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Opinion piece

Safeguarding financial resilience through digital trust and responsible innovation

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Abstract In the rapidly evolving financial industry landscape, the convergence of digital and physical realms, known as the ‘phygital era’, presents novel challenges for boards that aim to build digital trust and strengthen their financial resilience while fostering responsible innovation and maintaining their competitive edge in the global business arena. These encompass people management, processes and their digital technology portfolio. Building a new phygital culture, upskilling and reskilling the workforce, deploying a mix of intelligent automation and hybrid augmented workflows and deploying frontier technologies responsibly are now on the agenda for forward-thinking boards. The latest deep tech innovation trends in financial services offer exponential pathways for innovative solutions yet increase cybersecurity threats, create new ethical dilemmas and demand a new risk tolerance from board executives. Novel risk management styles, the value of harmonising cyber and ethics programmes, and leadership traits are potentially viable solutions for risk management at the board level in this phygital era. This paper proposes a trifecta that financial industry boards can embrace to adapt their risk governance to the demands of this phygital era: zero trust cybersecurity, ethics by design and risk management by design. By deploying this combination of strategies, boards within the finance industry can successfully navigate the complexities of the phygital era and steer their organisations towards a more secure, trustworthy and sustainable future.

Keywords: *phygital, risk, governance, ethics, cybersecurity, innovation, leadership*

INTRODUCTION

Global landscape

The onset of the ‘phygital’ era has led to a notable convergence of digital and physical operational domains across various industries. The financial services sector is undergoing remarkably swift and impactful transformations within this overarching

disruption. Consequently, there is an imperative need for new perspectives and approaches in the paradigms of board governance and board risk management.

The contemporary global business landscape is undergoing an epochal transformation driven by the pervasive impact of digitalisation. This transformation touches on multiple dimensions, including the

economy, employment dynamics, population demographics and the education sector, which are collectively contributing to a multifaceted paradigm shift. However, amidst this profound change, a concomitant increase in cyber threats has emerged, leading to economic damages, a surge in ethics breaches resulting in reputational damage and investor hesitation, particularly in profound tech innovation.

- The global economy is inextricably tied to digital transformation, as the advent of digital technologies and data-driven decision making reshapes industries. The rise of e-commerce, cloud computing and the Internet of things (IoT) has created new avenues for business growth. However, it has also disrupted traditional economic structures, with legacy businesses grappling to adapt to the demands of the digital era. This transition has implications for both developed and developing economies, with a digital divide that presents opportunities and challenges. The digitisation of industries has significantly impacted employment dynamics. Automation and artificial intelligence (AI) have altered job profiles and necessitated reskilling and upskilling of the workforce. The emergence of the gig economy, characterised by short-term contracts and freelance work, has redefined traditional notions of employment. This shift has increased flexibility and raised concerns about job security, worker rights and social safety nets.
- Demographic shifts, particularly the ageing populations in many developed countries, influence the digital transformation landscape. As older individuals engage with technology and digital services, there is a growing market for products and services catering to their needs. Additionally, global migration patterns are shaping labour markets, with diverse talent pools contributing to innovation and economic growth in host countries.
- Education has been disrupted by digital transformation, with online learning platforms, massive open online courses and educational technology becoming integral components of the learning ecosystem.

Due to all the above-mentioned global changes and the exponential adoption of emerging and

frontier technologies, cyber threats have proliferated. Malicious actors exploit vulnerabilities in digital systems, leading to data breaches, financial fraud and operational disruptions. The economic ramifications of cyber attacks are profound, encompassing direct financial losses, increased cybersecurity spending and reputational damage.

Ethics breaches have also surged in the digital age and are triggered by various factors. Emerging social trends are being witnessed that cause unique ethical conundrums and increased antisocial or immoral behaviours, leading to privacy concerns.

The vast amounts of data collected and analysed by organisations raise ethical questions about privacy, surveillance and the responsible use of technology. Breaches of ethical standards can result in significant reputational damage, eroding trust among customers and stakeholders.

The global business and digital transformation landscape is dynamic and complex, marked by a fusion of economic, employment, demographic and educational shifts. The escalating cyber threats and ethics breaches can cause economic damage and erode the hard-earned reputations of businesses and institutions.

Board executives must respond to these challenges and balance the deep tech innovation potential and the imperative to mitigate the risks posed by this phygital age. Navigating this landscape requires a multidimensional approach integrating technological advancement with robust cybersecurity measures and new ethical approaches while fostering a global financial ecosystem that promotes inclusive growth and responsible innovation.

Tech trends influencing financial services

The financial services industry is experiencing a profound transformation due to the integration of cutting-edge technologies. These innovations are reshaping the industry across various domains, from banking and asset management to insurance and trade finance. This article explores how emerging technologies such as AI, digital twins, blockchain, edge computing, 5G, the metaverse and the industrial omniverse drive innovation across the financial services sector.

The financial services sector plays a pivotal role in the global economy, and its evolution is closely intertwined with technological progress. Recent

years have witnessed the convergence of several transformative technologies, bringing forth unprecedented opportunities and challenges.

While there are numerous applications of these technologies in the financial industry, a few are noteworthy due to increased adoption and their potential for revolutionising critical domains within the financial services industry:

- AI: wealth management benefits from AI-driven algorithms optimising personalised investment portfolios. AI can also enhance fraud detection in banking, ensuring secure transactions and improved risk management.
- Blockchain technology: FinTech operations can be augmented by blockchain technology for secure and transparent digital transactions, as well as streamlined cross-border payments, which enhances operational efficiency.
- Digital twin technology: wealth management platforms can gain real-time insights through digital twins, thus optimising asset performance.
- 5G networks can enable faster and more reliable mobile banking services, while wealth management operations can be optimised by real-time data processing and enhanced transaction speed powered by 5G.
- Edge computing enables faster secure computing capabilities that are uniquely suitable for mobile banking.
- Metaverse ecosystems can transform interactions for all financial services, offering immersive and personalised experiences.

The intersection of deep tech innovation, characterised by an increased adoption of the technologies above with IoT, the industrial Internet of things (IIoT), satellite Internet and soon even quantum computing, has caused numerous boards to rethink and redesign their strategy. While deep tech innovations promise transformative solutions to global challenges, investors have urged caution and have expressed a need for novel risk strategies.

OPINION STATEMENT

The quest to balance deep-tech-driven innovation in this digital era with novel yet robust risk

management solutions, building a culture of cyber resilience and digital ethics while accelerating responsible innovation, is an ongoing journey for board executives globally. It requires new leadership styles, upgraded or new skill sets, heightened vigilance, increased adaptability and a holistic approach to governance. Boards within the finance industry that successfully navigate this intricate terrain will drive innovation, retain or gain digital trust and fortify their organisations against the myriad challenges of the digital age.

In today's fast-paced business landscape, where innovation is a driving force behind competitiveness and growth, boards within the finance industry face a multifaceted challenge. They should consider the need for a delicate balance between nurturing an innovation pipeline and deploying robust risk management strategies. This equilibrium is essential for organisations seeking to remain agile, responsive and resilient while safeguarding long-term viability.

Innovation is the core of modern financial organisations. It drives product development, process optimisation and market expansion. Boards within the finance industry recognise that fostering innovation is not a choice but a necessity. An active innovation pipeline ensures that a company can adapt to changing market dynamics, meet evolving customer demands and stay ahead of the competition.

Conversely, risk management is equally indispensable. The digital age has ushered in a new era of vulnerabilities. Cyber threats loom, data privacy regulations are stringent and geopolitical risks are ever-present. Boards within the finance industry must safeguard the organisation's assets, reputation and stakeholder trust. Effective risk management also assures investors, customers and partners that the company takes its responsibilities seriously.

The challenge lies in reconciling these imperatives. Striking the right balance is complex and dynamic. It involves aligning innovation with risk appetite and continuously assessing the risk-reward trade-offs.

LITERATURE REVIEW

The financial services industry is undergoing a remarkable transformation driven by a convergence

of advanced technologies. As AI, digital twins, blockchain, edge computing, 5G, the metaverse and the industrial omniverse continue to evolve and mature, their applications within the financial sector will further redefine how financial services are delivered, ensuring greater efficiency, security and customer-centricity. Embracing these innovations is essential for financial institutions to remain competitive and resilient in an increasingly digital and interconnected world.

Business leaders can benefit immensely from the latest published research in understanding the rapidly changing landscape and discovering novel science-driven solutions. Academic research, in particular, offers a unique perspective, as it operates without financial conflicts of interest, providing impartial insights and innovative approaches. This impartiality allows for a hybrid approach to business intelligence, where scientific publications become invaluable resources for informed decision making.

By leveraging academic research, business leaders can better understand emerging trends, disruptive technologies and potential risks within the financial industry. These insights help recalibrate digital roadmaps, ensuring they align with the evolving demands of the market and regulatory landscape.

Furthermore, scholarly research often explores foundational principles and theories, offering a solid knowledge base for innovative problem solving. Business leaders can draw inspiration from interdisciplinary research, fostering cross-industry collaboration and driving the development of science-driven solutions that can propel their organisations to new heights.

By incorporating scientific publications into their strategic decision-making processes, business leaders can navigate the intricate dynamics of the financial sector with a clear and unbiased perspective, ultimately enhancing their adaptability and competitiveness in the ever-changing business landscape.

The latest research underscores the profound disruption caused by deep tech in all financial industry domains, including banking, insurance, asset management, investment services, wealth management, payments, treasury, lending trade and capital markets.

A comprehensive review of publications since January 2023 addressing the influence of emerging

or frontier technologies in the financial services industry revealed several trends. AI, IoT, blockchain technologies, digital twins, edge computing and cloud computing are often reported as critical drivers of profound financial service changes. Several studies have explored the applications of these technologies in financial risk assessment, accounting and FinTech and their role in driving innovation. AI has been making significant strides in revolutionising the financial services industry. Recent research has explored the various applications of AI in finance, focusing on its role in prediction, forecasting, management and research.

Weber *et al.*¹ conducted a comprehensive systematic review of finance, information systems and computer science literature to investigate the applications of explainable AI (XAI) in the financial domain. Their study explores XAI's latest trends and developments, highlighting its role in making financial decision making more transparent and interpretable. Chen *et al.*² researched XAI in finance, offering a bibliometric review. By analysing influential works, authors and trends, the authors clearly understood the landscape of XAI within the financial sector. Their work leads to a deeper understanding of critical areas of intervention or further research required. Kureljusic and Karger³ concentrated on applying AI, particularly in forecasting within financial accounting. Their systematic literature review not only explores the current state of AI in financial accounting but also outlines a future research agenda. This helps guide further developments in the field. Hijazi, *et al.*⁴ contributed a paper presented at the IEEE 13th Annual Computing and Communication Workshop and Conference. Their work offers a systematic review of AI models used for prediction in finance. By examining various AI techniques, they shed light on the diverse applications of AI in financial prediction. Arsenyan and Piepenbrink⁵ conducted a computational literature review focusing on AI research within the management domain. Their research provides insights into the scope, trends and vital topics in AI research related to management, enhancing our understanding of how AI influences managerial decision making. In their chapter on 'Opportunities and Challenges for Artificial Intelligence and Machine Learning Applications in

the Finance Sector⁷, Sawwalakhe, Arora and Singh⁶ explore the potential and complexities of applying AI and machine learning in finance. They discuss AI's opportunities for financial applications and the challenges associated with implementing these technologies. Regin *et al.*⁷ reviewed secure neural networks and big data mining applications in financial risk assessment. Their research delves into the use of advanced AI techniques and big data analytics to enhance financial risk assessment in the ever-evolving financial landscape. Fahlevi and Purnomo⁸ systematically reviewed the integration of IoT and cloud computing in finance and accounting. Their work highlights the synergies between IoT's real-time data collection capabilities and cloud computing's scalability, offering insights into how these technologies transform financial processes.

Taherdoost⁹ explored emerging trends in FinTech, shedding light on the future of finance. His research provides valuable insights into the disruptive innovations that FinTech is bringing to traditional financial services, from digital banking to cryptocurrencies. Tyagi *et al.*¹⁰ examined the opportunities and challenges of blockchain IoT applications in Industry 4.0 and Society 5.0. Their study discusses how the convergence of blockchain and IoT is reshaping industrial and societal paradigms. Bourechak *et al.*¹¹ conducted a comprehensive review of the confluence of AI and edge computing in IoT-based applications. Their research explores how these technologies drive real-time decision making and data processing in IoT applications, with potential implications for financial services. George *et al.*¹² surveyed industry perspectives and predictions on the impact of edge computing on the future of cloud computing. Their study highlights how edge computing redefines cloud computing paradigms, with potential implications for cloud-based financial services.

Another focused review of recent publications also underscored the research completed by several authors to highlight the impact of deep tech innovation on cybersecurity risks in the financial ecosystem. This body of research publications further deepens our existing knowledge about the crucial role of cybersecurity systems and digital ethics programs in maintaining or gaining digital trust in the financial services sector. Bajracharya *et al.*¹³

surveyed recent advances in cybersecurity and fraud detection in financial services. Their research delves into the evolving landscape of cybersecurity and the cutting-edge methods employed to detect and combat fraud in the financial sector. Alodhiani¹⁴ conducted a systematic literature review on the intersection of FinTech and cybersecurity. The study explores the intricate relationship between FinTech innovations and the security measures required to safeguard financial transactions and data. Saeed *et al.*¹⁵ investigated the challenges digital transformation poses in cybersecurity for business resilience. Their research discusses the issues faced by businesses undergoing digital transformation and provides recommendations to address cybersecurity concerns. Jaipong *et al.*¹⁶ reviewed the metaverse's emergence and its cybersecurity implications in the digital era. The study explores the security challenges presented by the metaverse, which has gained prominence recently. Gill *et al.*¹⁷ conducted a scoping review of the literature on the evolution of cybersecurity in FinTech. Their research provides insights into how FinTech has shaped the cybersecurity landscape and caused it to evolve, reflecting the industry's dynamic nature. Agostini *et al.*¹⁸ examined the relationship between corporate accountability, big data analytics and non-financial disclosure. Their research highlights the role of cybersecurity and data privacy in corporate accountability, emphasising the need for robust data protection measures.

DISCUSSION

In the dynamic landscape of corporate governance, boards within the finance industry face a formidable challenge: balancing the imperative for innovation with the need for risk management. This delicate equilibrium demands a nuanced approach that acknowledges the inevitability of risks while fostering innovation. There are several essential strategies that boards within the finance industry can consider to accomplish this intricate balancing act.

Revised business strategy

Several publications highlight that boards have been recognising, mitigating and continuously adapting

their risk governance to meet the demands of the digital era.

Almashhadani and Almashhadani explore recent advancements in corporate governance in their 2022 article published in the *International Journal of Business and Management Invention*.¹⁹ The authors provide an insightful overview, delving into likely emerging trends, challenges and innovations that are shaping contemporary corporate governance practices.

In 2019, van der Heijden²⁰ examined risk governance and risk-based regulation in a comprehensive review in the 'State of the Art in Regulatory Governance Research Paper Series'. This work sheds light on the global academic discourse surrounding risk management, offering valuable insights into regulatory approaches.

Klarner *et al.* contribute to the literature by evaluating the board governance of strategic change in their 2023 publication in the *International Journal of Management Reviews*.²¹ Their assessment navigates through existing literature, identifying gaps and proposing avenues for future research in this critical domain.

Brogi and Lagasio's 2019 literature review in the *International Journal of Business Governance and Ethics*²² investigates the significance of bank boards. By exploring the characteristics of bank boards, the authors contribute to the understanding of governance structures within the banking sector.

In 2020, Kurzhals *et al.*²³ offered a comprehensive review of and research agenda on strategic leadership and technological innovation in 'Corporate Governance: An International Review'. Their work explores the dynamic relationship between leadership strategies and technological advancements, providing a roadmap for future research in this evolving field.

Business strategy in the digital era demands a comprehensive overhaul for effective adaptation to novel challenges. Strategy execution, a key lever of success, requires a customised risk framework that evolves with the dynamics of the phygital landscape. The revised strategic roadmap starts with capability assessment, as boards must intricately measure the organisation's digital prowess. Embracing emerging technologies and recalibrating their risk tolerance become pivotal for boards in this era.

So, what are the unique challenges they face in the phygital era compared to the digital era? Some examples are ultra-rapid emerging tech adoption and legacy system obsolescence, tech convergence and the increased level of integration required, a high percentage of hybrid augmented workflows and a remote hyperconnected workforce, ultra-high-speed networks like 5G, oversight complexity and the unpredictability of generative AI systems, to only name a few.

Risk-aware innovation

Another vital approach entails the cultivation of a culture of risk-aware innovation. This paradigm shift advocates for innovation initiatives to undergo rigorous risk assessments. While innovation is an indispensable driver of growth and competitiveness, a comprehensive understanding of potential pitfalls cannot be overstated. A sophisticated approach acknowledges that calculated risks are essential for progress but does not relinquish the need for prudence in evaluating and addressing inherent uncertainties.

Agile risk mitigation

Boards within the finance industry should advocate for agile risk mitigation strategies that enable organisations to respond rapidly to emerging risks. This agility is achieved by establishing rapid response plans, regular stress testing and proactive monitoring mechanisms. Such measures are instrumental in facilitating organisations' ability to address nascent risks promptly and effectively, all the while preserving the dynamism of their innovative endeavours.

Integrated governance

Integral to this multifaceted strategy is the notion of integrated governance. Governance structures will have to integrate risk management into the decision-making process seamlessly. This integration extends to risk committees working collaboratively with innovation teams. By doing so, organisations can ensure that ethical and cybersecurity considerations become intrinsic components of innovative ventures.

This collaborative approach is essential for aligning innovation goals with the imperatives of responsible risk management.

Responsible innovation

In parallel with these strategies, boards within the finance industry can place ethical innovation at the core of their organisational values. Ethical considerations should permeate product and service design, reflecting an organisation's unwavering commitment to responsible innovation. In this context, responsible innovation extends beyond mere regulatory compliance; it becomes a fundamental aspect of an organisation's identity, showcasing its dedication to societal well-being and sustainability.

The harmonisation of risk-aware innovation and responsible governance is a complex yet indispensable undertaking for modern boards within the finance industry. By advocating for rigorous risk assessments, agile risk mitigation, integrated governance and responsible innovation, boards within the finance industry can successfully navigate this intricate balancing act, ensuring that innovation propels their organisations forward while safeguarding against potential pitfalls. This multifaceted approach embodies the essence of prudent, forward-thinking corporate governance, where innovation and risk management coexist in harmonious synergy.

Balancing innovation with cybersecurity programmes

In the digital age, cybersecurity is paramount. Organisations face an ever-expanding threat landscape, with cyber attacks growing in frequency and sophistication. Boards within the finance industry must simultaneously nurture innovation while deploying robust cybersecurity measures to protect sensitive data and maintain operational continuity. Innovation often relies on the rapid adoption of new technologies and digital platforms. These innovations can inadvertently introduce vulnerabilities. Cybercriminals are quick to exploit weaknesses in emerging technologies.

Consequently, boards within the finance industry must find ways to harmonise innovation and cybersecurity. Cybersecurity considerations should

be embedded in the early stages of product and service development. This proactive stance ensures that security is not an afterthought but an inherent part of innovation. Building a cybersecurity culture by upskilling and reskilling the entire workforce is essential. Having well-defined cyber response procedures in place can also minimise the impact of a breach on their innovation pipeline and legacy operations.

Balancing innovation with digital ethics programmes

The digital age demands that organisations operate with unwavering ethical standards. With the increasing integration of technology into every facet of business, boards within the finance industry are expected to ensure that innovation aligns with ethical principles and societal values. Innovative ethical considerations encompass a broad spectrum, from data privacy and algorithmic fairness to social responsibility and transparency. Balancing innovation with ethical imperatives requires a comprehensive approach. Proactive digital ethical frameworks that are aligned with enterprise strategies are essential. Championing transparency, accountability, diversity, equity and inclusion is imperative for boards within the finance industry that aim to maintain digital trust.

NOVEL SOLUTIONS

In the ever-evolving and high-stakes landscape of the financial sector, governing boards within the finance industry are presented with the opportunity to fortify their strategic vision by incorporating three fundamental pillars tailored to the demands of the phygital era. These pillars encompass zero trust cybersecurity, ethics by design and risk by design, each customised to address the unique challenges and opportunities within the financial ecosystem.

Zero trust cybersecurity

Financial institutions are advised to fully deploy the zero trust cybersecurity paradigm, wherein all systems and users, including those deeply embedded

within the institution, are treated as potential security risks. In this digital realm, perpetual vigilance against ever-evolving cyber threats is paramount. For instance, banks should invest significantly in advanced threat detection systems and employee cybersecurity training programmes and imbue the organisation's culture with a commitment to cyber resilience.

Ethics by design

Ethics must serve as the foundational bedrock of every financial institution's operations. Boards within the finance industry must take a proactive role in developing and rigorously overseeing ethical frameworks that permeate every aspect of decision making at all levels of the organisation. By doing so, financial institutions safeguard their brand and foster trust among all their internal and external stakeholders.

Risk management by design

While risk management by design has been proposed before facing this phygital era, boards within the finance industry are now challenged to elevate their risk management approaches further. Traditional risk management by design, which emphasised a proactive and technology-driven approach to embed risk prevention and mitigation throughout the organisation's DNA, must now be revised to meet the unique deep tech capabilities.

Organisations can effectively address risks by combining various management strategies and embracing deep tech, while maintaining operational efficiency and fostering innovation. In a world of constant change, risk management by design is an indispensable approach for organisations committed to long-term success and resilience. This approach aims to prevent and mitigate risks at every level and within all hybrid augmented workflows. It recognises that effective risk management should not be a separate entity but rather profoundly ingrained in the organisation's fabric. Central to risk management by design is the use of cutting-edge technology to embed risk governance within the organisational structure. This approach harnesses the power of deep tech to

monitor, evaluate and predict risks continuously in real time. Doing so eliminates the need for retroactive assessments, allowing organisations to respond swiftly and proactively to emerging threats.

A fusion of strategies: The phygital trifecta

Risk management by design is not a one-size-fits-all solution; instead, it embraces a holistic approach that combines various management strategies to address risks comprehensively. Some of the core strategies that align with this approach include:

- **Agility:** Agile methodologies enable organisations to adapt rapidly to changes, making them valuable for managing risks associated with evolving market conditions, customer preferences and technology advancements.
- **Design thinking:** Design thinking fosters a user-centric approach to problem solving, helping organisations identify potential risks early by involving end-users in the innovation process and considering their perspectives.
- **Systems thinking:** This strategy encourages organisations to view risks as interconnected components within a more extensive system. Organisations can identify systemic vulnerabilities and design more robust preventive measures by analysing how risks interact.
- **Lean Six Sigma:** Lean Six Sigma principles emphasise process efficiency and continuous improvement. By reducing process variability and errors, organisations can minimise the occurrence of operational risks.
- **Gemba and kaizen:** Gemba means going to where work is done to understand processes and risks better. Kaizen, on the other hand, focuses on continuous improvement. Both strategies empower employees to contribute to risk identification and mitigation.

The benefits of risk management by design

Implementing risk management by design offers several advantages:

- **Continuous improvement:** By continuously monitoring for risks, organisations can take proactive measures to prevent issues from arising or escalating.
- **Innovation consciousness:** Unlike traditional risk management approaches that may stifle innovation, risk management by design encourages innovation by embedding risk considerations into the innovation process.
- **Operational efficiency:** Organisations can improve operational efficiency and reduce costly disruptions by identifying and mitigating real-time risks.
- **Strategic decision making:** Organisations can make more informed and strategic decisions by considering risk factors at every level of planning and execution.
- **Enhanced resilience:** By addressing risks systemically, organisations become more resilient to unexpected events, ensuring business continuity.

FUTURE DIRECTIONS FOR RESEARCH

The rapidly evolving digital transformation landscape is poised to usher in new frontiers and paradigms. As organisations worldwide grapple with the complexities of the digital era, several main directions are emerging to shape the future of innovation, regulation and performance measurement.

Customised metrics and key performance indicators

The future of development demands tailored approaches to assessing the impact of financial innovation, the cybersecurity landscape and digital ethics. Organisations recognise the need for customised metrics and key performance indicators (KPIs) aligning with their specific goals and contexts. These metrics should not be one-size-fits-all but reflect the nuances of each organisation's unique objectives and challenges.

For instance, customised financial innovation metrics can gauge the economic and social impacts of novel financial technologies, providing a

comprehensive view of their contribution to economic growth and financial inclusion. Likewise, in the context of deep tech solutions, organisations require custom cyber metrics to evaluate the effectiveness of cybersecurity measures in safeguarding proprietary technologies and data assets. Digital ethics metrics can assess adherence to ethical principles in developing and deploying technology, helping organisations demonstrate their commitment to responsible innovation.

Developing international deep tech standards

The global nature of deep tech innovation demands the development of international standards to ensure interoperability, safety and ethical compliance. Collaborative efforts among nations, industries and regulatory bodies are crucial to defining common frameworks and guidelines for emerging technologies such as AI, quantum computing and biotechnology.

International deep tech standards will promote consistency in innovation practices, enhance cross-border collaboration and facilitate market access for innovative solutions. These standards should encompass technical specifications, ethical principles and regulatory harmonisation to create a cohesive ecosystem conducive to responsible and globally accepted deep tech development.

Novel regulatory frameworks suitable for the phygital era

The convergence of the physical and digital realms in the phygital era necessitates regulatory frameworks that can adapt to this transformative landscape. Traditional regulations often need help to keep pace with the rapid evolution of deep tech solutions, IoT and augmented reality. Future development requires innovative regulatory approaches that balance risk management and agile innovation.

Regulators must adopt a proactive stance, engaging with industry stakeholders and technologists to craft regulatory frameworks that accommodate emerging technologies while mitigating potential risks. Such frameworks should foster experimentation and

entrepreneurialism while ensuring ethical standards and safeguards against harm.

Optimisation of hybrid augmented workflows

The optimisation of hybrid augmented workflows is at the forefront of future development strategies. Organisations increasingly integrate human and machine capabilities to manage risks effectively while fostering agile innovation. This approach involves the seamless collaboration between human expertise and AI in decision-making processes.

Organisations can identify, assess and mitigate risks more effectively by harnessing the power of advanced analytics, machine learning and real-time data. At the same time, human intuition, creativity and ethical judgment remain indispensable in guiding the direction of innovation. The optimisation of these hybrid workflows maximises the benefits of both human and machine capabilities, creating a dynamic and resilient development environment.

The future of development in the digital transformation landscape is marked by customisation, international collaboration, innovative regulation and the optimisation of hybrid workflows. These directions reflect the imperative of adapting to a rapidly evolving environment where technology's potential is vast, but the responsibility for ethical, secure and globally harmonious innovation remains paramount. As organisations and nations embrace these directions, they will be better equipped to navigate the complexities of the digital age and leverage the transformative power of deep tech solutions for the betterment of society and the global economy.

ARTICLE LIMITATIONS

This opinion piece aims to contribute to the ongoing discourse surrounding the phygital-era-related challenges in the financial industry. However, like many opinion pieces, it grapples with inherent limitations that restrict its ability to comprehensively assess multifaceted problems within the sector.

While the influences of geopolitical and social dynamics on the financial industry are not addressed

in this paper, they exert complex, multifaceted effects on financial markets and institutions. Further research will be beneficial to shed light on the immediate impacts of these events and their long-term consequences.

The financial industry's legal and regulatory environment is intricate and perpetually evolving, representing another domain that will demand global collaboration to address complex challenges in this phygital era.

While human capital is a pivotal factor in the financial industry — and this opinion piece has barely highlighted the tectonic shift in population demographics — extensive research will be required to demonstrate the impact of Generation Z, X or Alpha on deep tech innovation in the financial industry. Areas of focused research could be talent acquisition, retention, workforce development, diversity and inclusion initiatives and evolving job roles in this phygital era.

This paper will hopefully spark further interest in the scientific community and encourage in-depth research that considers geopolitical, legal, human capital and demographic factors.

CONCLUSION

In the phygital era, financial services boards within the finance industry will face numerous challenges. To ensure resiliency and foster innovation, this paper proposed a trifecta that boards within the finance industry can embrace to adapt their risk governance to the demands of this phygital era: zero trust cybersecurity, ethics by design and risk management by design. By deploying this combination of strategies, boards within the finance industry can navigate the complexities of the phygital era and steer their organisations towards a more secure, trustworthy and sustainable future.

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