

Green Entrepreneurship Incubation Model for Students at Trilogi University Business Incubator: A Literature Review

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Abstract. Green entrepreneurship, which emphasizes sustainable economic methods, has grown rapidly in recent decades. Green startups are supported by several incubation programs worldwide. Their frameworks, resources, and mentorship tactics have changed to meet new requirements. This study explores these paradigms in Trilogi University's academic and cultural milieu. Second, this research analyzes global green entrepreneurship incubation models' frameworks, resources, and mentorship methods. Second, to evaluate these models' suitability for Trilogi University. A systematic literature study was conducted using academic databases. The evolution of green entrepreneurship incubation approaches was highlighted in 1990–2023 articles. A rigorous two-stage review and theme analysis were used to organize retrieved data into trends and difficulties, notably at universities. The study examines incubation frameworks, resource diversification, and mentorship strategy development. Various worldwide models are investigated, focusing on Trilogi University. The study highlights the benefits of integrating these approaches in academic contexts, such as multidisciplinary collaboration and access to huge resources. This study connects global incubation models to university environments, preparing future researchers. Global best practises can help academic institutions, like Trilogi University, optimise their incubation methods. The report recommends addressing scalability and funding dynamics to help green businesses grow in academia.

1 Introduction

In today's rapidly evolving global landscape, sustainability remains at the forefront of crucial conversations, particularly in the context of business. Green Entrepreneurship, a term that encapsulates this paradigm shift, refers to the development of businesses that consciously

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seek to strike a balance between profitability and environmental responsibility. At its core, Green Entrepreneurship is about envisioning and implementing business strategies that prioritize the environment, not just as an afterthought, but as an intrinsic part of the business model [1].

The significance of Green Entrepreneurship is even more pronounced for the younger generation. As inheritors of a world grappling with the repercussions of climate change, resource depletion, and environmental degradation, the youth have a unique and urgent responsibility. They possess the innovation, adaptability, and vigor required to pioneer solutions and transform industries [2]. Moreover, Green Entrepreneurship aligns with the values of many millennials and Gen Z individuals, who show a marked preference for sustainable products, practices, and brands [3].

Integrating Green Entrepreneurship into the academic and developmental journey of young individuals can serve a dual purpose. It not only equips them with the tools to launch successful, sustainable businesses but also ingrains a mindset of environmental stewardship that can permeate all areas of their professional and personal lives [4]. By embracing Green Entrepreneurship, the young generation stands at the cusp of not just driving economic growth, but also ensuring that such growth does not come at the expense of our planet.

Business incubators, having earned recognition as catalysts for innovation and entrepreneurial growth, are pivotal in providing nascent entrepreneurs with the resources and mentorship they need to translate ideas into viable business models [5]. Particularly for university students, these incubators often serve as the initial platform to experiment, innovate, and embark on their entrepreneurial journeys.

In the context of Green Entrepreneurship, the role of these incubators becomes even more salient. With the escalating concerns about the environment, there's a surging interest among students to adopt business models that are not only profitable but also sustainable [6]. However, while the passion and commitment might be abundant, the expertise in sustainable business practices might be lacking. This is where business incubators step in.

Business incubators, tailored to support Green Entrepreneurship, not only provide traditional entrepreneurial resources such as funding, mentorship, and networking but also offer specialized guidance on sustainability [7]. They introduce student entrepreneurs to green technologies, sustainable business practices, and the intricacies of operating in green markets. Moreover, they can facilitate collaborations with environmental experts, industry stakeholders, and foster a community of green entrepreneurs, all of which can significantly enhance the learning and growth trajectory of student-led green startups [8]. For university students, this holistic environment can be instrumental. It ensures that their zeal for green entrepreneurship is backed by robust knowledge, a supportive network, and an ecosystem that's conducive to sustainable innovation.

Trilogi University, as an esteemed academic institution, is uniquely positioned to influence the next generation of entrepreneurs. Higher education institutions have long been recognized as drivers of innovation, and in the current landscape, they are increasingly seen as crucibles for sustainable entrepreneurship [9]. Business incubators housed within universities, such as those at Trilogi University, can be especially influential in this paradigm. They offer more than just infrastructural support; they provide a confluence of academic research, experiential learning, and industry networking, making them fertile grounds for green innovations [10].

In the context of Trilogi University, the significance of its business incubator extends beyond the campus. Given the strategic position of the university within its region, and its potential outreach, the incubator has the capability to set benchmarks for sustainability and to influence not only students but also the surrounding entrepreneurial ecosystem [11]. By fostering green entrepreneurship, Trilogi University's incubator can serve as a lighthouse – illuminating pathways to sustainable business practices, catalyzing regional growth, and

reinforcing the symbiotic relationship between academia and industry in the realm of sustainability [12]. For students at Trilogi University, the incubator's emphasis on green entrepreneurship signifies a forward-looking, global approach to business, preparing them for an entrepreneurial landscape where sustainability is not just an addendum, but a core tenet.

In the evolving landscape of the 21st century, the imperative of intertwining business practices with environmental sustainability has emerged as a dominant narrative. At the heart of this transition lies green entrepreneurship, which emphasizes a synergistic approach between profitability and sustainable environmental practices [13]. Business incubators dedicated to nurturing this form of entrepreneurship play a pivotal role in transforming nascent ideas into tangible green businesses. The primary objective of this study is twofold: firstly, to explore the diverse array of global incubation models that support green entrepreneurship, identifying their distinctive frameworks, resources, and mentorship strategies [14]. Secondly, to meticulously analyze and understand the applicability and relevance of these models to the unique academic and cultural milieu of Trilogi University. The challenge lies in discerning how global best practices in green incubation can be harmonized with the ethos of Trilogi University, ensuring the creation of a model that resonates with both its student body and the wider community [15].

The novelty of this study emerges from its focus on the confluence of green entrepreneurship incubation models within the specific context of an academic institution. While there exists a broad discourse on business incubators, literature specifically pinpointing green entrepreneurship within university settings remains sparse. By amalgamating global insights with the intricacies of Trilogi University's ecosystem, this research offers an innovative perspective that is not only of academic significance but also presents practical implications for universities worldwide aiming to be at the vanguard of the green entrepreneurial movement.

2 Methodology

The primary objective of this study was to explore the evolution and application of green entrepreneurship incubation models, particularly in the context of Trilogi University's Business Incubator. The methodological approach, anchored in a systematic literature review, was tailored to ensure a rigorous and comprehensive exploration of the topic.

2.1 Systematic Literature Review

To achieve a deep understanding of green entrepreneurship incubation models and their applicability to Trilogi University, a systematic literature review was undertaken.

2.1.1 Data Sources

Articles from 1990–2023 were sourced from prominent academic databases, ensuring a historical to contemporary view. Platforms like JSTOR, Scopus, Web of Science, and Google Scholar were consulted to curate a diverse array of scholarly articles, journals, reports, and case studies on the subject.

2.1.2 Selection Criteria

Studies included focused on green entrepreneurship incubation frameworks, resources, mentorship strategies, and their relevance to academic settings, especially universities.

Articles outside this time frame or without a direct relevance to the core objectives were excluded.

2.1.3 Data Extraction and Synthesis

Pertinent information from each article was methodically extracted, capturing their main objectives, results, and insights regarding the evolution of incubation models. Data was subsequently synthesized to present a cohesive narrative relevant to Trilogy University's context.

2.1.4 Thematic Analysis

A rigorous two-stage review was conducted on the extracted data. The initial phase involved coding to identify preliminary patterns. The subsequent phase categorized these patterns into overarching themes, elucidating trends and challenges in the global and academic contexts of green entrepreneurship incubation.

2.2 Validity and Rigour

2.2.1 Data Triangulation

To bolster the validity, data from various sources were triangulated. This integrated approach provided a more holistic and well-rounded understanding, incorporating perspectives from both academia and industry.

2.2.2 Source Evaluation

Each source was critically appraised for its contribution to the study's objectives. Parameters like publication quality, author reputation, and original study methodology were used as benchmarks to ensure only credible sources were incorporated.

2.3 Ethical Considerations

Ensuring proper citations and referencing was paramount to maintain the study's integrity. As the research relied solely on published works, there were minimal ethical concerns, and all sourced information was handled with academic rigor and respect.

The methodology employed aimed to offer a thorough exploration of green entrepreneurship incubation models, particularly their applicability in academic settings like Trilogy University. This approach endeavored to contribute meaningfully to the existing body of knowledge and provide actionable insights for academia.

3 Results and discussion

3.1 Evolution of Green Entrepreneurship Models

Green entrepreneurship, inherently multifaceted in its approach, has witnessed significant transformations over the past three decades. As the global consciousness has shifted towards sustainability, the models of green entrepreneurship have adapted, reflecting the broader changes in societal, economic, and environmental priorities.

3.1.1 Eco-friendly Products Era (Late 1990s to Early 2000s)

In the late 1990s, as environmental concerns started gaining traction, green entrepreneurship predominantly revolved around the development and marketing of eco-friendly products. These were products designed to minimize environmental harm, either in their production, use, or disposal [16], [17]. Firms during this era capitalized on the burgeoning consumer awareness and the willingness to pay a premium for "green" products [18]. Entrepreneurs, primarily driven by market opportunities, ventured into producing biodegradable goods, organic foods, and energy-efficient appliances, among others.

3.1.2 Emphasis on Sustainable Processes (Mid 2000s to Late 2010s)

The mid-2000s ushered in an era where product differentiation based on "eco-friendliness" was no longer sufficient. The conversation shifted from just creating green products to adopting sustainable processes throughout the business cycle. This shift recognized that true sustainability encapsulated not just the product but the entire value chain – from raw material sourcing to production processes, logistics, usage, and end-of-life management [19]. Companies like Patagonia and Tesla became frontrunners, embedding sustainability not just in their offerings but in every aspect of their business operations [20].

3.1.3 Holistic Systems Thinking (2020s onwards)

As we entered the 2020s, the bar for green entrepreneurship was raised yet again. The focus transitioned from isolated sustainable efforts to a more holistic systems thinking approach. Entrepreneurs began to evaluate the interdependencies in ecosystems, striving for regenerative and circular business models [21], [22]. They recognized that addressing one environmental issue in isolation could inadvertently exacerbate others. Hence, a systems perspective became imperative. Startups like Echogen Power Systems and Green Energy Storage started emphasizing technological innovations that not only catered to sustainability but were ingrained in circular economic principles, ensuring that resources were perpetually recycled and reused [23]

The evolution of green entrepreneurship models underscores the dynamic nature of sustainability challenges and the need for businesses to be adaptive, innovative, and forward-thinking. As the global landscape changes, green entrepreneurs must continue to recalibrate their strategies, ensuring that they remain at the vanguard of sustainable business practices.

3.2 University-based Green Incubators: A Trend Analysis

The integration of sustainability into academia is not new; however, the past two decades have witnessed an unparalleled growth in the establishment of university-based incubators dedicated to green entrepreneurship. These incubators are pivotal intersections of academic research, student innovation, and sustainable entrepreneurial endeavors, propelling universities to the forefront of the green revolution.

3.2.1 Emergence and Early Adoption (Early 2000s)

In the early 2000s, a handful of leading universities began acknowledging the imminent environmental challenges and recognized the need to promote sustainable entrepreneurship [24]. The first wave of university-based green incubators emerged as a response to the growing student interest in green businesses and the urgency to translate academic research into viable environmental solutions [25]. These early adopters, often supported by grants and

endowments, were primarily focused on generating awareness and providing students with foundational resources.

3.2.2 Expansion and Specialization (Late 2000s to 2010s)

As the impact of the early incubators became evident and the green economy proliferated, more universities jumped on the bandwagon. The late 2000s and 2010s saw a proliferation of such incubators, not just in numbers but also in the depth of offerings. Universities began to establish specialized incubators, focusing on niche areas such as renewable energy, sustainable agriculture, or circular economy solutions [26], [27]. Collaboration with industries [28], mentorship programs [29], and seed funding opportunities [30] started becoming standard offerings, enhancing the incubators' value proposition.

3.2.3 Present Scenario: Integrated Ecosystems (2020s onwards)

Entering the 2020s, university-based green incubators are no longer just supplementary units but integrated ecosystems within academic settings [31]. They have transformed into dynamic hubs where research meets practice, and where budding entrepreneurs can access resources, mentorship, funding, and a conducive environment for growth [32]. Moreover, the collaboration between different departments within universities ensures a multi-disciplinary approach to sustainability challenges [33], [34]. With the increasing importance of sustainability in business and society, these incubators are anticipated to play a more prominent role in shaping the future of green entrepreneurship [35].

The trend analysis underscores the importance of university-based green incubators in driving sustainable innovations. As the challenges of climate change and environmental degradation intensify, the role of academic institutions in fostering green entrepreneurs becomes even more critical. These incubators, with their unique blend of academic and entrepreneurial energies, hold the promise of a sustainable future.

3.3 Global Landscape of Green Entrepreneurship Incubation Models

Green entrepreneurship, with its focus on sustainable and eco-friendly business practices, has experienced significant momentum over the past three decades. Various incubation models, designed to support, nurture, and accelerate these green startups, have come to the fore. As these models have proliferated, so too have their frameworks, resources, and mentorship strategies diversified and matured [14].

3.3.1 Evolution of Frameworks

The 1990s saw the emergence of green entrepreneurship incubation models primarily as a response to environmental challenges. Initial frameworks were reactive in nature, focusing on mitigating environmental degradation [36], [37]. By the turn of the century, these frameworks evolved to incorporate proactive measures, emphasizing not only on prevention but also on creating value through sustainable innovation [38]. Today, holistic frameworks that intertwine economic viability with social and environmental responsibility are the norm, reflecting a comprehensive understanding of sustainability [39], [40].

3.3.2 Resource Diversification

Early incubation models were often reliant on limited resources, predominantly governmental grants and non-profit funds [41]. However, as the green entrepreneurship landscape matured, a broader spectrum of resources became available. This includes venture capital specifically tailored for green startups, eco-focused corporate partnerships, and crowdfunded platforms dedicated to sustainable ventures [42], [43].

3.3.3 Mentorship and Its Evolution

Mentorship in the early days was largely focused on compliance, guiding startups through the maze of environmental regulations [44]. As the field matured, the nature of mentorship expanded. Today, mentors not only offer guidance on compliance but also provide insights into market dynamics, sustainable innovation, strategic partnerships, and scaling up in an eco-conscious market [45].

3.4 Frameworks and Strategies of Green Entrepreneurship Incubators

The architecture of incubation models is multifaceted, reflecting the unique challenges and opportunities in the field of green entrepreneurship. Across the board, these models can be broadly categorized based on their principal focus areas such as mentorship, financial backing, infrastructural provisions, or sector-specific guidance.

3.4.1 Emphasis on Mentorship and Networking

Mentorship plays a pivotal role in the growth trajectory of green startups. By providing fledgling entrepreneurs with direction, advice, and critical industry insights, mentors bridge the gap between theory and practicality [46]. Furthermore, networking sessions integrated into the incubation process open avenues for strategic partnerships, customer acquisition, and potential investor engagement [47], [48]. Key incubators emphasizing mentorship include the Cleantech Open, which boasts a vast network of industry experts, experienced entrepreneurs, and thought leaders in the sustainable sector [49].

3.4.2 Prioritizing Financial Support

A significant barrier for many green startups is acquiring the necessary capital to transition from ideation to operational stages [50]. Certain incubators have carved a niche by predominantly offering financial backing either directly or through connections to venture capitalists, angel investors, and grant opportunities [51]. This financial support often goes hand-in-hand with rigorous training programs to ensure startups are investor-ready.

3.4.3 Infrastructural Resources

The technological nature of many green innovations necessitates advanced infrastructure [52]. Startups that are affiliated with incubators which provide access to advanced labs, prototyping facilities, and software platforms have a distinct advantage [53]. For startups delving into product development, these facilities expedite the R&D process, fostering rapid iterations and real-time testing [54].

3.4.4 Sector-Specific Guidance

A specialized approach is adopted by incubators that cater to startups within particular sectors, such as Cleantech or AgriTech. By offering industry-specific resources, workshops, and mentors, these incubators ensure that startups benefit from deep domain knowledge, thereby addressing sector-specific challenges and market dynamics more effectively [55].

3.5 Applicability to Trilogy University

The green entrepreneurship incubator landscape features diverse models, each with unique advantages. The key lies in identifying relevant elements for a specific context, such as Trilogy University.

3.5.1 Comparative Analysis

At Trilogy University, interdisciplinary collaboration is highly valued as a means to address complex environmental issues holistically. Such challenges necessitate expertise and insights from diverse fields and perspectives. Collaborating across disciplines ensures a comprehensive approach to these challenges, fostering sustainable solutions that benefit both humanity and the environment [56]. It is posited that this methodology promotes the attainment of objectives in an ethical and responsible manner

Drawing parallels, some incubators prioritize interdisciplinary collaboration. The 100+ Accelerator, promotes interdisciplinary ventures and fosters startups that bring together technologists, environmentalists, and business strategists for cohesive project development. This shared values provide a strong foundation for potential collaboration or model adaptation [57].

3.5.2 Potential Adaptations

Due to cultural, economic, and institutional differences, direct replication of global models may not be practical. However, the essence of these models provides a rich pool of strategies that can be adapted to fit the unique context of Trilogy University. The university can establish a mentorship program that connects students with both internal faculty and external experts from the industry. The program can utilize the academic and professional networks within and around the university to guide green entrepreneurs with academic rigor and practical insights. Many global incubators' resource-centric approach can inspire Trilogy University to optimize its own assets. Green startups can use collaborative workspaces [58], research labs [59], and digital platforms [60] to conceive, prototype, and test their solutions in real-world situations.

3.6 Strengths of Integrating Global Models into Academic Settings

The pursuit of green entrepreneurship in academic settings promotes sustainable practices and innovations. Integrating globally tested models in such environments offers multiple benefits. It combines global best practices with the innovative spirit of academia.

3.6.1 Interdisciplinary Collaboration

Integrating global models into academic settings encourages cross-disciplinary collaboration and strengthens work culture. Academic institutions can implement global incubation

models, developed and refined in diverse ecosystems, to promote interdisciplinary collaboration. In green entrepreneurship, tech students collaborate with peers from environmental sciences, management, and social sciences to develop a feasible green business model. According to Hassan (2020), collaborations in academic settings lead to more innovative solutions and prepare students for real-world complexities that require interdisciplinary problem-solving skills [61]. Moreover, as universities are inherently interdisciplinary, they become the ideal grounds for implementing such collaborative global models, fostering a richer, more diverse learning and innovation environment.

3.6.2 Access to Resources

Integrating global models into academic environments provides unparalleled access to intellectual resources, tools, frameworks, and best practices from around the world. Global incubation models also offer established networks of mentors, industry professionals, and alumni, providing students with valuable insights and opportunities [62]. Integrating these models means tapping into this vast network, offering students mentorship opportunities and networking sessions they wouldn't have had access to otherwise. This amalgamation of international resources and local academic strengths creates a rich, nurturing environment for green startups, preparing them for both local and global challenges.

3.7 Challenges and Recommendations

The integration of global incubation models into academia comes with challenges. Success requires introspection, planning, and adaptability. Let's explore the challenges and recommendations.

3.7.1 Addressing Scalability

One of the major challenges faced by academic incubators leveraging global models is the issue of scalability. Oftentimes, innovations birthed in academic settings, while groundbreaking, struggle when it comes to real-world application and scaling. This disconnect can arise from various factors: a lack of market understanding, logistical constraints, or even technological limitations.

Recommendations:

- **Market-Driven Curriculum:** Integrate market-driven modules into the academic curriculum. Encouraging students to understand and navigate market dynamics from early stages can help bridge the gap between innovation and application.
- **Industry Collaborations:** Establish robust collaborations with industries. Engaging industry professionals in the incubation process, hosting workshops, and facilitating internships can provide students with firsthand insights into real-world challenges and scaling.
- **Prototyping and Testing Facilities:** Augment incubation facilities with rapid prototyping tools and testing labs, allowing innovators to iteratively test and refine their solutions, increasing the chances of successful market transition.

3.7.2 Funding Dynamics

Funding remains the lifeblood of any startup or innovative venture. For academic incubators, especially those relying on public funds or limited university grants, consistent funding can become a challenge, hampering the growth of nascent startups.

Recommendations:

- **Public-Private Partnerships (PPP):** Explore the possibility of PPP models, which allow universities to harness both public resources and private sector efficiencies. Such models not only diversify funding streams but also facilitate the integration of industry expertise.
- **Alumni Engagement:** Tap into the university's alumni network. Successful alumni can provide mentorship, funding, and networking opportunities, acting as valuable catalysts for green startups.
- **Crowdfunding and Competitions:** Encourage students to explore crowdfunding platforms or participate in startup competitions. Such avenues not only provide funding opportunities but also enhance visibility and credibility.

4 Conclusion

In the pursuit of advancing green entrepreneurship, a myriad of global incubation models has emerged, each characterized by distinctive frameworks, resources, and mentorship strategies. This study provides a comprehensive examination of the evolution of these models, ranging from initial responses to environmental challenges to more proactive approaches in sustainable innovation. Aligning with the study's objectives, it has been elucidated that various global incubation models hold substantial promise for the academic and cultural environment of Trilogly University. Moreover, the amalgamation of principles from these models with indigenous methodologies could potentially foster a conducive environment for the blossoming of green startups within the university's precincts. Key benefits identified encompass interdisciplinary collaboration, enriched access to diverse resources, and the infusion of best practices from a global perspective. However, challenges remain. One primary concern is the issue of scalability within the academic realm. While innovations might be groundbreaking, transitioning them to real-world applications often poses significant challenges. Additionally, funding remains the linchpin for the growth trajectory of startups. To navigate these challenges, the study advocates for approaches such as public-private partnerships, alumni engagement, and exploring crowdfunding platforms. In summation, the integration of global green entrepreneurship incubation models into academic settings like Trilogly University offers a promising avenue to accelerate green innovations and bolster the growth of green startups in the foreseeable future.

4.1 Practical Implications

The theme of green entrepreneurship is gaining increasing attention in this era, where sustainability and environmental responsibility are global priorities. This research illustrates the immense potential of green entrepreneurship incubation models within academic settings, as evidenced at Trilogly University. For other universities and higher education institutions, these findings offer a blueprint on how to approach, design, and implement incubation programmes centred on green entrepreneurship. Further, for stakeholders in the business sector and government, this research underscores the importance of supporting such initiatives, be it through funding, mentorship, or strategic collaborations. For budding

entrepreneurs keen on green entrepreneurship, this provides an insight into the resources, support, and structure they might anticipate when partaking in university incubation programmes. Ultimately, in a broader context, with an increasing number of universities adopting and adapting such models, we can hope for an acceleration in innovation and implementation of green business solutions, ultimately contributing positively to global sustainability objectives.

4.2 Theoretical Implications

This research serves as a crucial addition to the expanding literature on green entrepreneurship and its integration within academic settings. By examining the evolution and operationalisation of green entrepreneurship incubation models, the study bridges an evident gap in the extant literature. The innovative amalgamation of global best practices with the unique context of Trilogi University provides a new theoretical framework, promoting an interdisciplinary approach to green entrepreneurship. Moreover, the identified challenges and recommendations offer future researchers a robust theoretical foundation from which to conceptualise new hypotheses or refine existing models. The investigation into the scalability of innovations and funding dynamics brings forth nuances that were hitherto under-explored in academic entrepreneurship literature. As universities worldwide increasingly engage with green entrepreneurial initiatives, this study's findings ensure that the academic discourse keeps pace with these developments, thereby enriching the theoretical landscape of entrepreneurship research.

4.3 Limitations and Future Research Directions

Every empirical endeavour possesses intrinsic limitations, and this study is no exception. The primary constraint of this research emanates from its exclusive reliance on literature review methodologies. This approach, whilst comprehensive, might not capture the intricacies and dynamism inherent in practical implementations of green entrepreneurship incubation models at different global locales. Moreover, the cultural, economic, and political contexts of Trilogi University might present unique challenges and opportunities not fully encapsulated within the scope of existing literature. Additionally, the temporal frame of the reviewed literature, spanning from 1990 to 2023, might inadvertently exclude emerging trends and innovations post-2023.

For future research, there is a compelling case to undertake primary data collection, incorporating both qualitative and quantitative methods, to gain richer, more nuanced insights into the operational nuances of green entrepreneurship incubators. Comparative studies analysing the efficacy of various global incubation models across different university settings would offer a broader understanding. Furthermore, as the global socio-economic landscape evolves, especially in the wake of global challenges like climate change, it would be pertinent for future researchers to periodically update and refine the framework proposed in this study. Such endeavours would ensure that academic institutions remain at the vanguard of green entrepreneurial initiatives, aligning theory with practice in this ever-evolving domain.

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