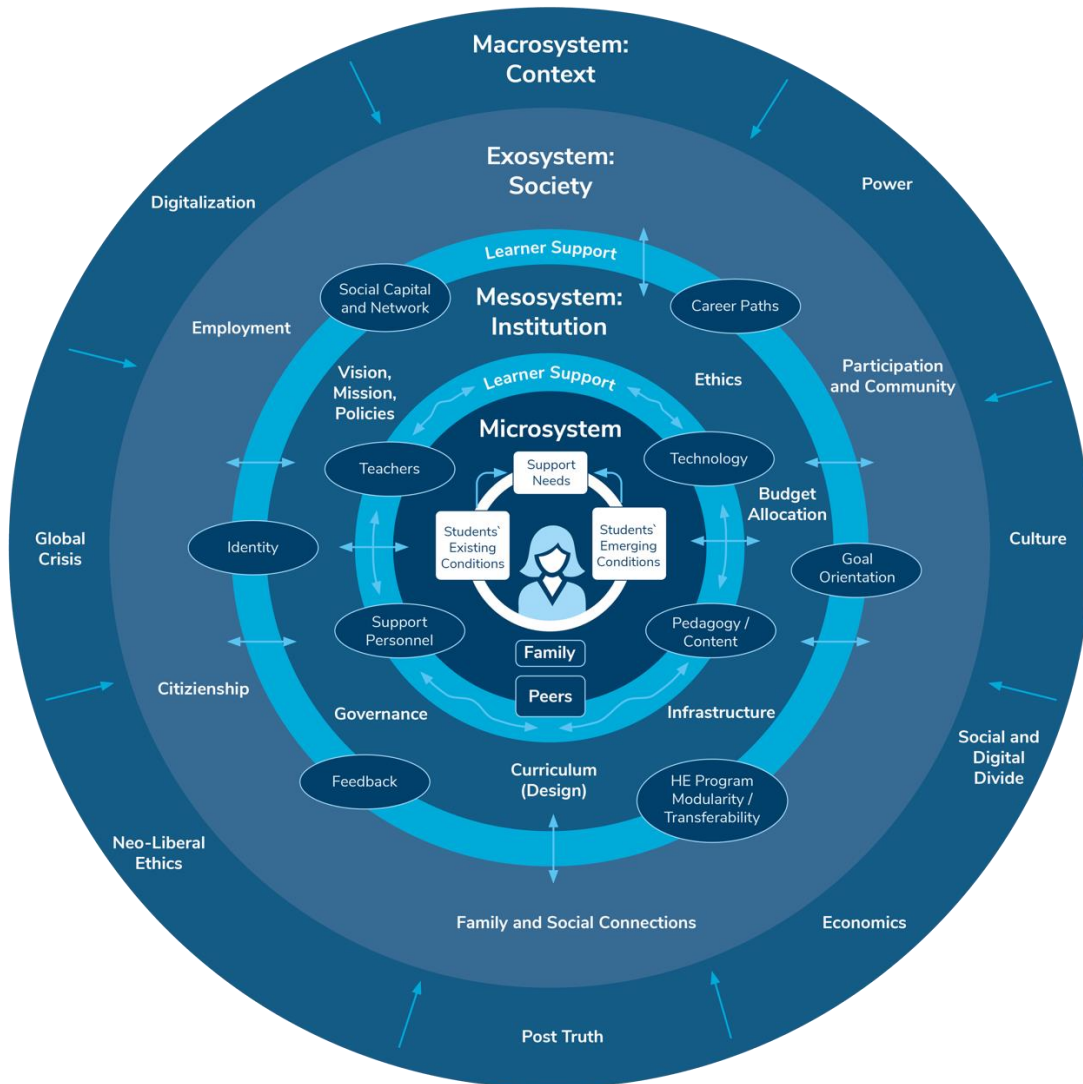
From a Luhmannian perspective, such ecological models can be interpreted as attempts to describe the multiple layers of structural coupling between the education system and its environment. While Bronfenbrenner's ecological systems theory offers valuable insights into the multi-layered environmental contexts of learning, it is important to note that it rests on different theoretical assumptions than Luhmann's systems theory. Most notably, Bronfenbrenner takes the individual as the central unit of analysis and conceptualizes development as the result of interactions across nested environmental systems. In contrast, Luhmann conceptualizes social systems as communicatively constituted and operationally closed, with individuals belonging to the environment of the system rather than being part of it. These differences point to distinct epistemological perspectives: one focusing on human development within environments, the other on the self-referential reproduction of communication.

At the center of Cefa's LSCEM (Figure 2), within the microsystem, are the learners with their individual characteristics, aims and needs, their family background, and the support requirements that arise during their studies. The microsystem is linked to the institutional mesosystem with its infrastructure through a support communication layer involving teachers, support personnel, technology, and the curriculum. The mesosystem, in turn, resonates with the environment, the exosystem of the society, through another communication layer, for example via feedback on societal qualification needs that are addressed in curriculum design.

The society interacts with its external environment, which Cefa (2025) calls the context of the macrosystem. This includes global processes such as the digital transformation, global crises, political and economic developments etc. that influence or irritate the systems of society and thereby also affect the educational system with its institutions and, ultimately, the psychological systems of individuals.

**Figure 2**

*Cefa's (2025) Model of Learner Support as Communication in the Ecosystem (LSCEM)*



The model illustrates the complexity of a single subsystem within the broader ODDE system. Cefa (2025) concludes: “Yet the results highlight the need for an ecosystem in which all actors communicate effectively. Communication between stakeholders is crucial” (p. 11).

In such systems, there is always a danger that if the complex environment is not sufficiently observed and the self-referential system fails to adequately perceive changing environmental factors, reproducing itself only through its existing operations, and the survival of the system cannot be guaranteed. A global process at the macro level over the past 20 years has undoubtedly been digitalization, which affects all social subsystems and, consequently, all sub-systems of the education system. As already mentioned above, this has led to a blurring of boundaries between distance and campus-based universities, since almost all higher education institutions now offer digital programs in some form. As a result, open and distance teaching universities no longer occupy a niche position and are coming under increasing pressure, as reflected in declining student numbers, at least in the Global North. They must therefore face new conditions, adapt,

and, if necessary, reinvent themselves to prepare for the future in order to remain competitive. (see Paul, 2024; Olcott, 2024).

All the more relevant, therefore, is a holistic ecological view of the systems involved, in order to analyze, manage, and lead the complexity of ODDE and its evolution. While Bronfenbrenner's ecological framework provides a useful descriptive model of nested environmental influences, Luhmann's theory offers the underlying conceptual explanation of how such relationships are constituted through communication and system–environment differentiation.

#### 4 Systemic integration: Situating ODDE in theoretical paradigms

Building on the preceding discussion of Luhmann's theory of social systems, this section develops an integrative perspective that connects techno-functionalist, socio-critical, and ecological paradigms within a systems-theoretical framework. Each paradigm rests on distinct ontological and epistemological assumptions and has produced different interpretations of how education and technology interact within broader social systems. The Integrated Systems Model of ODDE (Figure 3) proposed here is conceptually grounded in Luhmann's theory of social systems. The three paradigmatic layers (techno-functionalist, socio-critical, and ecological) can be interpreted as different observational perspectives on the same communicatively constituted system.

The *techno-functionalist paradigm* is rooted in rational-instrumental and systems-theoretical traditions. This perspective corresponds to earlier systems-oriented models in ODDE as discussed above. It views technology as a neutral tool designed to enhance efficiency, coordination, and performance within educational systems. Emerging from the legacy of structural functionalism, as articulated by Parsons (1951) and Merton (1968), this perspective interprets education as a subsystem within society that fulfills specific integrative and adaptive functions. Moore and Kearsley (1996) developed a systems view of distance education as an interdependent structure of technologies, processes, and people. Within ODDE, this paradigm foregrounds instructional design, quality assurance, and technological affordances that enable flexible, large-scale delivery of learning opportunities. It views ODDE primarily as mechanisms for enhancing access, efficiency, and scalability within educational systems. The techno-functionalist paradigm is closely aligned with managerial and performance-oriented perspectives, emphasizing optimization, standardization, and measurable learning outcomes. It assumes that technological innovation naturally translates into systemic improvement, largely overlooking questions of power, culture, and social inequality.

In contrast, the *socio-critical paradigm* challenges the presumed neutrality of technology and education and focuses on power, equity, and ideology in education. From a Luhmannian perspective, this reflexive dimension can be understood as a form of second-order observation, in which the system observes and critiques its own operations and underlying assumptions.

Drawing on the critical theory of the Frankfurt School and the emancipatory pedagogy of Paulo Freire (1970), the socio-critical perspective regards education as a site of both domination and potential liberation. The central aim of education, from this standpoint, is not system efficiency but emancipation, developing learners' critical consciousness and their capacity to question and transform oppressive structures. The socio-critical paradigm questions who benefits from digitalization and how it may reinforce or challenge existing social structures. Technology is conceptualized not as a neutral instrument (Feenberg, 1991). Applied to ODDE, this paradigm interrogates issues of digital divide, inclusion, surveillance, and the commodification of knowledge, emphasizing education as a transformative and emancipatory practice rather than merely an efficient mode of delivery.

The *ecological paradigm* resonates with the notion of structural coupling in Luhmann's theory and can be further illustrated through models such as Bronfenbrenner's ecological systems theory, which describe the layered environmental contexts with which educational systems interact. Grounded in systems ecology (Bronfenbrenner, 1979), cybernetics (Bateson, 1972), and complexity theory (Capra, 1996), the ecological approach conceptualizes education as a living, adaptive ecosystem. It highlights the dynamic interrelations among learners, institutions, technologies, and their environments. Rather than focusing solely on optimization or emancipation, the ecological paradigm foregrounds interdependence, adaptation, and sustainability (Capra, 1996). It situates ODDE within a network of interacting systems—technological, social, cognitive, and environmental. Education is understood as a complex, adaptive system that co-evolves with its context. From this perspective, ODDE is not just a response to technological innovation but part of a broader socio-technical ecosystem characterized by feedback loops, emergence, and interdependence. This systems-oriented view resonates with contemporary efforts to design learning environments that are both technologically advanced and socially responsive.

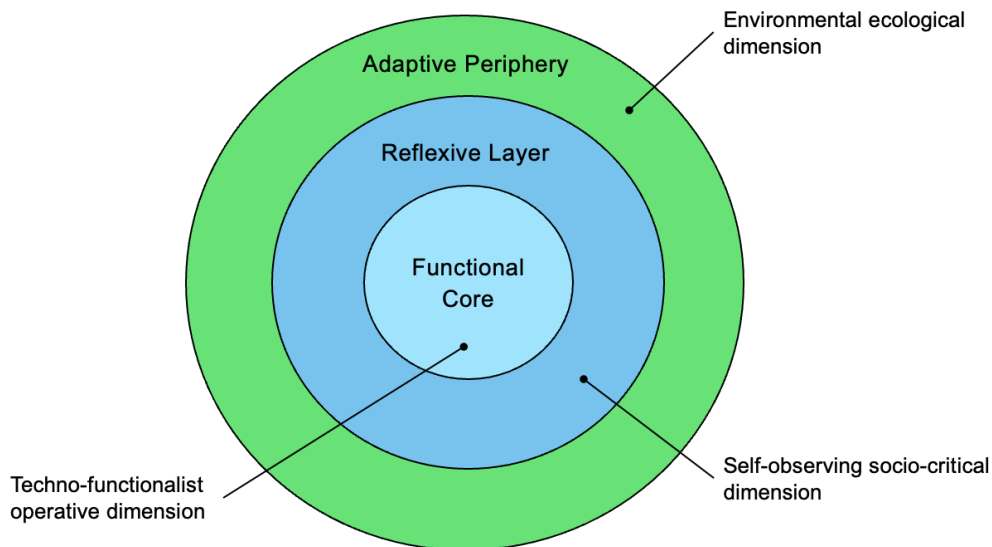
Together, these paradigms provide a conceptual foundation for analyzing ODDE as both a technological and social phenomenon, functional in purpose, critical in reflection, and ecological in its systemic interrelations. While the techno-functionalist paradigm seeks stability and efficiency, the socio-critical paradigm emphasizes transformation and justice, and the ecological paradigm focuses on systemic balance and adaptability.

To address the complexity within which ODDE systems function, particularly in relation to society and global environmental change, a holistic systems *Weltanschauung* is suggested. Such a view envisions ODDE as a multi-layered system comprising interrelated functional, social, and ecological dimensions. As elaborated above, these dimensions correspond to three theoretical paradigms, i.e. the techno-functionalist, socio-critical, and ecological paradigms, which together constitute an integrative systems framework as depicted in Figure 3.

At the center of the model lies the *functional core* of ODDE, representing the operational subsystems in Luhmannian terms that sustain the system's basic functions, such as teaching, learning, support, assessment, learning material design and production, and institutional coordination and administration. This layer corresponds to the techno-functionalist paradigm, which focuses on structure, efficiency, and performance. Technologies, organizational processes, and digital infrastructures interact here as stabilizing elements that ensure the reliability and scalability of the educational system. This layer conceptualizes ODDE as a system that maintains internal operations through communication and self-regulation.

Surrounding the functional core is the *reflexive layer*, corresponding to the socio-critical paradigm, that represents processes of second-order observation within the system. This dimension introduces self-reflection, critique, and normative orientation into the system. Within the systems framework, this layer functions as a mechanism of self-observation, allowing ODDE to question and reflect on whose needs are served, and how openness and digitalization can promote equity and participation of a diverse student population rather than merely efficiency.

The outer layer represents the *adaptive periphery*, derived from the ecological paradigm. This dimension reflects the system's structural coupling with its environment, and highlights the interdependence and co-evolution of ODDE with its broader social, cultural, technological, and ecological environment. It conceptualizes ODDE as a system that interacts with and is irritated by external forces, responding to changes through adaptation and innovation (i.e., evolution through variation, selection, and re-stabilization) within dynamic networks.

**Figure 3***Integrated Systems Model of ODDE*

The loose coupling and interaction among these three layers constitute the system's *Weltanschauung* of ODDE. Functionality provides structure and stability, critical reflection ensures ethical and social legitimacy, and ecological adaptability sustains evolution and resilience.

## 5 Conclusion

This article set out to explore how Luhmann's theory of social systems can inform a more integrated understanding of ODDE. The theoretical considerations discussed in this article suggest that Luhmann's systems theory aligns with earlier work on systems perspectives of distance education and its functional subsystems. It offers a powerful analytical lens for examining the operational structures, organizational layers, environmental interactions, and evolutionary dynamics of ODDE.

The aim of this paper was to use Luhmann's systems theory as a theoretical framework to provide an initial systemic perspective on ODDE at the macro-theoretical level, offering orientation for the analysis of processes of change in the context of its dynamic development. These considerations lead to the proposed *Integrated Systems Model of ODDE*. It can be understood as a translation of key elements of Luhmann's theory into the context of ODDE. The functional core reflects the differentiation of communicative subsystems that reproduce the system through their operations. The reflexive layer can be interpreted as a form of second-order observation, in which the system reflects upon and critiques its own structures and practices. The adaptive periphery represents the structural coupling of ODDE with its broader social, technological, and ecological environment. In this sense, the model does not depart from Luhmann's framework but operationalizes it for the analysis of ODDE. Ecological perspectives, such as Bronfenbrenner's model, can be situated within this framework as descriptive accounts of the layered environmental contexts with which ODDE is structurally coupled.

Rather than offering prescriptive guidance, the model provides an analytical lens for examining how ODDE systems process complexity, respond to environmental “irritations,” and evolve through communication. Such a holistic perspective is crucial for relating ODDE practice to wider societal needs and environmental influences. For research, this theoretical framework offers orientation and coherence, providing a basis for situating diverse research areas and for shaping research agendas at individual, institutional, and national levels.

The ongoing process of digitalization and new technological advancements, such as generative AI, are triggering profound transformations that encounter different preconditions at traditional distance universities and campus-based institutions. From a systems-theoretical perspective, such developments can be understood as new forms of environmental irritation that trigger processes of variation, selection, and restabilization within ODDE. Further analytical and conceptual “translation work” will be required to examine the ODDE system and its subsystems and their evolution in greater depth.

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