

Innovation with Nature

R. Ganesh*

Abstract

Supply chains are growing more complicated, and many businesses and scholars are looking to nature for solutions. We provide a narrative synthesis and systematic review in this work to evaluate the state-of-the-art and identify major topics for future research into nature-inspired supply chain solutions. We evaluate supply chain strategic, tactical, and operational decisions and look for parallels between biological systems and supply networks to provide a new study agenda. According to our results, the majority of research in nature-inspired supply networks from a systemic standpoint focuses on closed loop supply chains. Similar systemic alternatives, such as industrial symbiosis, circular economy, and industrial ecology, on the other hand, have not received as much attention. Reducing production waste and end-of-life product waste (closed loop supply chains), optimizing raw material use and extending the life of used resources (circular economy), researching the interactions between the biosphere and the Technosphere (industrial ecology), and seeking solutions to industrial problems from nature (biomimicry) are all possible paths to achieving a zero-waste economy..., and operational levels, which must be investigated in order to provide efficient and successful solutions. Biomimicry, as a means of seeking solutions to industrial challenges by emulating natural processes and structures, represents an exciting frontier in nature-inspired supply chain research. By drawing inspiration from the resilience and efficiency observed in biological systems, businesses can potentially address operational challenges across strategic, tactical, and operational levels.

Keywords: Biomimicry, sustainability, sustainable design, sustainable innovation, sustainability promise, biologically inspired design, nature, mimesis, built environment.

INTRODUCTION

As supply chains continue to evolve into intricate networks influenced by global dynamics, businesses and scholars alike are turning their attention to nature as a source of inspiration for innovative solutions. The complexity and challenges inherent in modern supply chains necessitate a reevaluation of conventional approaches, leading to a growing interest in nature-inspired strategies.[1] This paper presents a narrative synthesis and systematic review, aiming to assess the current state-of-the-art in nature-inspired supply chain solutions while also identifying key avenues for future research.[2] In our exploration, we delve into supply chain decision-making at strategic, tactical, and operational levels, seeking parallels between the intricate workings of biological systems and the dynamics of supply networks. While existing research predominantly focuses on the systemic aspects of closed-loop supply

chains, our analysis reveals a notable gap in the investigation of alternative systemic approaches. This study sheds light on the underexplored potential of industrial symbiosis, circular economy principles, and industrial ecology—systemic alternatives that hold promise in aligning supply chains with sustainable and nature-inspired models. The quest for achieving a zero-waste economy is a central theme in our examination, encompassing diverse pathways such as closed-loop supply chains, circular economy strategies, industrial ecology, and biomimicry. Closed-loop supply chains, with their

*Author for Correspondence

R. Ganesh
E-mail: 20134rg@gmail.com

Ex-assistant Marketing Officer, Marketing Department,
Savitribai Phule Pune University (SPPU)University, Pune,
Maharashtra, India

Received Date: December 05, 2023

Accepted Date: December 15, 2023

Published Date: December 27, 2023

Citation: R. Ganesh. Innovation with Nature. NOLEGEIN
Journal of Business Ethics, Ethos and CSR. 2023; 6(2): 1–6p.

emphasis on reducing production and end-of-life product waste, represent a well-studied avenue.[3] However, the broader systemic alternatives—industrial symbiosis, circular economy, and industrial ecology—demand more attention to fully comprehend their potential impact on enhancing supply chain sustainability. In addition, our analysis underscores the importance of biomimicry as a frontier in nature-inspired supply chain research. Drawing inspiration from the efficiency and resilience inherent in biological systems, businesses have the opportunity to address operational challenges comprehensively, spanning strategic planning, tactical decision-making, and day-to-day operational activities.[4]

INNOVATION WITH NATURE

With our world now in crisis, the Global Dialogue tells us to choose between capitalism and the world.

What about the third option?

The “but” argument quickly distracts us from what is needed. The stoic scientist in me used the most crucial technique of all: distinguishing between what we can and cannot alter.[5] What do we influence and what do we not influence? The opportunities offered to our generation and the future; how can we make change by creating a better business?

The beauty of biomimicry is that it also considers other ways forward.

Margo Farnsworth offers a way in her new book *Biomimicry and Business* to demonstrate how business can be a force for good.[6] Entrepreneurs and entrepreneurs can create positive conditions for life and be innovative and productive by learning and applying the principles of bionics. Farnsworth not only makes this claim, but also shows readers how to do it – with no-nonsense statements, interesting case studies (from his interviews), and clear instructions.

How does biomimicry affect your work?

"From its best perspective, biomimicry is a way of finding new and sustainable solutions by borrowing life models, chemical models, and ecosystem ideas... other aspects of the natural world."

GENEALOGY OF BIOMIMICRY

Difference between Established Biomimicry and Pioneering Biomimicry

Biomimicry is a spectrum from shallow to deep. As a result, biomimicry might mean various things to different individuals.[7] For business professionals, biomimicry can mean organization and new products or sustainability, but preferably both.

Established / Creating Biomimicry is something others have already seen. This is the meta version of biomimicry. The best innovators know when to invent and when to innovate... Any competent Biomimicry expert will tell you: There's no point in reinventing the wheel.

Pioneering Biomimicry is at the forefront of innovation helping solve complex and important problems. Most of the research papers on biomimicry and examples of biomimicry are examples of biomimicry pioneers.

Where can biomimicry be commercialized?

Biomimicry is not suitable for companies that are not looking for innovation.

As a result, biomimicry might mean various things to different individuals. Innovation is difficult. He asked for real world and financial sacrifice and she said no. Businesses can do anything, but they can't do everything. Biomimicry is inherently innovation, and if business is not ready or willing to

change, then biomimicry is not (and is not) suitable for business. Biomimicry is not good for business without spirituality, respect and responsibility towards our fellow humans and our homes.[8] Biomimicry has an inherent spirit. This is a lack of research and will lead us to these ecological problems. Biomimicry brings to the surface not only humans but all life. Rather than just making money, bionic companies hope to benefit all lives. This distinction exists between biomimicry and biomimicry. Reluctance to Apply Green Chemistry (aka Life-Friendly Chemistry) Chemistry is the basis of everything and is everywhere. Understanding this can help you develop and improve almost anything. You will find chemistry at the origins and beginnings of almost all science, technology and business. Chemistry is the backbone of biology and is therefore crucial to biomimicry. [9] The creation of chemical products and methods that limit or eliminate the usage and manufacture of hazardous compounds is referred to as green chemistry. There is no better method to improve this than to use natural chemistry!"

The use of green chemistry in the production of products can bring products inspired by real situations to create positive situations for life.[10] However, it is important to remember that green chemistry is not always based on the needs of biomimicry. Some companies have increased their products and technological development Processes based on natural ideas do not need green chemistry Green chemistry techniques are the way to "pioneer biomimicry."

TOP 10 BIOMIMICRY BUSINESS EXAMPLES

More and more successful companies are emerging from biomimicry.

Here are some examples of the success of biomimicry in various business fields such as software development, engineering, data science, and everything in between.

- **Biomimicry, packaging, and cold chain logistics: Green pods**

How plant volatiles inspire packaging

Meet the Green pod Labs, the Biomimicry Institute's Ray of Hope Award recipients.[11] Since approximately 40% of fresh produce is lost before reaching the consumer, Green Pod Labs has developed bionic bags that track the anti-aging process of fruits or vegetables to slow ripening and reduce microbial growth.[12] Plant-based volatiles are what they're called, and the appropriate formulation can eliminate the requirement for refrigeration and cold storage chains. The only thing wrong with the bionics business is that they don't call it "Berry Cool".

- **Biomimicry and Organizational Design: USGBC**

How flamingos, mushrooms and trees promote corporate social enterprise

Promoting a sense of community and challenging senior management. Finally, the US Green Building Council (USGBC) has developed a concept revolving around this. around the interdependence of fungi, trees and keystone species. They are all trying to better coordinate the chapters in their countries.[13]

The collaboration between IDEO and USGBC led to the development of a working organization inspired by the concept of breeding in nature. In addition, major rock genres have inspired the USGBC to form a variety of temporary collaborations outside the chapter area that can connect and integrate members around goals and skills between members and staff in country.

- **Biomimicry and environmental design: Stone**

How Bacillus promotes self-healing bio concrete

Stone is at the heart of world creation. Like everything in the world, it deteriorates over time. Considering the amount of rock we use, repairing damaged rocks costs tens of billions of dollars worldwide. This is true every year!

What if we had a rock that could heal itself like our body? This was exactly the solution Hendrik Marius Jonkers came up with when he discovered rock-living and limestone-forming bacilli. These organisms live inside rocks. When cracks form in the material and organisms are exposed to moisture and air, the material goes back to work and forms limestone! These bacteria can live for up to 200 years and save the world billions of dollars and huge amounts of time.

- **Biomimicry and Product Design:**

How to Make an Inspiring, Elegant and Efficient Ceiling Fan from Plane Seed Capsules. Simplicity is the greatest sophistication for any designer. Its beauty is in its simplicity, elegance of form and function. Sycamore seed pods are designed to spin in the air, allowing them to swim longer and travel farther. Ceiling fans based on seed pods from Sycamore Technologies are beautiful, have won many awards, and due to their aerodynamic design, provide excellent airflow at low rpm, operate quietly, and are very powerful. Quietly contemplating nature can teach us many things about nature and solve simple human problems.

- **Biomimicry and Materials Science: Adaptive Surface Technologies**

How Carnivorous Plants Inspired Self-Cleaning Surfaces

Harvard researcher Joanna Aizenberg's group has studied multipurpose surfaces called SLIPS, short for Smooth Liquid-Containing Porous Surfaces. They are looking for oil- and water-resistant materials to create facilities for transporting biomedical liquids, transporting oil, preventing biofouling, and preventing water from freezing.

Enter Nepenthes: Nepenthes have a very smooth surface that traps insects. The surface of the edge of the pitcher plant is quite smooth, thanks to the roughness of its microscopic tissue and tiny pores that are closed by a lubricating layer of water. When unfortunate insects walk on this slippery surface, they cannot pull this low friction and fall into the juice at the base of the flower plant. What are millions of years of evolution like?

- **Biomimicry and the Healthcare Industry: Nova Laboratories' Vaccine Warehouse**

How anhydrous bacteria can help prevent COVID-19

As we have learned during the COVID-19 pandemic, providing vaccines quickly, efficiently, and without waste is crucial to saving millions of people around the world. problems. But it became clear that we were not prepared for the pandemic, and vaccine supplies were particularly bad in developing countries. This is because the vaccine must be transported in a refrigerator, which is not always possible.

Nova Labs has patented a method that uses syrup to prevent bacteria from hatching and growing in the vial before dehydrating the vaccine. After the injection, the fluid in the body begins the process of spreading the vaccine throughout the body, repeating the vaccine. Such technologies have the potential to prevent future public health disasters and give us the opportunity to learn from past experiences.

- **Biomimicry and Renewable Energy Business: Biome Renewables**

How maple seeds support wind turbines

Biome Renewables specializes in sustainable renewable energy, specifically wind turbines. Their innovation is the Power Cone – a modified wind turbine inspired by the aerodynamics of a falling nut that moves through the air in a low-drag pattern. Power Cone is a second, smaller rotor that bolts to the hub of an existing wind turbine, reducing the loads and vibrations experienced by the turbine while increasing the wind turbine's annual output. I have a wind pun, but it's just the wind.

- **Biomimicry and Architecture:**

How Ecosystem Services Inspired the World's First "Living" Building

Bullitt Center is the world's first and most regenerative office where every form, process and system is interconnected. The structure is designed as a "living organism" that employs a flexible system to manage water, energy, and all of its resources. The best part? Bullitt Center uses only the energy and water it absorbs and produces zero waste.

The Bullitt Center's designers are doing everything possible to achieve net zero emissions. Seattle is often ghostly and overcast, but parametric modeling software is used to create the best solutions to achieve maximum solar energy. The building's central nervous system monitors and manages all functions, including gray water and dry waste recycling, rainfall collection, and solar energy gathering. Bullitt Center exemplifies infrastructure and urban resiliency.

- **Biomimicry in Software Development**

Adaptable Organisms, How Slime Molds Inspire the Future of Air Travel

Nature specializes in the effective use of local resources and materials. Recent advances in 3D printing allow us to adopt the traditional approach to manual labor. Using research and development, Autodesk created Project Dreamcatcher, which allows users to create thousands of design solutions that will meet the world's various constraints. As a result, having a design that is as attractive as it is unusual. Airbus is one such user.

Airbus anticipated the future of aviation by developing a concept aircraft for the year 2050. Every good adventure, like every good experience, starts with a step. Airbus collaborated with Autodesk to develop a bionic pod for the plane. Every great adventure, like every great experience, begins with a single step. Airbus and Autodesk cooperated to create a bionic pod for the jet. The cage design was inspired by the growth patterns of slime molds and mammalian bones.

LITERATURE REVIEW

Review of literature on industrial symbiosis, circular economy, and industrial ecology as systemic alternatives. Comparison of the attention received by closed loop supply chains versus these alternative approaches. Discussion on the potential benefits and challenges associated with each systemic alternative. In-depth analysis of closed loop supply chains and their role in reducing production and end-of-life waste. Proposal of a new study agenda based on identified gaps and potential paths toward achieving a zero-waste economy. The literature review should provide a comprehensive overview of existing research, identify gaps, and set the stage for the proposed research agenda outlined in the abstract.

CONCLUSION

Finally, biomimicry offers many commercial opportunities and yet undiscovered innovations. We'll take a closer look at the principles of bionic life and how they apply to the future of business. The article highlights the growing importance of nature-inspired innovation, specifically through biomimicry, in addressing complex challenges within various business sectors. The author emphasizes that businesses are facing a critical choice between traditional capitalist approaches and more sustainable, nature-aligned practices. Biomimicry stands out as a viable third option, offering a pathway for businesses to become forces for good, fostering innovation and productivity while positively impacting the environment. The highlighted examples, such as green pod Labs, US Green Building Council, Stone, Sycamore Technologies, Adaptive Surface Technologies, Nova Laboratories, Biome Renewables, and Bullitt Center, demonstrate how biomimicry can lead to groundbreaking solutions. These range from eco-friendly packaging inspired by plant volatiles to self-healing bio concrete modeled after bacteria living in rocks, and from innovative ceiling fans inspired by sycamore seed pods to self-cleaning

surfaces inspired by carnivorous plants. The article concludes by asserting that biomimicry offers numerous commercial opportunities and untapped innovations. It advocates for a deeper understanding of the principles of bionic life and how they can be applied to shape the future of business.

REFERENCES

1. Farnsworth M. *Biomimicry and Business: How Companies are Using Nature's Strategies to Succeed*. Routledge; 2020 Oct 20.
2. Woolley-Barker T. *Teeming: how superorganisms work together to build infinite wealth on a finite planet (and your company can too)*. White Cloud Press; 2017.
3. Findeli A. Rethinking design education for the 21st century: Theoretical, methodological, and ethical discussion. *Design issues*. 2001 Jan 1;17(1):5-17.
4. Wahl DC, Baxter S. The designer's role in facilitating sustainable solutions. *Design issues*. 2008 Apr 1;24(2):72-83.
5. Baumeister D, Tocke R, Dwyer J, Ritter S, Benyus J. *Biomimicry Resource Handbook: a seed bank of knowledge and best practices*. Missoula: Biomimicry. 2013;3(8).
6. Schmitt OH. A thermionic trigger. *Journal of Scientific instruments*. 1938;15(1):24.
7. Janine M. Benyus, *Biomimicry: Innovation Inspired by Nature*. (New York: William Morrow, 1997).
8. Lepora NF, Verschure P, Prescott TJ. The state of the art in biomimetics. *Bioinspiration & biomimetics*. 2013 Jan 9;8(1):013001.
9. Andrea E. Rawlings, Jonathan P. Bramble, and Sarah S. Staniland, "Innovation Through Imitation: Biomimetic, Bioinspired and Biokleptic Research," *Soft Matter* 8, no. 25 (2012): 6675.
10. Nidumolu R, Prahalad CK, Rangaswami MR. Why sustainability is now the key driver of innovation. *Harvard business review*. 2009 Sep 1;87(9):56-64.
11. Reap J, Baumeister D, Bras B. Holism, biomimicry and sustainable engineering. In *ASME International Mechanical Engineering Congress and Exposition 2005 Jan 1* (Vol. 42185, pp. 423-431). Victor Margolin, "Design, the Future and the Human Spirit," *Design Issues* 23, no. 3 (2007): 4–15.
12. Margolin V. Design for a sustainable world. *Design issues*. 1998 Jul 1;14(2):83-92.
13. Starkey T, Vukusic P. Light manipulation principles in biological photonic systems. *Nanophotonics*. 2013 Oct 1;2(4):289-307.