SOFIA UNIVERSITY -
MARKING MOMENTUM
FOR INNOVATION AND TECHNOLOGICAL TRANSFER

SUMMIT
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SOCIAL AND PEDAGOGICAL PARADIGMS FOR RESEARCH AND MODELLING OF EDUCATIONAL ECOSYSTEMS

Research field: *Interdisciplinary education studies*

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Rationale

Over the past two decades, the interest of researchers and practitioners in the ecological dimensions and meanings of education has intensified enormously. This has led to the emergence of a huge variety of paradigmatic approaches and terminological usages. Some of these address learning itself, e.g., "learning ecosystem" (J. Dillan 2022), "STEM learning ecosystem", "e-learning ecosystem" (E. Railean 2019), "distributed learning ecosystem" (D. Otto, G. Scharnberg, M. Kerres, O. Zawacki-Richter 2023), "personalized learning ecosystem" (R. Zheng 2018). Others have focused on dimensions of school as ecosystem - "school as ecosystem" (T. Akiva, K. H. Robinson, 2022), "eco school" (Lase-Jeruma & Birzina 2019), green school (Gough, Lee, Tsang 2014), ecosystem for research-engaged schools (David Godfrey, Chris Brown 2019). Others have attempted to conceptualize and model education as a whole on ecosystem principles, bringing into use concepts such as "education ecosystem" (Sehwa Wu, Carol Yeh-Yun Lin 2020; Bertram C. Bruce 2020), education ecosystem framework for a new normal (Irvin L. Scott 2023). There is a sense that almost everything in education can treated as an "ecosystem" without seeking and satisfying clear systemic boundaries of organic educational complexity and sustainability. Therefore, the *presented research is committed to the search for workable criteria to systematize and classify existing paradigm approaches and models for researching and modelling ecosystems in education.* This would allow to make better use of what has been achieved so far and to channel the search for a new credible paradigm that builds on the achievements of systems approaches and practices with the possibilities of ecosystem thinking and action. This *study therefore aims to identify and analyse research paradigms and approaches to ecosystem dimensions of education through which the ecosystem cycle is realised.*

Methodology

METHODOLOGY
(1) A thematic review and analysis of leading research and best practice;
(2) A mixed-methods empirical study of operating models of educational ecosystems;
(3) Experimental conceptualization and validation of a complex paradigm model for interdisciplinary research (mapping) and modelling of educational ecosystems.

SCIENTIFIC CONTRIBUTIONS
(1) Systematizing and classifying social and pedagogical paradigms for researching and modelling educational ecosystems;
(2) Conceptualizing an interdisciplinary paradigm for researching and modelling educational ecosystems;
(3) Approbation of a complex paradigm model for interdisciplinary research (mapping) and modelling of educational ecosystems.

EXPECTED RESULTS
- 3 publications (authorship/co-authorship) in publications indexed in Web of science / Scopus (month 11);
- 8 individual contributions (authorship/co-authorship) in scientific forums - (m.11);
- 1 organized and implemented scientific forum (round table, m. 11);
- 1 reported substantive paper (m. 12).
- 3 publications (authorship/co-authorship) in journals refereed and indexed in Web of Science / Scopus (m. 13);
- 8 individual contributions (authorship/co-authorship) in scientific forums - (month 13);
- Digital platform for modelling/design of educational ecosystems (m.20);
- 1 scientific forum/conference organized and implemented (m.23);
- 1 content report (m.23).

Conceptual Framework

OBJECTIVES
(1) To explore, analyse, and classify basic social and pedagogical paradigms for researching and modelling educational ecosystems (month 1 - 12);
(2) To create and test prototypes of freely available digital tools (platforms) for interdisciplinary (socio-pedagogical) research and complex modelling of educational ecosystems (month 13 – 24).

TASKS
(1) To review, analyse and classify basic social and pedagogical paradigms for research and modelling of educational ecosystems (month 1 - 12);
(2) To critically identify and analyse practices/cases of educational ecosystems in Bulgaria and Europe (mixed empirical study) (month 1 - 12).
(3) To develop and approbate a concept for interdisciplinary (socio-pedagogical) research (mapping) and modelling of educational ecosystems (month 13 - 24).
(4) To develop and test prototypes of freely available digital tools (platforms) for interdisciplinary (socio-pedagogical) research and complex modelling of educational ecosystems.

HYPOTHESIS 1 Basic models of educational ecosystems treat relatively self-contained dimensions of connectivity between people, their activities and interactions, conditions/contexts and environments in the educational, but do not reflect the complex nature and determinacy of educational models and therefore do not guarantee their holistic sustainability, resilience and positive impact.

Rationale: There is a huge variety of educational ecosystem models that represent distinct aspects and/or levels of connectivity between educational models and their contexts and environments (physical, professional, social, digital, etc.). However, applied in isolation and unilaterally, they cannot be reliable tools for the sustainability of educational activities, environments, resources and outcomes that are determined by a complex set of social and pedagogical conditions and factors.

HYPOTHESIS 2 In order to achieve sustainability, resilience and positive impact from the functioning of educational ecosystems, their conceptualization, analysis and modelling should be based on the synergy between an interdisciplinary (socio-pedagogical) paradigm and a complex design integrating basic dimensions and levels of ecological connectivity between people, conditions, resources and environments in educational practices.

Rationale: In order to achieve systemic (holistic) resilience, the 'ecosystem' in education should be understood and applied as a package/complex of ecosystem dimensions and patterns that only in their integrity and connectivity create a sustainable foundation for practices and ensure their resilience to diverse and multidirectional (social and pedagogical) ongoing factor influences, internal and external dynamics. That is, a holistic model of the ecosystem is needed, integrating several complementary dimensions of sustainability, resilience and impact:

- At the level of educational paradigms, processes and activities (system-forming elements and relationships of educational practice with the external/social and internal environment);
- At the level of educational conditions and factors (system-supporting physical, working and communicative conditions that, in harmony with each other, facilitate access, participation and development of everyone and everything);
- At the level of educational environments, (system-determining social behaviours and communication networks that ensure the balance between people and their social and institutional statuses and roles by complexly modelling the boundaries of acceptable behaviours and communication forms, channels and flows.

Current Results

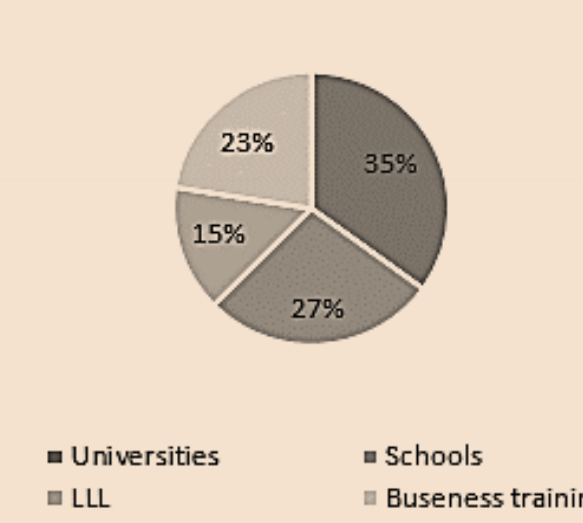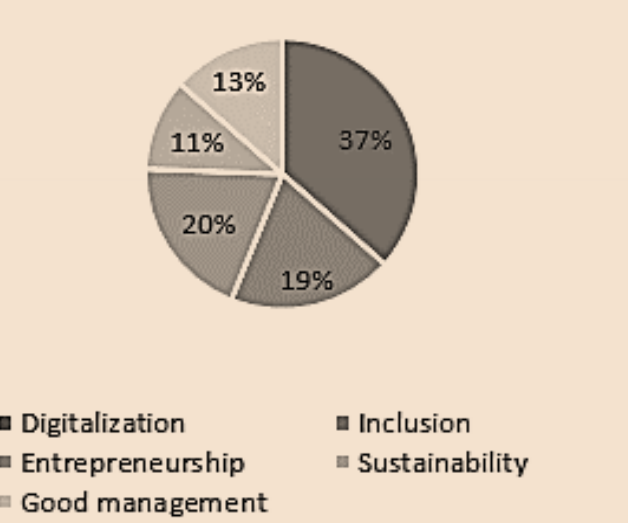*Fig. 1* Identified structural elements of educational ecosystems

Universities 35%, Schools 27%, LLL 15%, Business training 23%

Fig. 2 Identified value-functional dimensions of educational ecosystems

Digitalization 37%, Entrepreneurship 19%, Good management 20%, Inclusion 11%, Sustainability 13%

Tab. 1 Identification, through the systematic review, of the range of structural and functional dimensions of the studied educational ecosystems

| Structural elements of educational ecosystems (institutions, organisations, sectors)	Functional dimensions of educational ecosystems
University ecosystems (*28 publications*)	Digitalization (*30 publications*)
School ecosystems (*22 publications*)	Inclusion (*16 publications*)
Lifelong Learning Ecosystems (*12 publications*)	Entrepreneurship (*16 publications*)
Professional Business and Engineering Learning Ecosystems (*18 publications*)	Sustainability (*9 publications*)
	Good Governance (*11 publications*)
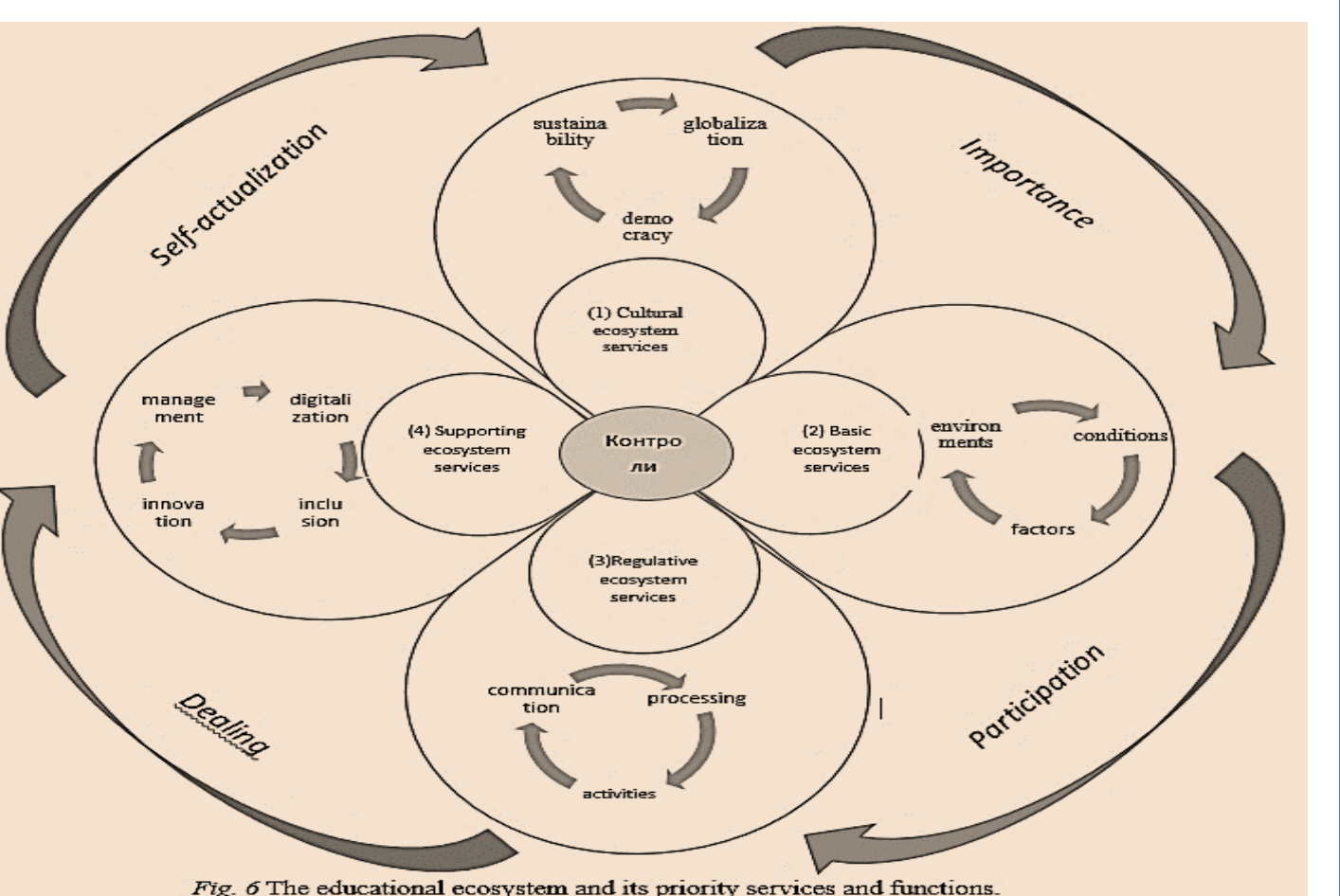
Fig. 6 The educational ecosystem and its priority services and functions.

Tab. 2 Functional and service diversity of reviewed ecosystem models

Ecosystem services / Ecosystem functional dimentions	Basic ecosystem services	Supportive ecosystem services	Regulative ecosystem services	Cultural ecosystem services
Digitalization	Digital infrastructure; Digital connectivity; Digital resources and tools	Digital services; Digitised learning environments; ICT in education	Digital learning; Digital learning; Education 4.0	Digital accessibility; Digital inclusion
Inclusion	Inclusive infrastructure; Inclusive regulations	Inclusive environment/network; Inclusive school; Inclusive teacher	Inclusive education; Inclusive methods; Inclusive techniques	Social Inclusion; Educational Affiliation
Entrepreneurship	Network connectivity infrastructure for entrepreneurship in education	Educational (partner) networks for training in/on entrepreneurship	Training models in/on entrepreneurship; Development of entrepreneurial competences	Entrepreneurial attitudes, culture and participation
Sustainable development	Infrastructure for the sustainability of educational environments and practices	Policies and programmes in support of education for sustainable development	Models and approaches to education for sustainable development	Sustainable development

Conceptual framework of the project implementation

- Needs
- Expectations
- Competences
- Approaches etc.
→ Learning and development

- Cultures
- Norms & rules
- Spaces
- Traditions etc.
→ Environments

- Legal
- Physical
- Technologies
- Time
- Human etc.
→ Conditions

Design of educational ecosystems as complex models of ecological conditions, environments and learning

1. Modelling complex ecosystems in education
2. Mapping complex ecosystems in education
3. Digital platform for designing complex ecosystems
4. Pilot training for users of digital platform

Social and pedagogical paradigms

Current Conclusion

The first year qualitative research on educational ecosystems unequivocally confirms the need for an even more sustained search for new, uncontroversial data and arguments to enable a fuller elucidation of the opportunities and challenges for ecosystem paradigms in education. It is becoming clear that these are multi and interdisciplinary in their determinism and conceptualisation, as are the underlying ecosystem functions, services and 'controls'. It is therefore necessary and valuable to find as many productive heuristics and technologies as possible for their cross-disciplinary study, modelling and management.