

SECTION 1.

THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF THE FUNCTIONING OF AN INNOVATIVE EDUCATIONAL ECOSYSTEM THE EUROPEAN DIMENSION

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CONCEPTUALISING INNOVATIVE EDUCATIONAL ECOSYSTEMS IN HIGHER EDUCATION: THEORETICAL FOUNDATIONS AND AN INTEGRATED FRAMEWORK

Boichenko M. A.

INTRODUCTION

Contemporary higher education operates within an environment characterised by unprecedented complexity, rapid technological change, global interconnectedness, and continuously evolving societal expectations. Universities are no longer expected merely to transmit knowledge or implement isolated educational innovations. Instead, they are increasingly required to function as adaptive organisations capable of continuously learning, responding to emerging challenges, and generating sustainable educational transformation. Under these conditions, educational innovation can no longer be adequately understood as the introduction of new pedagogical methods, digital technologies, or organisational reforms considered independently. Rather, innovation emerges through the dynamic interaction of multiple pedagogical, organisational, technological, relational, and human-centred processes that collectively shape institutional development.

These developments have stimulated growing interest in ecosystem thinking as a theoretical perspective capable of explaining the complexity of contemporary higher education. Over the past decade, the concepts of educational ecosystem, learning ecosystem, digital education ecosystem, and innovative educational ecosystem have become increasingly prominent in international educational research and policy discourse. International organisations, including UNESCO, the OECD, the European Commission, and the European University Association, increasingly employ ecosystem perspectives to conceptualise learning as a collaborative, adaptive, and continuously developing process extending beyond traditional institutional

boundaries. Within this paradigm, universities are understood not simply as providers of educational services but as dynamic learning organisations in which educational transformation emerges through ongoing interaction among institutional structures, educational actors, technologies, organisational culture, and external partnerships.

Despite the growing popularity of ecosystem terminology, the theoretical foundations of innovative educational ecosystems remain insufficiently consolidated. Contemporary scholarship frequently employs ecosystem-related concepts interchangeably, while their conceptual boundaries, explanatory capacities, and underlying assumptions remain only partially clarified. Existing studies predominantly describe the structural components of educational ecosystems, such as pedagogy, technology, learning environments, governance, or collaboration, yet considerably less attention has been devoted to explaining the conceptual mechanisms through which these dimensions become integrated into coherent systems capable of sustaining continuous institutional learning and educational transformation. Consequently, the ecosystem metaphor has gained widespread acceptance, whereas its theoretical potential remains only partially realised.

This chapter proceeds from the assumption that innovative educational ecosystems should be understood not as institutional models or collections of educational resources, but as conceptual frameworks that explain how universities develop the capacity for continuous pedagogical innovation, organisational learning, and sustainable transformation. From this perspective, ecosystem thinking represents more than an extension of existing educational terminology; it constitutes a distinct theoretical lens through which the complexity, interdependence, and adaptive nature of higher education can be more comprehensively understood.

Accordingly, **the purpose of this chapter** is to conceptualise innovative educational ecosystems in higher education by reconstructing the evolution of ecosystem thinking, clarifying the conceptual relationships among educational environments, learning ecosystems, and educational ecosystems, and developing an integrated conceptual framework that explains innovative educational ecosystems as adaptive systems of continuous institutional learning and pedagogically driven transformation.

Rather than proposing a theoretical model a priori, the study adopts an evidence-informed conceptual approach in which theoretical propositions emerge through the systematic synthesis of international scholarship, policy discourse, and contemporary educational theory. The resulting framework therefore represents not a descriptive classification of ecosystem components but an integrated conceptual explanation of the relationships and mechanisms that enable universities to evolve as continuously learning, adaptive, and innovative educational systems.

Research design and methodological approach

The conceptual complexity of innovative educational ecosystems requires a methodological approach capable of explaining not only the characteristics of ecosystem thinking but also the theoretical relationships through which educational transformation can be understood. Since innovative educational ecosystems represent an emerging and conceptually evolving field of higher education research, this chapter adopts a theory-building perspective aimed at developing an integrated conceptual understanding rather than testing predefined theoretical assumptions. The study therefore belongs to the tradition of conceptual inquiry, in which theoretical knowledge is generated through the systematic analysis, comparison, synthesis, and interpretation of existing scholarly and policy-based evidence.

The research is guided by the assumption that innovative educational ecosystems cannot be adequately explained from a single disciplinary perspective. Their conceptual development has been shaped by educational theory, systems thinking, organisational learning, complexity theory, digital education, innovation studies, and higher education research. Consequently, the methodological design integrates conceptual analysis with comparative theoretical synthesis in order to identify the principal conceptual foundations, analytical relationships, and developmental mechanisms underlying ecosystem thinking in higher education.

The study is organised around one overarching research question: *How can innovative educational ecosystems in higher education be conceptually understood as adaptive systems of continuous institutional learning and pedagogically driven educational transformation?*

To address this question, the chapter investigates four interrelated research questions: How has ecosystem thinking evolved within contemporary educational theory? In what ways do the concepts of educational environment, learning ecosystem, and educational ecosystem differ in their conceptual assumptions and explanatory functions? Which conceptual dimensions constitute an innovative educational ecosystem in higher education? How can these dimensions be synthesised into an integrated conceptual framework capable of explaining sustainable educational transformation?

Rather than beginning with a predetermined conceptual model, the study proceeds from the working hypothesis that innovative educational ecosystems represent dynamic institutional capabilities emerging from the continuous interaction of pedagogical, organisational, technological, relational, and human-centred dimensions. This hypothesis functions as an analytical point of departure and is progressively refined throughout the conceptual inquiry.

Methodologically, the chapter employs an evidence-informed theory-building approach that combines several complementary methods.

Conceptual analysis is used to examine the evolution of ecosystem-related concepts and clarify their theoretical meanings. Comparative conceptual analysis identifies similarities, differences, and developmental trajectories among educational environments, learning ecosystems, and educational ecosystems. Document analysis provides evidence from contemporary international policy frameworks and scholarly literature, while conceptual synthesis integrates these findings into a coherent theoretical explanation of innovative educational ecosystems.

Particular methodological significance is attached to conceptual attribute analysis, developed specifically for this research as a systematic analytical procedure for comparing related educational concepts according to their defining conceptual attributes rather than their terminology alone. By examining conceptual core, educational logic, institutional, pedagogical, human-centred, and transformational dimensions, this analytical framework enables the reconstruction of the conceptual architecture of ecosystem thinking and provides the theoretical basis for developing an integrated conceptual framework.

1. The Evolution of Ecosystem Thinking in Education

The evolution of ecosystem thinking reflects a fundamental epistemological shift in educational research. Rather than replacing the concept of educational environment, the ecosystem paradigm expands it by moving analytical attention from educational conditions towards the dynamic relationships, institutional capacities, and continuous processes through which learning and educational transformation emerge. Consequently, educational ecosystems should be understood not as a new educational setting but as a new explanatory framework for interpreting the complexity of contemporary higher education.

Within this tradition, the concept of the *educational environment* functioned primarily as an analytical framework for examining the conditions under which learning takes place. Educational environments were understood as multidimensional constructs comprising physical, social, psychological, organizational, and cultural dimensions that collectively influence learners' experiences and educational outcomes. Research conducted within this paradigm significantly expanded understanding of how classroom organization, institutional culture, interpersonal relationships, learning resources, and educational support contribute to effective teaching and learning. Rather than treating these factors as isolated variables, scholars increasingly recognized that they constitute an integrated context within which educational processes unfold.

An important theoretical foundation for this contextual perspective was established by Urie Bronfenbrenner's ecological systems theory¹, later developed into the bioecological model of human development². U. Bronfenbrenner did not formulate the concept of an educational ecosystem, nor did he attempt to explain universities as ecosystems. His contribution was of a different nature. He demonstrated that human development cannot be understood independently of the multiple environmental systems within which individuals participate and that development emerges through reciprocal interactions between the individual and these environments over time. Particularly significant was the later evolution of his theory, which shifted attention from environmental structures alone to proximal processes – the regular, reciprocal interactions between individuals and their immediate contexts that serve as the primary engines of development. This transition from static environmental description to dynamic interaction laid an important theoretical foundation for later relational perspectives in education.

From the perspective of contemporary higher education research, U. Bronfenbrenner's work should therefore be interpreted not as the origin of ecosystem thinking but as one of its intellectual antecedents. His ecological perspective encouraged educational researchers to move beyond explanations centred exclusively on individual learners and to examine education as a phenomenon embedded within multiple interacting contexts. Nevertheless, the primary unit of analysis remained the environment, i.e the set of conditions surrounding learning rather than the evolving relationships through which educational systems themselves develop and transform. Consequently, while ecological theory substantially broadened educational research, it did not yet provide an explanatory framework for understanding universities as adaptive, continuously evolving systems.

If the concept of the educational environment successfully explained the contextual conditions of learning throughout much of the twentieth century, an important question arises: why did education theorists begin searching for new conceptual frameworks? The answer lies not in the inadequacy of environmental perspectives themselves but in the profound transformation of higher education during the late 20th and early 21st centuries. As universities expanded their educational missions, diversified their stakeholders, embraced digital technologies, and intensified international collaboration, they gradually evolved from relatively stable education institutions into

¹ Bronfenbrenner U. *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, MA: Harvard University Press, 1979.

² Bronfenbrenner U., Morris P. A. The bioecological model of human development // *Handbook of Child Psychology* / ed by R. M. Lerner. Vol. 1, P. 793–828. Hoboken, NJ: Wiley, 2006.

dynamic systems characterized by continuous change, multiple interdependencies, and increasing organizational complexity³.

This transformation fundamentally altered the nature of educational change. In traditional models of higher education, innovation was frequently understood as the implementation of discrete improvements, e.g. curriculum reform, the adoption of new teaching methods, or the introduction of educational technologies. Such innovations could often be analysed independently because institutional structures remained comparatively stable. Contemporary universities, however, increasingly experience educational change as an ongoing and interconnected process in which curriculum design, digital transformation, professional development, student engagement, governance, quality assurance, and international cooperation mutually influence one another. Consequently, educational innovation has become less a sequence of isolated interventions than a continuous process of institutional adaptation.

These developments stimulated growing interest in systems thinking, which offered a more comprehensive framework for understanding educational organizations. Rather than examining education institutions as collections of separate structures or activities, systems approaches emphasize interdependence, feedback, emergence, and adaptation. Within this perspective, universities are understood as organizations whose development depends not only on the quality of individual components but also on the relationships that connect them. The work of Peter Senge on learning organizations contributed significantly to this shift by demonstrating that sustainable organizational improvement emerges through systemic learning rather than through isolated reforms⁴. Similarly, complexity-oriented educational research argues that meaningful educational change cannot be fully understood through linear models of cause and effect because learning organizations continuously evolve through interactions among multiple actors, institutional structures, and external environments⁵.

The increasing complexity of higher education has also been described by Ronald Barnett, whose concept of *supercomplexity* highlights the growing uncertainty, plurality of knowledge, and rapidly changing conditions within which contemporary universities operate. R. Barnett argues that universities no longer function in relatively predictable environments but are required to respond continuously to competing

³ Global Education Monitoring Report 2023: Technology in Education – A Tool on Whose Terms? Paris: UNESCO, 2023.

⁴ Senge P. M. The Fifth Discipline: The Art and Practice of the Learning Organization. New York: Doubleday, 1990.

⁵ Davis B., Sumara D. Complexity and Education: Inquiries into Learning, Teaching, and Research. Mahwah, NJ: Lawrence Erlbaum Associates, 2006.

expectations, emerging technologies, societal challenges, and evolving forms of knowledge. Under such conditions, institutional resilience depends less on stability than on the capacity for continuous learning, adaptation, and organizational renewal⁶. Although R. Barnett does not explicitly employ the concept of educational ecosystems, his analysis provides an important theoretical bridge between environmental perspectives and ecosystem thinking by demonstrating that increasingly complex universities require equally dynamic explanatory frameworks.

Consequently, the growing adoption of systems thinking should not be interpreted as a rejection of the concept of the educational environment. Rather, it represents an important stage in the evolution of educational thought. Systems perspectives shifted scholarly attention from analysing educational conditions towards understanding educational processes, thereby creating conceptual foundations for the subsequent emergence of ecosystem thinking. Once educational research began to focus on relationships, adaptation, and continuous institutional learning, it became possible to conceptualize universities not simply as environments that support learning but as evolving systems in which learning, organizational development, and innovation are mutually constitutive.

The gradual adoption of systems thinking created the intellectual conditions for the emergence of ecosystem thinking in education. However, the transition from systems to ecosystems did not occur simply because educational terminology changed. Rather, it reflected a growing recognition that contemporary universities could no longer be understood solely as organizations composed of interacting structures and processes. They increasingly function as dynamic learning communities in which educational transformation emerges through continuous interactions among learners, educators, institutional leadership, digital technologies, physical and virtual learning environments, external partners, and society as a whole. Under these conditions, the concept of an ecosystem offered a more comprehensive explanatory framework capable of capturing not only organizational complexity but also the relational, adaptive, and developmental nature of higher education.

Contemporary international organizations have played a particularly important role in advancing this conceptual shift. Although UNESCO and the OECD approach educational ecosystems from different perspectives, together they illustrate the multidimensional nature of ecosystem thinking. UNESCO primarily conceptualizes educational ecosystems through the lens of learning, emphasizing the integration of pedagogy, technology, learning spaces, inclusion, and lifelong learning to create human-centred educational

⁶ Barnett R. *Realizing the University in an Age of Supercomplexity*. Buckingham: Society for Research into Higher Education & Open University Press, 2000.

systems capable of supporting continuous development⁷. Within this perspective, innovation is understood not as the implementation of isolated technological solutions but as the creation of educational conditions that empower learners, strengthen collaboration, and promote active participation in knowledge construction⁸.

The OECD complements this perspective by focusing on the institutional conditions that enable educational ecosystems to function effectively. Rather than emphasizing technology itself, OECD publications consistently highlight governance, institutional capacity, trust, collaboration, equity, digital infrastructure, and professional learning as essential components of sustainable educational transformation^{9,10}. Consequently, educational ecosystems are presented not merely as innovative learning environments but as institutional arrangements that enable universities to coordinate multiple actors, resources, and processes in ways that support continuous improvement and adaptation. This governance-oriented perspective significantly expands ecosystem thinking beyond pedagogical innovation by demonstrating that sustainable educational change depends upon the quality of institutional relationships as much as upon the quality of individual educational practices.

Recent conceptual and systematic review studies further reinforce this evolution. While contemporary research offers different definitions of learning ecosystems and educational ecosystems, a common pattern can be observed across the literature. Educational ecosystems are increasingly described as dynamic networks of relationships that integrate pedagogical approaches, digital technologies, learning environments, institutional culture, stakeholder collaboration, and continuous knowledge exchange. Importantly, these studies move beyond describing ecosystem components and instead emphasize the interactions through which educational value is continuously created, shared, and transformed. This represents a significant departure from earlier environmental perspectives, where analytical attention was directed primarily towards educational conditions rather than towards the relationships that generate educational development.

⁷ Global Education Monitoring Report 2023: Technology in Education – A Tool on Whose Terms? Paris : UNESCO, 2023.

⁸ Guidance for Generative AI in Education and Research. Paris : UNESCO, 2024.

⁹ OECD Digital Education Outlook 2023: Towards an Effective Digital Education Ecosystem. Paris : OECD Publishing, 2023.

¹⁰ OECD Future of Education and Skills 2030: OECD Learning Compass 2030. 2019.

2. Educational environments, learning ecosystems and educational ecosystems: a conceptual analysis

The rapid development of ecosystem thinking in higher education has generated a growing body of literature employing such concepts as educational environment, learning environment, learning ecosystem, educational ecosystem, digital learning ecosystem, and innovative educational ecosystem. While these concepts have emerged within different theoretical traditions and have been developed to address different educational challenges, contemporary literature frequently uses them interchangeably or with only limited conceptual differentiation. As a result, the boundaries between these constructs have become increasingly blurred, creating ambiguity regarding their respective analytical purposes and explanatory capacities.

This conceptual overlap is understandable. All of these concepts seek to explain how learning is supported, how educational actors interact, and how educational processes develop within institutional contexts. Consequently, they often share common components, including learners, educators, learning resources, digital technologies, institutional settings, and collaborative practices. Their structural similarities have led many researchers to treat them as alternative labels describing essentially the same educational reality. However, such an interpretation risks oversimplifying the theoretical evolution of educational research by reducing fundamentally different analytical perspectives to terminological variation.

A closer examination of contemporary scholarship suggests that these concepts should not be distinguished primarily according to the educational elements they include, but rather according to the questions they are intended to answer. The concept of the *educational environment* primarily explains the contextual conditions that support learning; the concept of the *learning ecosystem* focuses on the interactions and networks through which learning develops; whereas the *educational ecosystem* seeks to explain how education institutions continuously generate, sustain, and transform learning through the dynamic relationships among pedagogical, organizational, technological, cultural, and social processes. Thus, the principal distinction among these concepts lies not in their structural composition but in their explanatory logic.

The increasing diversity of ecosystem-related concepts in higher education presents not only a terminological challenge but also a methodological one. Existing studies typically compare concepts by juxtaposing their definitions or identifying recurring keywords. Although such approaches are valuable for mapping conceptual developments, they often remain descriptive and provide only limited insight into the theoretical assumptions underlying different conceptual frameworks. Consequently, concepts that differ substantially in their explanatory purposes may appear more similar than they actually are.

This limitation becomes particularly evident in studies addressing educational environments, learning ecosystems, and educational ecosystems. Many of these concepts share common educational components, including learners, educators, technologies, learning resources, institutional settings, and collaborative practices. However, the mere presence of similar components does not necessarily indicate conceptual equivalence. What distinguishes these concepts is less *what* they include than *how* these elements are organised, interconnected, and interpreted within a particular theoretical perspective. In other words, the explanatory potential of a concept depends not only on its structural composition but also on the relationships established among its defining attributes.

To address this methodological challenge, the study employs *conceptual attribute analysis*, a systematic analytical approach developed for the purposes of this research. Rather than comparing concepts at the level of terminology, conceptual attribute analysis examines their underlying conceptual architecture through the identification, comparison, and interpretation of their defining attributes and the relationships among them. This approach makes it possible to reveal the distinctive analytical functions performed by related concepts, identify areas of conceptual convergence and divergence, and uncover dimensions that remain insufficiently represented in contemporary scholarship.

For the purposes of this study, each concept was examined according to a common analytical framework consisting of six interconnected dimensions: 1) conceptual core, which identifies the primary educational phenomenon and the dominant metaphor underlying the concept; 2) educational logic, describing its principal purpose, unit of analysis, and mechanisms of educational development; 3) institutional dimension, encompassing governance, leadership, and institutional culture; 4) pedagogical dimension, including pedagogy, learning, professional development, and assessment; 5) human dimension, focusing on collaboration, agency, inclusion, and well-being; and 6) transformational dimension, capturing adaptability, innovation, sustainability, and continuous educational transformation. In addition, each concept was evaluated in terms of its explanatory strengths and conceptual limitations.

This analytical framework was intentionally designed to move beyond the comparison of definitions toward the comparison of explanatory models. It enables examination of educational concepts as multidimensional theoretical constructs rather than isolated terminological units. Such an approach is particularly appropriate for investigating innovative educational ecosystems, whose complexity cannot be adequately understood through linear or component-based descriptions alone. Instead, the concept requires an analysis of dynamic relationships among pedagogical, organisational,

technological, cultural, and human dimensions that collectively shape institutional development.

The findings of the conceptual attribute analysis are summarised in Table 1. Rather than serving as a descriptive comparison of definitions, the matrix functions as an analytical instrument that reconstructs the conceptual architecture of each educational approach. By making explicit the defining attributes, their interrelationships, and their explanatory roles, the matrix reveals both the shared foundations and the distinctive analytical contributions of educational environments, learning ecosystems, and educational ecosystems.

Consequently, comparison presented below should not be interpreted as an attempt to identify a single “correct” concept. Instead, it demonstrates how each conceptual framework illuminates a particular dimension of educational reality and how, taken together, these perspectives reflect gradual evolution of theoretical thinking about higher education. It also exposes conceptual gaps that remain insufficiently addressed in existing scholarship, thereby providing the rationale for developing an integrated understanding of the innovative educational ecosystem in the subsequent section.

Table 1

Analytical matrix of conceptual attributes

Attribute	Educational Environment	Learning Ecosystem	Educational Ecosystem
Primary purpose	To create favourable conditions for learning	To facilitate continuous learning through interaction	To enable continuous institutional learning, innovation and transformation
Ontological focus	Educational context and conditions	Learning as a networked and collaborative process	Higher education as a dynamic adaptive system
Dominant metaphor	Environment / Context	Network	Living ecosystem
Unit of analysis	Learning environment	Learning relationships and networks	Institutional relationships and ecosystem dynamics
Core mechanisms	Provision of resources and supportive conditions	Collaboration, knowledge exchange, co-creation	Co-evolution, adaptation, feedback, institutional learning
Role of pedagogy	Supports effective teaching and learning	Organises collaborative learning	Integrates pedagogy as a driver of institutional development
Role of technology	Educational resource	Learning enabler	Integrated component of ecosystem functioning
Governance	Limited	Indirect	Central coordinating mechanism
Leadership	Rarely addressed	Occasionally recognised	Strategic driver of ecosystem development

Table 1 (continuance)

Institutional culture	Contextual factor	Supports collaboration	Constitutive component of ecosystem sustainability
Professional development	Individual activity	Collaborative professional learning	Continuous capacity-building embedded in institutional processes
Assessment	Measures learning outcomes	Supports learning improvement	Feedback mechanism for continuous ecosystem development
Student role	Learner	Active participant	Co-creator of educational innovation
Collaboration	Desirable	Essential	Structural characteristic of the ecosystem
Inclusion & Well-being	Supportive conditions	Important for participation	Integral values shaping ecosystem development
Adaptability	Limited	High	Continuous adaptive capacity
Innovation	Improvement of educational practice	Pedagogical innovation	Continuous institutional innovation
Expected outcome	Effective learning environment	Sustainable learning processes	Sustainable educational transformation
Explanatory capacity	Explains learning conditions	Explains learning interactions	Explains institutional transformation through relationships
Main conceptual limitation	Limited explanation of institutional dynamics	Limited explanation of governance and institutional change	Requires clearer integration of pedagogical and organizational dimensions in many existing definitions

Source: Developed by the author based on the conceptual attribute analysis of international policy documents and contemporary scholarly literature

The comparative analysis presented in Table 1 demonstrates that educational environments, learning ecosystems, and educational ecosystems should not be understood as competing or mutually exclusive concepts. Rather, they represent successive stages in the theoretical evolution of educational thought, each reflecting a different way of conceptualising learning, education institutions, and educational change. The observed differences therefore stem not from the educational components included in each concept but from the explanatory logic through which these components are organised into coherent theoretical frameworks.

The analysis reveals that all three concepts share a common educational foundation. Each recognises the importance of learners, educators, learning resources, and institutional settings as essential elements of educational processes. Similarly, collaboration, technology, and supportive learning conditions appear, to varying degrees, across all conceptual approaches. These recurring attributes explain why the concepts are frequently treated as synonymous in contemporary literature. However, the comparison also demonstrates that structural similarity should not be equated with conceptual equivalence. Identical educational components perform different analytical

functions depending on the theoretical perspective within which they are embedded.

The most significant distinction identified through the analysis concerns the **unit of explanation**. The concept of the educational environment primarily explains the conditions under which learning occurs. Its analytical focus remains centred on the quality of educational contexts and the factors that facilitate effective teaching and learning. Learning ecosystems shift this perspective towards the processes and relationships through which learning develops, emphasising interaction, collaboration, knowledge exchange, and the active participation of learners within interconnected educational networks. Educational ecosystems extend this logic further by positioning the university itself as an adaptive and continuously evolving organisation in which pedagogical, organisational, technological, and cultural processes interact to generate sustainable educational transformation. From this perspective, the transition from educational environments to educational ecosystems represents considerably more than a gradual expansion of educational terminology. It reflects a fundamental shift in the underlying assumptions about how educational development occurs. Earlier conceptualisations primarily viewed educational improvement as the optimisation of learning conditions, whereas ecosystem perspectives increasingly understand educational change as an emergent property of complex relationships among multiple actors, institutional structures, and continuous processes of adaptation. Consequently, innovation is no longer interpreted as the implementation of isolated educational practices but as a systemic capacity embedded within the university itself.

Another important finding concerns the changing role of education institutions. Within environment-based approaches, universities are generally understood as providers of learning conditions and educational resources. Learning ecosystem perspectives expand this role by viewing universities as facilitators of collaborative learning and knowledge exchange. Educational ecosystem approaches, however, conceptualise universities as adaptive learning organisations capable of continuously redesigning their pedagogical practices, organisational structures, and institutional culture in response to emerging educational challenges. This transformation significantly broadens the analytical scope of higher education research by integrating pedagogical, organisational, and strategic dimensions within a single conceptual framework.

The analysis further indicates that the explanatory power of ecosystem approaches depends not merely on the number of educational elements they include but on the relationships established among those elements. While educational environments tend to organise educational components around contextual support and learning ecosystems around collaborative learning

processes, educational ecosystems conceptualise these components as mutually dependent and continuously interacting processes. Thus, the defining characteristic of an educational ecosystem lies not in the presence of additional educational components but in the dynamic configuration of relationships through which institutional learning, innovation, and transformation continuously emerge.

These findings suggest that conceptual development from educational environments to educational ecosystems should be interpreted as a progressive increase in explanatory complexity. Rather than replacing earlier concepts, ecosystem thinking incorporates and extends them, offering a more comprehensive understanding of contemporary higher education. At the same time, a comparative analysis reveals that many existing interpretations of educational ecosystems continue to privilege either technological or organisational perspectives, while pedagogical mechanisms that sustain ecosystem development remain comparatively underexplored. This conceptual observation provides grounds for the subsequent synthesis aimed at identifying the distinctive characteristics of an innovative educational ecosystem in higher education.

The results of comparative conceptual analysis presented above demonstrate that the educational ecosystem cannot be adequately understood as a simple extension of the concepts of educational environment or learning ecosystem. Although these concepts share numerous educational components, they differ fundamentally in the way educational reality is conceptualised. The distinctive contribution of the educational ecosystem perspective lies in its ability to explain not individual educational elements but the dynamic relationships through which these elements collectively generate continuous institutional learning, innovation, and transformation.

This distinction suggests that the defining characteristic of an educational ecosystem is not the presence of particular educational resources, technologies, or organisational structures. Rather, it is the capacity to establish and sustain adaptive relationships among pedagogical, organisational, technological, cultural, and human dimensions of university life. Consequently, an educational ecosystem should be viewed primarily as a relational and developmental framework that explains how universities continuously reorganise their internal capacities in response to changing educational needs rather than merely as a collection of educational components.

An equally important finding emerging from the comparative analysis concerns the role of educational change. Earlier conceptual approaches generally interpret educational development as the improvement of existing conditions or practices. Ecosystem perspectives, by contrast, conceptualise change as an inherent and continuous characteristic of institutional life. Within this perspective, innovation is not understood as the implementation

of isolated initiatives but as an ongoing process of institutional adaptation supported by collaborative learning, reflective practice, distributed leadership, and continuous organisational development.

The analysis also demonstrates that contemporary interpretations of educational ecosystems increasingly recognise the importance of digital technologies, collaboration, and networked learning. However, considerably less attention has been devoted to the pedagogical mechanisms through which ecosystem development is sustained over time. Such elements as academic leadership, professional learning of university staff, institutional culture, formative assessment, well-being, and inclusive participation often appear as secondary considerations despite their fundamental contribution to the long-term vitality of educational ecosystems. This observation indicates that current conceptualisations remain only partially integrated, tending to privilege either technological innovation or organisational transformation while paying comparatively limited attention to the pedagogical processes that connect these dimensions into a coherent whole.

From this perspective, innovation should not be regarded as an independent component added to an existing educational ecosystem. Rather, innovation represents an emergent property arising from the continuous interaction among pedagogical practice, institutional governance, collaborative culture, technological infrastructure, and professional agency of educators and learners. The innovative capacity of an educational ecosystem therefore depends less on the availability of individual innovations than on the university's ability to create conditions under which new educational practices continuously emerge, are collectively refined, and become embedded within institutional culture.

Consequently, the concept of an innovative educational ecosystem represents a qualitative advancement in ecosystem thinking rather than merely a specialised variation of existing educational ecosystem models. It integrates the pedagogical, organisational, relational, technological, and human-centred dimensions of university development into a single conceptual framework capable of explaining not only how learning occurs but also how universities themselves become adaptive learning organisations capable of sustained educational innovation (Table 2).

The conceptual synthesis presented in Table 2 demonstrates that the evolution from educational environments to educational ecosystems reflects a progressive expansion of the explanatory scope of education theory. Rather than replacing earlier conceptualisations, ecosystem thinking incorporates and extends them, offering increasingly comprehensive perspectives on learning, institutional development, and educational transformation. As a result, contemporary ecosystem approaches provide a substantially richer

Table 2

**Conceptual synthesis of educational environment,
learning ecosystem and educational ecosystem**

Analytical Dimension	Educational Environment	Learning Ecosystem	Educational Ecosystem
Primary educational focus	Learning conditions	Learning interactions and processes	Continuous educational and institutional transformation
Dominant metaphor	Environment / Context	Network	Living adaptive ecosystem
Unit of analysis	Educational setting	Learning community and networks	University as a dynamic adaptive system
Organising principle	Provision of supportive conditions	Collaboration and knowledge exchange	Interdependence, co-evolution and continuous adaptation
Role of the university	Provider of educational conditions	Facilitator of collaborative learning	Adaptive learning organisation and ecosystem orchestrator
Understanding of innovation	Improvement of educational practice	Development of collaborative learning innovations	Institutional capability for continuous pedagogical innovation and transformation
Role of pedagogy	Effective teaching and learning	Collaborative knowledge construction	Driver of institutional learning, innovation and continuous development
Nature of relationships	Context influences learning	Participants co-create learning	Pedagogical, organisational, technological and cultural processes co-evolve
Explanatory contribution	Explains educational conditions	Explains collaborative learning dynamics	Explains the mechanisms of sustainable institutional development and educational transformation

Source: Developed by the author based on the conceptual attribute analysis of international policy documents and contemporary scholarly literature

understanding of higher education than environment-based models alone, particularly in explaining complexity, interdependence, and institutional adaptability.

At the same time, the comparative analysis reveals that no single conceptual approach fully captures the multidimensional nature of innovation in contemporary universities. Existing interpretations variously emphasise pedagogical processes, organisational development, digital transformation, collaborative networks, or human-centred learning; however, these dimensions are frequently examined in relative isolation. Consequently, current conceptualisations often explain important aspects of educational ecosystems without adequately integrating them into a coherent theoretical model capable of reflecting the complexity of university development in the 21st century.

The findings suggest that the distinctive value of the innovative educational ecosystem concept lies precisely in its integrative potential. Rather than introducing an entirely new educational paradigm, it brings together pedagogical, organisational, technological, relational, and human-centred dimensions within a single conceptual framework. Such integration enables educational innovation to be understood not as a collection of separate initiatives but as a continuous institutional process emerging from the dynamic interaction of educational actors, organisational structures, institutional culture, leadership, and professional learning. This perspective also implies a reconsideration of the university's role. Within an innovative educational ecosystem, the university is understood not simply as a provider of educational services or a facilitator of learning, but as a continuously learning organisation capable of generating, evaluating, and transforming educational practices through collaborative inquiry, reflective governance, and adaptive institutional development. Innovation, therefore, becomes an intrinsic characteristic of ecosystem functioning rather than an external outcome of individual projects or technological interventions.

3. Towards an integrated conceptual framework of an innovative educational ecosystem in higher education

The comparative conceptual analysis conducted in section 1.2 demonstrates that the ecosystem perspective has significantly expanded the theoretical understanding of contemporary higher education. The concepts of educational environment, learning ecosystem, and educational ecosystem should therefore be regarded not as competing alternatives but as complementary perspectives that explain different dimensions of educational reality. Together, they reflect the gradual evolution of educational thought from relatively stable learning settings towards increasingly dynamic, relational, and adaptive interpretations of university development.

At the same time, the analysis indicates that the growing diversity of ecosystem-related concepts has generated a certain degree of conceptual fragmentation. Existing approaches successfully explain particular aspects of higher education, including learning environments, collaborative learning processes, digital transformation, organisational development, and institutional innovation. However, these dimensions are frequently examined through separate theoretical lenses, resulting in conceptual models that illuminate individual components of educational ecosystems without fully explaining their dynamic interdependence.

This observation is particularly significant for contemporary universities, where educational innovation rarely emerges from isolated pedagogical initiatives or technological interventions alone. Instead, innovation develops through the continuous interaction of educational actors, institutional culture,

organisational structures, leadership practices, professional learning, digital technologies, and external partnerships. Understanding such complexity requires a conceptual framework capable of integrating these dimensions into a coherent explanation of how universities continuously learn, adapt, and transform.

The findings of the conceptual attribute analysis further demonstrate that the distinctive value of ecosystem thinking lies not simply in recognising multiple educational components but in explaining the relationships among them. Educational ecosystems are therefore characterised less by the presence of specific elements than by the dynamic processes through which these elements influence one another, generate new educational practices, and collectively contribute to sustainable institutional development. Consequently, an integrated conceptual framework should move beyond descriptive classifications of ecosystem components and instead explain the mechanisms through which pedagogical, organisational, technological, relational, and human-centred dimensions become mutually reinforcing within university life. From this perspective, the development of an integrated conceptual framework represents not a departure from existing ecosystem theories but their logical continuation. It seeks to synthesise their principal theoretical contributions while addressing the conceptual gaps identified through the comparative analysis. In doing so, the framework provides a foundation for understanding innovative educational ecosystems not as static institutional models but as continuously evolving systems capable of generating educational innovation through the interaction of people, practices, structures, and institutional values.

The conceptual analysis presented in the preceding sections suggests that an innovative educational ecosystem cannot be adequately defined through a simple enumeration of its structural components. Although contemporary interpretations consistently recognise the importance of pedagogy, technology, collaboration, and institutional context, the comparative analysis demonstrates that the distinctive nature of an educational ecosystem lies primarily in the dynamic relationships established among these dimensions rather than in the individual components themselves. Consequently, an integrated definition should reflect not only the structure of the ecosystem but also the mechanisms through which it continuously evolves. Against this conceptual background, the following definition is proposed: *An innovative educational ecosystem in higher education is an adaptive, pedagogically driven, and continuously evolving university system in which pedagogical, organisational, technological, relational, and human-centred dimensions interact through collaborative, reflective, and evidence-informed mechanisms to generate continuous institutional learning, sustainable educational innovation, and transformative development for learners,*

educators, and the university community. This definition deliberately conceptualises the university as a dynamic learning system rather than a static institutional structure. The term *adaptive* emphasises the ecosystem's capacity to respond proactively to emerging educational, societal, and technological challenges through continuous learning and organisational renewal. Adaptation, therefore, is understood not as reactive adjustment but as an inherent capability embedded within institutional culture and governance. The expression *pedagogically driven* reflects one of the central conclusions of the comparative conceptual analysis. While digital technologies, organisational reforms, and strategic leadership play essential roles in contemporary higher education, they do not constitute the primary source of educational innovation. Instead, pedagogical values, learning processes, curriculum development, assessment, and professional learning provide the fundamental mechanisms through which the ecosystem generates sustainable institutional change. Technology functions as an enabling condition rather than the defining principle of ecosystem development. The definition further emphasises that innovation emerges through the *dynamic interaction* of multiple dimensions. Pedagogical practice, organisational structures, institutional culture, leadership, technological infrastructure, collaborative networks, and human agency should not be interpreted as independent variables but as mutually reinforcing elements of an integrated developmental process. Consequently, innovation is conceptualised as an emergent property of ecosystem functioning rather than as the outcome of isolated initiatives or externally introduced reforms. Finally, the proposed definition extends existing ecosystem perspectives by identifying *continuous institutional learning* as the central developmental mechanism connecting educational innovation with organisational transformation. Within an innovative educational ecosystem, learning becomes a characteristic not only of students but also of educators, academic communities, institutional leadership, and the university as a whole. The university therefore functions as a learning organisation whose capacity for continuous reflection, knowledge creation, collaboration, and adaptation enables sustainable educational development under conditions of constant change.

Rather than replacing existing conceptualisations, the proposed definition synthesises their principal theoretical contributions within a coherent pedagogical framework. In doing so, it provides a conceptual foundation for examining innovative educational ecosystems not only as institutional contexts for learning but also as dynamic systems through which universities intentionally cultivate innovation, resilience, and continuous educational transformation.

Table 3

Structural and functional components of the author's conceptual framework of an innovative educational ecosystem

Component	Conceptual Meaning	Primary Function
Pedagogical	Learning, curriculum, assessment, teaching innovation	Drives educational transformation
Organisational	Governance, leadership, institutional structures	Enables strategic adaptation
Human-centred	Agency, well-being, inclusion, participation	Sustains engagement and development
Relational	Collaboration, partnerships, knowledge exchange	Generates collective learning
Technological	Digital infrastructure and learning technologies	Enables innovation and connectivity
Adaptive	Continuous feedback, reflection and renewal	Maintains ecosystem resilience

The integrated conceptual framework proposed in this study conceptualises the innovative educational ecosystem as a dynamic architecture rather than a static institutional model. Its defining characteristic lies not simply in the coexistence of multiple educational dimensions but in the mechanisms that continuously connect and transform them. Consequently, the ecosystem should be understood as a living system of pedagogical relationships through which the university develops its capacity for learning, innovation, adaptation, and sustainable institutional development (Fig. 1).

Within this framework, five interdependent structural dimensions constitute the conceptual architecture of the innovative educational ecosystem.

The *pedagogical dimension* forms the conceptual core of the ecosystem. It encompasses teaching and learning processes, curriculum innovation, assessment, professional learning, and the continuous development of educational practices. Unlike technology-centred approaches, the proposed framework positions pedagogy as the primary driver of ecosystem development because it is pedagogical innovation that generates meaningful educational transformation.

The *organisational dimension* provides the institutional conditions that enable ecosystem development. Governance, distributed leadership, strategic vision, organisational structures, and institutional culture create the organisational capacity through which educational innovation can emerge, expand, and become embedded within university practice.

The *human-centred dimension* recognises students, educators, academic leaders, and professional staff as active agents of ecosystem development. Agency, inclusion, well-being, trust, participation, and shared responsibility therefore become essential conditions for sustaining collaborative learning communities capable of continuous development.

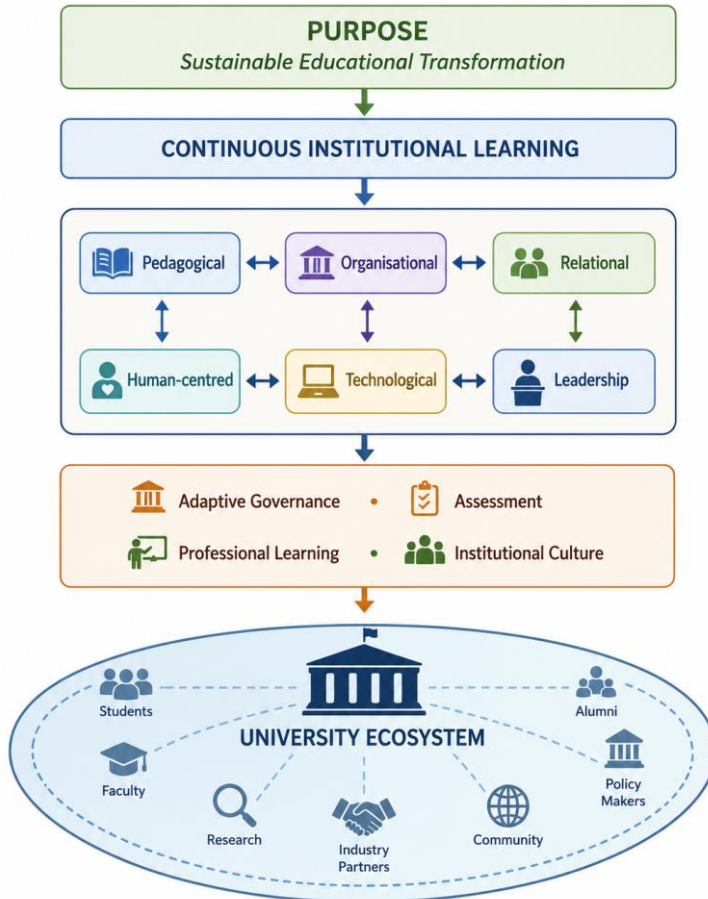


Fig. 2. Integrated Pedagogical Ecosystem Framework

Source: Developed by the author; visual representation created with the assistance of ChatGPT (OpenAI) based on the conceptual framework proposed in this study

The *relational dimension* reflects the ecosystem's networked character. Internal collaboration, interdisciplinary cooperation, partnerships with external stakeholders, international engagement, and knowledge exchange connect individual educational activities into coherent institutional learning processes. It is through these relationships that innovation becomes collective rather than individual.

The *technological dimension* functions as an enabling infrastructure supporting communication, collaboration, knowledge creation, data-informed decision-making, and flexible learning environments. Within the proposed framework, technology does not determine educational innovation; rather, it amplifies the pedagogical and organisational capacities of the ecosystem.

The interaction of these structural dimensions is sustained through a set of functional mechanisms that transform the ecosystem from an institutional structure into a continuously developing educational system. These mechanisms include collaborative knowledge creation, continuous professional learning, reflective governance, adaptive leadership, formative assessment and feedback, evidence-informed decision-making, institutional reflection, and the co-creation of educational innovation. Collectively, they enable the university to maintain its adaptive capacity while responding proactively to emerging educational, technological, and societal challenges. The integrated framework therefore conceptualises innovation not as an isolated outcome but as an emergent property arising from the continuous interaction of pedagogical, organisational, relational, technological, and human-centred processes. Educational transformation becomes sustainable because learning occurs simultaneously at the level of individuals, professional communities, institutional structures, and the university as an integrated ecosystem.

CONCLUSIONS

The conceptual inquiry presented in this chapter demonstrates that the growing adoption of ecosystem thinking reflects a fundamental transformation in the theoretical understanding of higher education rather than the emergence of a new educational metaphor. The increasing complexity of universities, the continuous expansion of digital learning, and the need for sustainable educational innovation require conceptual approaches capable of explaining higher education as an adaptive, relational, and continuously evolving system. Within this context, the ecosystem perspective provides a substantially broader explanatory framework than traditional environment-based approaches by shifting analytical attention from educational conditions to the dynamic relationships and institutional capacities through which educational transformation is continuously generated and sustained.

The study has shown that the concepts of educational environment, learning ecosystem, and educational ecosystem should not be interpreted as competing theoretical constructs but as successive stages in the evolution of educational thought. Comparative conceptual analysis demonstrates that these concepts differ primarily in their explanatory logic rather than in the educational components they include. While educational environments focus

on the contextual conditions supporting learning and learning ecosystems emphasise collaborative educational processes, educational ecosystems conceptualise the university itself as a dynamic adaptive system in which pedagogical, organisational, technological, relational, and human-centred dimensions continuously interact to produce institutional learning and sustainable educational transformation.

The principal outcome of the study is the development of an integrated conceptualisation of an innovative educational ecosystem in higher education. The proposed definition conceptualises the innovative educational ecosystem as an adaptive, pedagogically driven, and continuously evolving university system in which pedagogical, organisational, technological, relational, and human-centred dimensions interact through collaborative, reflective, and evidence-informed mechanisms to generate continuous institutional learning, sustainable educational innovation, and transformative development. In doing so, the chapter shifts the understanding of innovative educational ecosystems from descriptive institutional models towards a coherent theoretical explanation of how universities develop their capacity for continuous educational transformation.

The author's Integrated pedagogical ecosystem framework further extends this conceptualisation by providing a holistic theoretical representation of the structural and functional architecture of innovative educational ecosystems. Unlike existing ecosystem models, which frequently privilege either technological innovation or organisational change, the proposed framework places pedagogy at the centre of ecosystem development while conceptualising governance, leadership, institutional culture, professional learning, assessment, collaboration, and technological infrastructure as mutually reinforcing mechanisms that sustain continuous institutional learning. Consequently, the framework explains innovation as an emergent property of the ecosystem rather than as the outcome of isolated educational interventions.

Overall, this chapter establishes the theoretical foundations for understanding innovative educational ecosystems as dynamic systems of pedagogically driven institutional transformation. By integrating ecosystem thinking, conceptual analysis, and theory building into a coherent explanatory framework, the study contributes to the advancement of higher education theory and provides a robust conceptual basis for future empirical research examining how universities develop, implement, evaluate, and continuously improve innovative educational ecosystems under conditions of ongoing educational, technological, and societal change.

SUMMARY

This chapter conceptualises innovative educational ecosystems in higher education as adaptive systems of continuous institutional learning and pedagogically driven educational transformation. Drawing on conceptual inquiry, comparative conceptual analysis, and theory-building methodology, the study reconstructs the evolution of ecosystem thinking and clarifies the relationships among the concepts of educational environment, learning ecosystem, and educational ecosystem. The findings demonstrate that these concepts represent successive stages in the evolution of educational thought rather than competing theoretical perspectives. The chapter proposes an integrated conceptualisation of an innovative educational ecosystem as a dynamic university system in which pedagogical, organisational, technological, relational, and human-centred dimensions interact through collaborative and evidence-informed mechanisms to sustain continuous educational innovation. A major contribution of the study is the development of the author's Integrated pedagogical ecosystem framework, which positions pedagogy as the central driver of ecosystem development and explains innovation as an emergent property of institutional interactions rather than isolated interventions.

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Information about the author:

Boichenko Maryna Anatoliivna,

Doctor of Pedagogical Sciences, Professor,

Professor at the Pedagogy Department

Sumy State Pedagogical University named after A.S. Makarenko

87 Romenska str., Sumy, 40002, Ukraine