

THEORETICAL INSIGHTS FOR REGENERATIVE ARTIFICIAL INTELLIGENCE PARADIGM

Alexandru CĂPĂȚÎNĂ, ORCID 0000-0002-5439-838X,
Dunarea de Jos University of Galati, Romania,
alexandru.capatana@ugal.ro

Dragoș Sebastian CRISTEA, ORCID 0000-0001-8227-4854
Dunarea de Jos University of Galati, Romania,
dragos.cristea@ugal.ro

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Abstract

This paper examines Regenerative Artificial Intelligence as an emerging paradigm that extends beyond traditional AI capabilities by integrating autonomous adaptation, self-repair and continuous organizational learning. The study builds on literature from knowledge management, sustainability studies and dynamic capabilities to conceptualize Regenerative AI as a digital organizational entity capable of preserving corporate memory, mitigating knowledge fragmentation and enhancing long-term resilience. The review highlights how regenerative mechanisms support circular business models, foster innovation ecosystems and strengthen stakeholder collaboration. It also addresses critical risks associated with excessive automation, governance and the erosion of human expertise.

Keywords: *Regenerative Artificial Intelligence, organizational knowledge management, continuous learning systems, circular and sustainable innovation, dynamic capabilities.*

PERSPECTIVE TEORETICE PRIVIND PARADIGMA INTELIGENȚEI ARTIFICIALE REGENERATIVE

Rezumat

Acest articol explorează Inteligența Artificială Regenerativă ca paradigmă emergentă care depășește capacitățile tradiționale ale inteligenței artificiale prin integrarea adaptării autonome, a auto-reparării și a învățării organizaționale continue. Bazându-se pe literatura din managementul cunoștințelor, studiile de sustenabilitate și teoria capacităților dinamice, studiul conceptualizează Inteligența Artificială Regenerativă ca o entitate digitală organizațională capabilă să mențină memoria corporativă, să reducă fragmentarea cunoștințelor și să consolideze reziliența pe termen lung.

Analiza evidențiază modul în care mecanismele regenerative susțin modelele de afaceri circulare, stimulează ecosistemele de inovare și întăresc colaborarea dintre părțile interesate. De asemenea, sunt abordate riscurile critice legate de automatizarea excesivă, guvernarea și conservarea expertizei umane.

Cuvinte-cheie: *Inteligență Artificială Regenerativă, managementul cunoștințelor organizaționale, sisteme de învățare continuă, inovare circulară și durabilă, capacități dinamice.*

Introduction

Our paper examines Regenerative Artificial Intelligence (Regenerative AI) as an emerging technological paradigm that extends beyond traditional AI capabilities. The review synthesizes research on how AI systems can self-repair, self-optimize and continuously adapt to organizational environments while addressing critical challenges such as corporate amnesia and knowledge fragmentation [1]. The scope encompasses technological dimensions, organizational knowledge management, sustainability applications and strategic business transformation.

1. Conceptual Framework and Definitions

Regenerative AI represents a paradigm shift from conventional AI systems. Conventional AI systems require manual reprogramming and periodic updates. Regenerative AI, by contrast, demonstrates autonomous adaptation and continuous learning from feedback [2]. AI technology integrates principles from biological processes, specifically neuroplasticity and cellular repair mechanisms, to create digital entities capable of maintaining organizational memory and preventing knowledge loss.

The defining characteristic of Regenerative AI is its capacity to operate as an integrated digital entity within organizational ecosystems [3]. Whereas traditional AI tools provide immediate efficiency gains, Regenerative AI creates sustained value through evolutionary learning and self-organization mechanisms [4].

Regenerative AI operates through several interconnected mechanisms. First, it learns from continuous feedback streams and adapts autonomously to organizational changes without manual intervention [5]. Second, these systems can self-diagnose and correct errors, maintaining coherent corporate memory while automatically detecting and resolving

inconsistencies [6]. Third, the technology implements contextual learning that enables organizations to benefit from real-time operational data while preserving tacit knowledge [7].

2. Organizational Knowledge Management

One of the most critical contributions of advanced organizational systems is their capacity to combat corporate amnesia, i.e., the progressive loss of critical internal knowledge [8]. This problem occurs when information becomes fragmented, difficult to access, or completely lost due to personnel turnover, inadequate documentation procedures and excessive dependence on tacit expertise held by specialists [9].

Traditional organizations face significant vulnerabilities when organizational memory becomes fragmented or inaccessible. This leads to delayed decisions, duplicated work efforts and a loss of competitive advantage [10]. AI-driven systems address these vulnerabilities directly. They can create unified, living corporate memory systems that autonomously update their content as the organization evolves.

Knowledge becomes a living system. Rather than treating corporate memory as a static repository, advanced knowledge management systems implement organizational learning as an auto-regenerative organizational ecosystem [11]. Information no longer follows a linear pathway of creation, storage and loss [12]. Instead, knowledge is continuously recaptured, reinterpreted and reintegrated into operational decisions and processes [13].

This approach transforms organizational learning from sporadic events into continuous processes. Systems that automatically detect inconsistencies and correct errors maintain coherent and current corporate memory [14]. Continuous learning prevents knowledge degradation and situations in which organizations possess data but lack the interpretive capacity to extract operational meaning [15].

This process must include the integration of disparate information sources. Knowledge management systems unify data from structured and unstructured sources, digital archives and human experiences into coherent organizational memory [16]. Knowledge bases are continuously enriched with new operational data, project insights, market feedback and

team experiences. These systems create auto-regenerative ecosystems where information does not degrade but improves over time.

3. Adaptive and Self-Optimizing Capabilities

A defining feature of Regenerative AI systems is their capacity for autonomous self-optimization and adaptation based on performance metrics and environmental changes [17]. This significantly reduces dependency on human intervention for reconfiguration or updates. Rather than becoming rapidly outdated, models continuously adjust to remain efficient and relevant [18].

Machine learning systems demonstrate continuous and evolutionary learning through feedback from real operations [19]. The system develops adaptive intelligence: it learns more extensively where change accelerates and intervenes more rapidly when risks increase [20]. Continuous adaptation creates organizational agility by enabling business models to adapt at the pace of the market [21].

A significant advantage emerges in reduced dependency on manual retraining and system updates and maintenance burden. AI systems maintain optimal performance continuously without requiring frequent manual updates [22]. This self-optimization capacity extends model lifespan and ensures systems remain current with evolving organizational and market conditions [23].

4. Sustainable Business Models and Circular Innovation

Advanced technology enables organizations to transform linear business models into circular systems capable of continuous reutilization and optimization [24]. Circular resource management together with this technology enable organizations to manage knowledge and resources systematically, aligning them with circular economy requirements [25]. This transformation becomes evident in the minimization of material and informational waste, the reduction of consumption and the improvement of sustainability [26].

Research demonstrates that resource optimization, when combined with continuous-learning business models, leads to sustainable and re-

generative innovation ecosystems. These ecosystems are capable of resilience, particularly within knowledge-intensive industries [27]. Innovation emerges not randomly but through intelligent, continuous processes [28].

Within these ecosystems, sustainability transforms from a constraint into a source of innovation and competitive advantage [29]. Organizations adopting this strategic approach develop innovation capacity rather than viewing sustainability as an imposed burden [30].

Organizations create strategic frameworks for sustainable innovation based on connections between managerial decisions and impacts on economic and ecological systems. Technology enables traditional industries to transform into innovation hubs by stimulating circular processes of value creation and reutilization. Algorithms integrate social, economic and environmental objectives into new business-model designs [31].

5. Organizational Resilience and Competitive Advantage

Advanced organizational systems contribute directly to organizational resilience by maintaining knowledge continuity even during turbulent conditions or personnel loss [32]. AI technology enables organizations to prevent risks associated with knowledge loss and to fortify operational memory.

Through self-learning and resource-optimized approaches, organizations can develop substantial capacity for market adaptation and scalability of business models [33]. Intelligent learning and the reutilization of existing value guide this growth, generating value for employees, consumers, communities and the environment [34]. Beyond immediate efficiency gains, advanced systems amplify long-term organizational growth potential through continuous adaptation [35]. Their ability to evolve at accelerated speeds enables rapid response to market changes while maintaining strategic focus [36].

6. Stakeholder Collaboration and Co-Creation

Through transparent knowledge and resource exchange, advanced technologies connect actors across value chains and thereby stimulate collaboration and co-creation [37]. Collaborative mechanisms are central to ecosystem development [38].

Technology functions as a connector between human creativity and systematic processes, linking innovation, culture and community [39]. Organizations, communities and consumers can therefore jointly contribute to value creation within transparent feedback environments. [40]. The result is an inclusive innovation environment where stakeholders benefit from and actively participate in value regeneration [41].

7. Critical Considerations and Human-Centered Integration

While advanced AI offers substantial benefits, excessive reliance on autonomous systems carries a risk of marginalizing human roles in critical decision-making [42]. This may erode tacit knowledge that is difficult to codify but essential for innovation [7]. When employees perceive diminished value in their contributions, engagement declines. As a result, organizations lose internal competencies that previously offered competitive advantage [43]. Without human oversight, systems can propagate errors at scale, particularly when organizational data lacks interpretive meaning and suffers from knowledge loss [44].

Research emphasizes the need for robust governance and ethical frameworks to prevent harmful automation and preserve human judgment in creativity and ethics [45]. Technology must function as an intelligent partner rather than a replacement for humans [46]. Long-term success depends on finding an equilibrium between technological capabilities and human cognitive capital [47].

8. Future Directions and Strategic Implications

Advanced organizational models will become future standards because organizations require continuity, resilience and continuous-learning capacity [48]. Organizations regenerate not only processes but cultures, maintaining current knowledge and practice [1]. Environmental, Social and Governance (ESG) integration becomes intrinsic to organizational processes because resource optimization and knowledge preservation are built-in mechanisms of regenerative systems. Sustainability becomes an embedded operational principle rather than a compliance requirement [49].

Organizations transition from sustainability toward regeneration, moving beyond impact reduction to contributing positively to ecosystem renewal [50]. AI becomes a catalyst for this transition and paradigm shift, enabling economic and social regeneration [51].

Conclusion

Regenerative Artificial Intelligence represents a fundamental departure from traditional paradigms, positioning technology as an integrated organizational entity responsible for maintaining knowledge resilience, optimization and long-term value creation [52]. Rather than delivering immediate efficiency alone, this approach's real potential lies in creating durable value through continuous adaptation and regenerative mechanisms [29].

The convergence of autonomous learning, knowledge management, sustainable innovation and stakeholder collaboration creates organizational ecosystems capable of thriving amid accelerated change while maintaining human-centered governance [32]. Organizations adopting this paradigm position themselves for long-term competitiveness and positive societal impact [48].

Regenerative Artificial Intelligence emerges from this analysis as a transformative organizational paradigm that moves beyond conventional efficiency-driven AI by integrating continuous-learning, autonomous adaptation and self-regenerative knowledge processes into the core of managerial practice. Regenerative AI preserves and enriches corporate memory, mitigates knowledge loss and strengthens resilience against uncertainty while simultaneously enabling circular value creation, stakeholder co-innovation and sustainable strategic renewal. The integration of biological analogies, adaptive intelligence and systemic learning demonstrates how organizations can evolve from static knowledge structures to living, auto-regenerative ecosystems capable of sustaining long-term competitiveness.

References

1. NONAKA, I., & TAKEUCHI, H. *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press, 1995. ISBN 9780195092691
2. LECUN, Y., BENGIO, Y., & HINTON, G. E. Deep learning. In: *Nature*, 2015, 521(7553), pp. 436–444. DOI: <https://doi.org/10.1038/nature14539>
3. DAVENPORT, T. H., & RONANKI, R. Artificial intelligence for the real world. *Harvard Business Review*, 2018, 96(1), pp. 108–116. ISSN: 0017-8012
4. RUSSELL, S. J., & NORVIG, P. *Artificial intelligence: A modern approach* (4th ed.). Harlow: Pearson, 2020. ISBN-13 978-1292401133
5. SUTTON, R. S., & BARTO, A. G. *Reinforcement learning: An introduction* (2nd ed.). MIT Press, 2018. Available: <https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2ndEd.pdf> (Accessed 25.10.2025).
6. WITTEN, I. et al. *Data mining: Practical machine learning tools and techniques* (4th ed.). San Francisco: Morgan Kaufmann, 2016. ISBN 978-0-12-804291-5
7. POLANYI, M. *The tacit dimension*. University of Chicago Press, 2009. ISBN-13 978-0-226-67298-4
8. WALSH, J. P., & UNGSON G. R. Organizational memory. In: *Academy of Management Review*, 1991, 16(1), 57–91. DOI: <https://doi.org/10.5465/amr.1991.4278992>
9. COHEN, M. D. Reading Dewey: Reflections on the study of routine. In: *Organization Studies*, 2007, 28(5), pp. 773–786. DOI: <https://doi.org/10.1177/0170840606077>
10. ARGOTE, L., & MIRON-SPEKTOR E. Organizational learning: From experience to knowledge. In: *Organization Science*, 2011, 22(5), pp. 1123–1137. ISSN 1047-7039
11. SENGE, P. M. *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday, 1990. ISBN 0-385-26094-6
12. ARGYRIS, C., & SCHÖN D. A. *Organizational learning II: Theory, method and practice*. Boston: Addison Wesley, 1996. ISBN 978-0201629835
13. BROWN, J. S., & DUGUID P. *The social life of information*. Harvard Business School Press, 2000. ISBN 0-87584-762-5
14. HUBER, G.P. Organizational learning: The contributing processes and literatures. In: *Organization Science*, 1991, 2(1), pp. 88–115.
15. FIRESTONE, J. M., & MCELROY M. W. *Key issues in the new knowledge management*. London: Butterworth-Heinemann, 2003. ISBN 978-0-7506-7655-7
16. DAVENPORT, T. H., & PRUSAK L. *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press, 1998. ISBN 9780875846552
17. GOODFELLOW, I., BENGIO, Y., & COURVILLE, A. *Deep learning*. Cambridge, MA: MIT Press, 2016. ISBN: 9780262035613
18. BENGIO, Y., COURVILLE, A., & VINCENT, P. Representation learning: A review and new perspectives. In: *IEEE TPAMI*, 2013, 35(8), pp. 1798–1828. DOI: <https://doi.org/10.1109/TPAMI.2013.50>

19. KRIZHEVSKY, A., SUTSKEVER, I., & HINTON, G. E. ImageNet classification with deep convolutional neural networks. In: NIPS, 2012, 25, pp. 1097-1105. ISBN: 9781627480031
20. SCHMIDHUBER, J. Deep learning in neural networks: An overview. In: Neural Networks, 2015, 61, pp. 85-117. DOI: <https://doi.org/10.1016/j.neunet.2014.09.003>
21. DAFT, R. L., & WEICK, K. E. Toward a model of organizations as interpretation systems. In: Academy of Management Review, 1984, 9(2), pp. 284-295. ISSN: 0363-7425
22. HINTON, G. E. et al. Improving neural networks by preventing co-adaptation of feature detectors. 2012. DOI: <https://doi.org/10.48550/arXiv.1207.0580>, arXiv:1207.0580
23. LECUN, Y. et al. Gradient-based learning applied to document recognition. In: Proceedings of the IEEE, 1998, 86(11), 2278-2324. ISSN 0018-9219, DOI: <https://doi.org/10.1109/5.726791>
24. TOWARDS A CIRCULAR ECONOMY. Ellen MacArthur Foundation, 2015. Available: <https://www.ellenmacarthurfoundation.org/towards-a-circular-economy-business-rationale-for-an-accelerated-transition> (Accessed: 26.10.2025).
25. GEISSDOERFER, et al. The circular economy-a new sustainability paradigm? Journal of Cleaner Production, 2017, 143, pp. 757-768. DOI: <https://doi.org/10.1016/j.jclepro.2016.12.048>
26. MCDONOUGH, W., & BRAUNGART, M. Cradle to cradle: Remaking the way we make things. Berkeley, North Point Press, 2002. ISBN 0-86547-587-3
27. ETZKOWITZ, H., & LEYDESDORFF, L. The dynamics of innovation. In: Research Policy, 2000, 29(2), pp. 109-123. DOI: [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
28. CHESBROUGH, H. W. Open innovation. Boston: Harvard Business School Press, 2003. ISBN 1-57851-837-7
29. HART, S. L., & MILSTEIN, M. B. Creating sustainable value. In: Academy of Management Perspectives, 2003, 17(2), pp. 56-67. ISSN 0896-3789
30. PRAHALAD, C. K., & HART, S. L. The fortune at the bottom of the pyramid. In: Strategy & Business, 2002, No. 26 Available: <https://www.strategy-business.com/article/11518?pg=0> (Accessed: 25.10.2025).
31. BOCKEN, N. M. P. et al. A Literature and Practice Review to Develop Sustainable Business Model Archetypes. Journal of Cleaner Production, 2014, 65, 42-56. DOI: <https://doi.org/10.1016/j.jclepro.2013.11.039>
32. WEICK, K. E., & SUTCLIFFE, K. M. Managing the unexpected: Resilient Performance in an Age of Uncertainty (2nd ed.). San Francisco: Jossey-Bass, 2007. ISBN 978-0787996499
33. TEECE, D. J., PISANO, G., & SHUEN, A. Dynamic capabilities. In: Strategic Management Journal, 1997, 18(7), pp. 509-533. ISSN 0143-2095
34. FREEMAN, R. E. Strategic management: A stakeholder approach. Cambridge University Press, 2010. ISBN 9780521151740
35. MARCH, J. G. Exploration and exploitation. In: Organization Science, 1991, 2(1), pp. 71-87. ISSN 1047-7039

36. EISENHARDT, K. M., & MARTIN, J. A. Dynamic capabilities. In: *Strategic Management Journal*, 2000, 21(10-11), pp. 1105-1121. ISSN 0143-2095
37. PRAHALAD, C. K., & RAMASWAMY, V. *The future of competition*. Boston: Harvard Business School Press, 2004. eISBN 9781422160749
38. IANSITI, M., & LEVIEN, R. *The keystone advantage*. Boston: Harvard Business School Press, 2004. ISBN 1-59139-307-8
39. VON HIPPEL, E. *Democratizing innovation*. Cambridge, MA: MIT Press, 2005. ISBN 0-262-00274-4
40. WENGER, E. *Communities of practice: Learning, Meaning and Identity*. Cambridge University Press, 1999. ISBN 978-0521663632
41. MANZINI, E., & VEZZOLI, C. A strategic design approach to develop sustainable product service systems: examples taken from the 'environmentally friendly innovation' Italian prize. In: *Journal of Cleaner Production*, 2003, 11(8), pp. 851-857. DOI: [https://doi.org/10.1016/S0959-6526\(02\)00153-1](https://doi.org/10.1016/S0959-6526(02)00153-1)
42. BRYNJOLFSSON, E., & MCAFEE, A. *The second machine age*. Norton, 2014. ISBN: 978-0-393-35064-7
43. PFEFFER, J. *The human equation*. Boston: Harvard Business School Press, 1998. ISBN 0-87584-841-9
44. PASQUALE, F. *The black box society*. Cambridge, MA: Harvard University Press, 2015. ISBN 9780674970847
45. FLORIDI, L., & COWLEY, J. A unified framework for AI in society. In: *Harvard Data Science Review*, 2019, 1(1), 6. DOI: <https://doi.org/10.1162/99608f92.8cd550d1>
46. WINOGRAD, T., & FLORES, F. *Understanding computers and cognition*. New Jersey: Ablex Publishing, 1986. ISBN 0-89391-050-3
47. KAPLAN, A., & HAENLEIN, M. Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations and implications of artificial intelligence. In: *Business Horizons*, 2019, 62, pp. 15-25. DOI: <https://doi.org/10.1016/j.bus-hor.2018.08.004>
48. SENGE, P. M. et al. *The necessary revolution*. New York: Crown Currency, 2010. ISBN 978-0385519045
49. PORTER, M. E., & KRAMER, M. R. The Big Idea: Creating Shared Value. How to Reinvent Capitalism—and Unleash a Wave of Innovation and Growth. *Harvard Business Review*, 2011, 89(1/2), pp. 62-77. ISSN 00178012
50. MANG, P., & REED, B. Designing from place: a regenerative framework and methodology. In: *Building Research & Information*, 2012, 40(1), pp. 23-38. DOI: <https://doi.org/10.1080/09613218.2012.621341>
51. NONAKA, I., & KONNO, N. The concept of "Ba": Building foundation for knowledge creation. *California Management Review*, 1998, 40(3), pp. 40-54. ISSN 00081256
52. PAULI, G. *The blue economy: 10 years, 100 innovations, 100 million jobs*. Taos, NM: Paradigm Publications, 2010. ISBN 978-0912111-90-2