WORLD
ECONOMIC
FORUM

TradeTech:
Catalysing Innovation

INSIGHT REPORT

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Contents

Foreword

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Generative AI shocked the world.

What would TradeTech need to do to similarly grab the world's attention?

How about if it decided what to trade? How to trade? With whom?

What if technology autonomously financed that trade? Manufactured products and moved them itself? And did so faster, quicker, and more cost-effective than ever before?

That is not the future. It is the present.

Yet trade still has one foot in the past. Robots are doing paperwork. Drones need rubber stamps.

The TradeTech initiative is about stepping both feet into the future. Human creativity is needed.

Trade is global but is also for the individual.

Enveloping trade in a sea of information swells a tidal change in environmental and social performance, all along the supply chain.

Mastering trade information generates unprecedented efficiency and accuracy and even uncanny predictive power. Trade-as-a-service democratises trade.

The United Arab Emirates, a steeped in ambition and non-stop innovation country, has been chosen as the dynamic hub for this endeavour. But the effort is global – trade's future evolution demands a sense of collaboration, common ownership, and joint endeavour from the furthest reaches of the globe.

Traders and technologists, investors and logisticians, policy makers, and entrepreneurs – all are coming together to hurtle the trade ecosystem into a new era.

Join us!

Executive summary

Future TradeTech could link economies more efficiently, sustainably and inclusively.

The TradeTech Global initiative strives to revolutionize trade by leveraging innovative technologies to streamline trade processes and foster a more efficient, inclusive, sustainable and equitable trading ecosystem.

Realizing this vision is more easily said than done. Along the global trade value chain, numerous countries, companies and organizations collaborate in the production and distribution of a single good or service. The complex webs of interactions involved in global trade complicate efforts to optimize the system's operation. When supply chain participants try to maximize only their own self-interest, the outcome is frequently suboptimal and can lead to significant inefficiencies and missed collective goals.

Some of the most promising innovations of recent years – distributed ledger technology, robotics, artificial intelligence, machine learning, automation and the internet of things (IoT), for example – offer step-change opportunities for global trade. The transformative potential of these technologies cannot be realized, however, unless diverse members of the trade ecosystem collaborate on their deployment.

This document does not present a lengthy list of examples of TradeTech deployment or scenarios for future development. Rather, it concentrates on how to accelerate ecosystem development.

The TradeTech Global initiative articulates a vision for how diverse interests in the trade community can work together – sharing costs, hedging risks and directing substantial investments – to achieve technological transformation. It fills a gap in global collaboration by linking entrepreneurs and investors with regulators and established industry leaders, fostering open dialogue and engagement.

The initiative focuses initially on four areas seen as ripe for transformation: logistics, trade finance, carbon reduction and trade compliance.

Multistakeholder dialogue on these topics has generated three basic takeaways:

– **Takeaway 1:** Commercial actors will need to find ways to collaborate to overcome network barriers and first-mover costs.

– **Takeaway 2:** Enabling regulations and proactive governance are essential to facilitating the exchange of information and creating an environment of trust.

– **Takeaway 3:** Catalytic collaborations and pilot projects are needed at multiple stages of technology introduction to accelerate testing, demonstration and scale-up.

1 The path to TradeTech

TradeTech bridges the gaps that emerge as innovators, industries and regulatory agencies respond to technology opportunities.

Bridging the gaps requires incubating innovation, leveraging coalitions and updating regulation to build sustainable and inclusive trade. This report articulates the TradeTech vision of a new landscape to support technological change in trade.

Utopian and dystopian visions for the future of trade abound. In one scenario, the world is consumed by climate disasters and political upheaval as regions fragment into rival trading blocs. Supply chain disruptions and trade wars that intensified during the COVID-19 pandemic become normalized, protectionism intensifies and the world misses out on the potential economic gains from trade.

In an opposing scenario – a utopian technological future – robot labour moves goods seamlessly across borders, without any human intervention. Information about the goods in transit – bills of lading, customs authorizations and insurance documents, for example – glides effortlessly to each entity that needs it, including owners, transporters, lenders and regulators. The information is transferred through harmonized, integrated platforms and systems. Technology provides cost-effective tools to track CO_2 emissions and incentivize sustainable supply chains. Globalization thrives and GDP soars.

As these caricature visions of utopian and dystopian futures suggest, technology is likely to have expansive and transformative impacts on global trade in the coming years. The potential upsides of intelligent technology adoption are vast. The International Chamber of Commerce (ICC) suggested in 2021 that within five years, digitalizing the trade ecosystem could increase trade across the G7 by nearly $9 trillion.[1]

Humans have an astonishingly poor track record of predicting the future of technology. Attempts to imagine how innovation will impact societies tend to yield better science fiction than actionable insights. Predictions of the future trajectory of global trade, which spans industries and continents, are unlikely to perform well.

Nonetheless, the absence of information-sharing and collaboration presents a barrier to positive change. Companies adopt new technologies when convinced that their benefits outweigh their costs. However, positive externalities from trade technologies are unlikely to be seized without coordination. Indeed, vested interests stymie even changes that would benefit the majority of actors in the system.

The TradeTech approach is to encourage stakeholders to coalesce on shared technological visions, solutions and standards. The world does not have the luxury of time – the risks of inaction are substantial. In a business-as-usual scenario, it is likely that technological developments will further fragment international supply chains through the lack of interoperability, creating disproportionate barriers for smaller operators to gain traction in new markets.

FIGURE 1 | **Digitalization convoy**
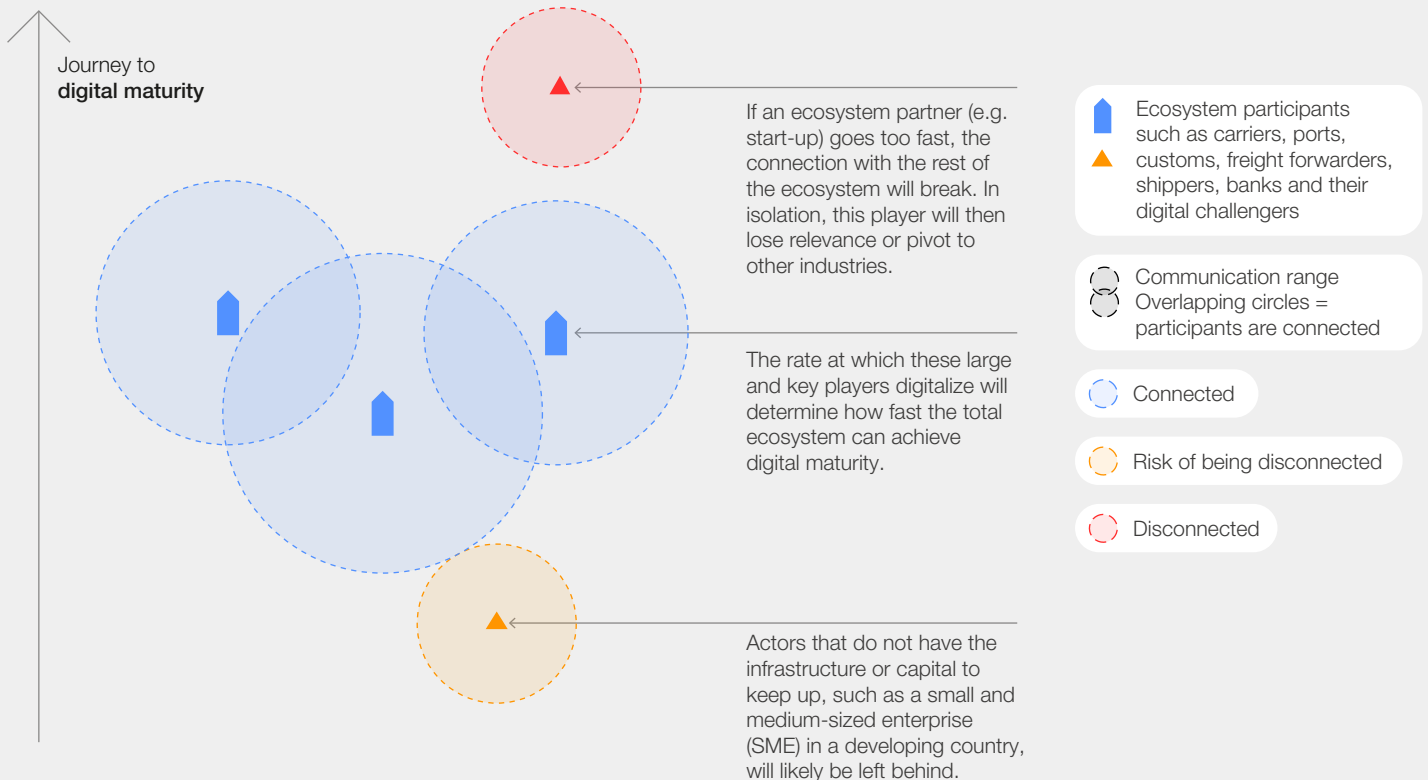
Source: World Economic Forum

❝ TradeTech
seeks a future
of trade that is
accessible and
transparent
and enables
opportunities for
diverse players.

A convoy analogy of the TradeTech Global initiative would show slower or weaker participants in the ecosystem being encouraged and supported to catch up, while shared signals and intelligence help market development. Not all members of the trade ecosystem will innovate and adapt at the same speed, of course. In fact, asynchronous development is a good thing: different time scales allow smaller, nimbler operators to compete, piloting and fine-tuning technological approaches before innovations are deployed at larger scales. However, the model recognizes that visionary innovations often need to connect to a larger ecosystem. While a start-up can pioneer a brilliant technological breakthrough, its innovations are most impactful when able to scale through links to other players.

Improving trade links between developed and developing markets and industry participants is a priority for the initiative – not least because of the growing diversification of global trade. Small businesses in developing countries, as well as their government administrations, often lack the necessary infrastructure and access to capital to fully embrace technological innovation. How can TradeTech accelerate the benefits of technological adaptation for all members of the trade ecosystem? What steps are needed to promote innovation by and for small- and medium-sized businesses?

There is no dearth of entrepreneurial activity. Numerous projects have been launched in recent years to support the exchange of shipping data, for example, or improve visibility in supply chains. However, many have foundered in a sceptical and competitive industry. The TradeTech initiative follows a different model. It does not propose specific solutions itself but seeks to sustain a supportive ecosystem and help innovators grow critical scale across industries and geographies.

The evolution of TradeTech is progressing towards three horizons.[2] The first horizon delineates low-risk initiatives to highlight potential, leverage existing technology and help developing markets and slower industry players take the basic digitalization steps to unlock further progress. The second horizon addresses the need to scale coalitions and address governmental and intergovernmental levers. The third horizon focuses on projects that require greater investment and synchronization.

The TradeTech initiative has focused its initial work, reflected in part in this report, on the first horizon. This work has prioritized creating an impartial platform for members of the trade and technology communities to highlight the possibilities of and identify challenges to technological renewal. It champions pilot projects to demonstrate the benefits of emerging technologies. In 2024, TradeTech will focus on developing Horizon 2 strategies to experiment with innovative technology and policy frameworks to begin to scale innovations that can inform Horizon 3 development.

FIGURE 2 | **Three horizons of digitalization**

TradeTech Initiative: Paving the way for global digital trade participation
Achieving complete digital integration by leveraging start-ups and corporate solutions for a unified and transformative trade ecosystem

Impact	Type of innovation	Objective	TradeTech project examples	Time horizon	Current focus
High risk-reward	**Horizon 3** Transform with disruptive tech	- Innovate business and data exchange models - Capitalize on novelty and synergies	- Trade data platform - Sustainability platform - Digital ports and customs - Green trade corridors	Long-term	30%
	Horizon 2 Test & integrate emerging tech	- Create sandbox to test potential and capture value - Curate promising TradeTech solutions	- Engage venture capitalists and funders - Proofs of concept with corporate partners - Accelerate/incubate start-ups for the regulatory sandbox		70%
Low risk-reward	**Horizon 1** Optimize with existing tech	- Cultivate thought leadership - Bolster awareness	- TradeTech Forum - TradeTech community sessions - Annual report	Short-term	

Horizon 3 projects wield immense potential to revolutionize the industry and sustain digital trade ecosystem value. They build upon the foundational work of horizons 1 and 2. The initiative executes select projects from all horizons simultaneously, adapting the focus as needed over time.

The trade community has an opportunity to imagine a world where trade facilitates human well-being, inclusivity and sustainability. This vision is not just about harmonizing and accelerating the uptake of new technologies – it is about imagining and planning collectively how to use new tools and platforms to broaden access to global trade, which can enable greater prosperity for communities around the world.

The barriers to operationalizing these changes are vast. The global trade ecosystem includes diverse players – from Latin American customs officials to African agricultural exporters to multinational banks – and their needs and challenges related to technology range considerably. TradeTech seeks a future of trade that is accessible, transparent and opportunity-enabling for these diverse players.

In some cases, TradeTech calls on sophisticated new technologies such as distributed-ledger platforms. In other cases, it involves harnessing more foundational technology, such as by making regulatory modifications to permit digital documents. Reforming legal codes for data storage might not seem as dazzlingly futuristic as automating warehouses or using artificial intelligence (AI) to manage supply chains. Yet broadly deploying basic TradeTech tools is important in building a just and sustainable trade ecosystem.

CASE STUDY 1

The Global Alliance for Trade Facilitation ePhyto roll-out

Phytosanitary certificates are official documents to confirm that shipments of plants and plant products being traded internationally are free of pests and diseases and therefore safe to import. Until recently, these certificates were always physical paper documents that were transferred between different parties by post, courier or other physical means. These paper certificates can take days to obtain and are prone to errors, loss and counterfeiting. This slows down trade and, at worst, results in spoiled goods, additional demurrage charges and frustrated customers and governments.

The ePhyto Solution, developed by the International Plant Protection Convention, allows countries to electronically exchange electronic phytosanitary certificates (ePhytos) with each other through a central hub, quickly, accurately and at low cost. The risk of loss, damage or fraud to the certificate is greatly reduced, as is the administrative burden on both border agencies and businesses. The Global Alliance for Trade Facilitation helps developing countries introduce the system. The collaborative nature of the project also paves the way for countries to exchange other types of data with trading partners.

Surveys, interviews and dialogue with several hundred practitioners from the TradeTech community have revealed the initial priorities regarding TradeTech needs and challenges upon which this report is based.

FIGURE 3 | **Initial TradeTech Global initiative priorities**

Needs

- Regulatory and documentary processes
- Supply chain planning and coordination
- Trade finance
- Sustainability

Challenges

- Network effects and vested interests
- Restrictive regulation
- Trust
- Inclusivity

2 Regulation and business-to-government relationships

Future TradeTech could link economies more efficiently, sustainably and inclusively.

The current international trade governance architecture is broadly split between the geopolitical and legal framework of the World Trade Organization (WTO) on the one hand and the World Customs Organization's building of technical standards on the other. There are multiple ongoing efforts to construct regulatory bridges. The WTO Joint Statement Initiative on Electronic Commerce, for instance, has touched on topics related to trade facilitation and the digital economy. Other forums, such as the G20, Asia-Pacific Economic Cooperation (APEC), Organisation for Economic Co-operation and Development (OECD) and Indo-Pacific Economic Framework for Prosperity (IPEF), have explored related issues. Bilateral and unilateral government actions have tested a variety of soft law approaches to encourage TradeTech development.

Given the rapid development of technology and the desire to leverage these different regimes, members of the global trade community need to engage in forward-looking dialogue focused on the practical delivery of technology-enhanced trade. To a certain extent, the WTO Trade Facilitation negotiations filled this gap for an earlier era. An updated dialogue is now needed, with greater participation from members spanning the TradeTech business ecosystem.

While the private sector can handle many aspects of technology development, underlying issues such as legal digital identity, liability and computational law need government involvement. The gatekeeper role of governmental border agencies in international trade flows means that reporting and regulatory compliance requirements have a determining role in the standards and formats of trade information flow.

In Australia and the United Kingdom, to cite two examples, roughly 30 different government agencies share responsibility for the border. Each of these agencies retains jurisdiction over important dimensions of trade. Implementing new technologies in such cases requires more than just updating software and digitalizing traditionally paper-bound records. It requires capacity building, the wholesale reimagining of some compliance practices, and a willingness to experiment with new regulatory models and conditions.

Efforts to digitalize and streamline border processing through national single windows, which centralize documentation requirements under a digitalized platform, still have a long way to go. When the United States created such a platform in 2016, it streamlined processes that previously required the submission of more than 250 forms to nearly 50 agencies. The partially centralized platform reduced waiting times at border crossings by one-third.[3] One study found that the presence of such streamlined trading windows could increase bilateral trade by nearly 40%.[4] But despite the potential benefits of the single-window example, most countries have not adopted them – let alone taken the logical next step of connecting with others to create a seamless experience across borders.

In the absence of state action, private sector solutions have emerged to facilitate company compliance with documentation requirements. But regulatory modernization remains essential. For example, in many jurisdictions, converting trade documentation to an electronic format raises questions about legal validity as an "original" document and what "possession" of documents looks like in an electronic environment. Clarifying these policy questions and regulatory ambiguities would facilitate faster and more widespread technology adoption. Legal initiatives such as the Model Law on Electronic Transferable Records demonstrate the feasibility of reform.[5]

As a further example, the widespread use of 3D printing would necessitate new approaches to traditional customs responsibilities, such as identifying origin, protecting intellectual property and collecting value-added tax (VAT).

The value of TradeTech to government agencies is high. Digital declarations help reduce errors and speed the movement of goods. AI applications are helping with customs classifications, automated verification and compliance monitoring. Technology-enabled transparency for sustainability and supply chain due diligence or to prevent counterfeiting can differentiate best performers from bad actors in the trade ecosystem. Biometric technology can combat identity fraud and security breaches.

Public-private collaboration on all these issues at a global level is overdue. For maximum inclusivity, it is essential to not forget that low-cost and high-speed digital and mobile access remains a prerequisite for developing country communities to engage with TradeTech.
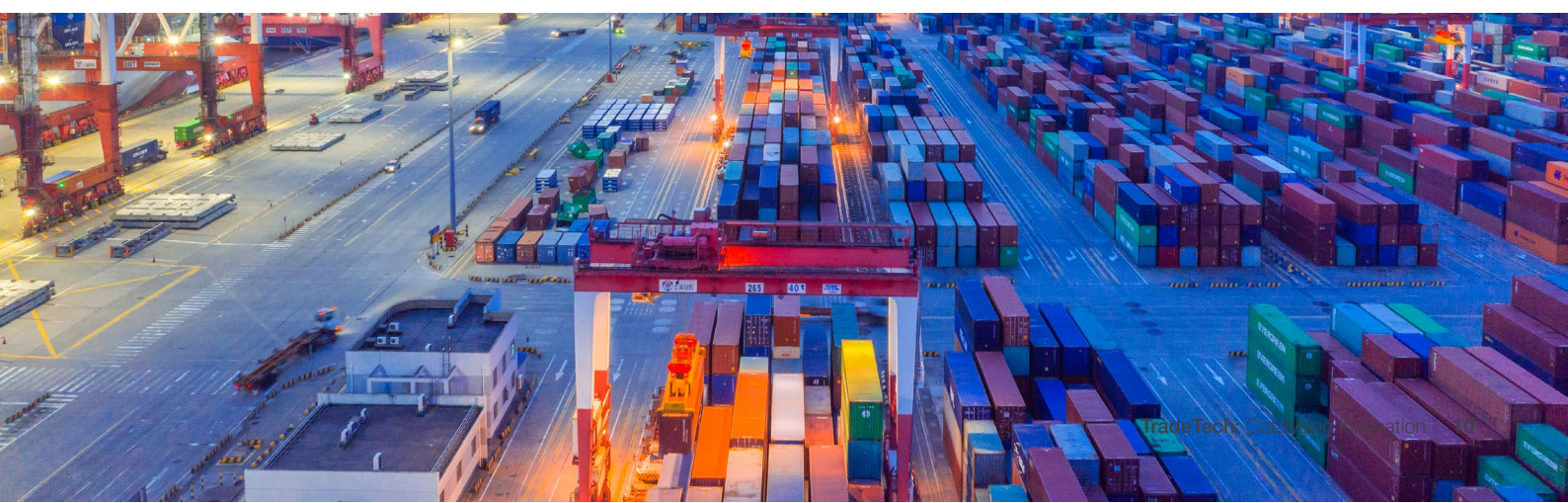
TradeTech solution – Maqta Gateway (mPCS)

Ports play an outsized part in the movement of global goods: 90% of worldwide trade is conducted via sea. AD Ports Group is pivotal in realizing Abu Dhabi's vision to lead as a trade and maritime hub and enhance trade competitiveness, in line with efforts to diversify the economy. AD Ports Group embarked on a digital transformation journey almost a decade ago. It launched the pioneering Maqta Port Community System (mPCS) in the United Arab Emirates, which an Emirati-majority workforce developed and managed.

mPCS streamlined port operations by integrating numerous stakeholders and end-users through an intuitive, mobile-responsive, single-window interface that enables secure and standardized information exchange. The track-and-trace system operates in real-time to increase transparency for authorities and customers alike. Authorities have information on goods entering the country prior to their arrival; customers have up-to-date information about their transactions. These insights boost the ability of the United Arab Emirates to trade with the rest of the world.

The services the system offers for container, general cargo and cruise ships have encouraged 100% adoption among all commercial seagoing vessels.

Maqta Gateway continuously enhances mPCS through the introduction of new modules and features that simplify payments, license management, gate management, container grading and more. mPCS links to 11 ports and 54 private jetties, allowing ship routes to be tracked before departing from original destinations. It connects 26 shipping lines and supports intermodal transport, unlocking the potential of seamless trade.

mPCS has logged 197,800 vessel entries, recorded more than 91 million transactions across all stakeholders and eliminated 1 million tonnes of carbon emissions. Since its launch, the interface has processed over 20 million TEUs (twenty-foot equivalent units) of container cargo. Its modular, multi-tiered structure built on cloud-based infrastructure with secure data exchange layers has paved the way for the system's integration with the country's key trading nations – evidence of its interoperability.

The impact of mPCS in modernizing Abu Dhabi's trade through its multi-modal model has pushed the boundaries of traditional port community systems, giving impetus to worldwide opportunities. The group is exporting mPCS to more international locations, starting with Jordan, and is orchestrating international virtual trade corridors that could transform the nature of global trade.

2.1 | Future public-private collaboration

> ❝ Trusted, unbiased intermediaries can play a leadership role in building coalitions and facilitating collaboration.

Technology can support piecemeal improvements in global trade and a comprehensive digital transformation that offers more inclusive and sustainable pathways to promote economic growth. Realizing this vision for business-government collaboration requires participants to overcome three of the most pressing challenges in the field.

The first challenge is in **harmonizing international policies and systems**. Without collaboration to coordinate the development of new policies, progress in TradeTech will be slow and uneven. Evidence of such fragmentation abounds: regulators in the United States recently flagged a free logistics platform used in shipping and port management as a tool that could allow a foreign government to gain "insights into shipping information, cargo valuations via customs clearance forms, and destination and routing information."[6] US lawmakers have proposed bills banning US ports from using the platform.[7] Geopolitical tensions can complicate the pursuit of interoperability and these risks heighten the need for trusted, unbiased intermediaries to play a leadership role in building coalitions and facilitating collaboration.

Undoubtedly, reducing vulnerability to cybersecurity attacks can improve the willingness of trade participants to innovate. Digitalizing sensitive information can leave firms vulnerable to new forms of online attacks. Protecting stakeholders against such attacks represents a significant challenge for the future of TradeTech.

The second challenge is in growing **collaboration between regulators and TradeTech users and developers** as it is vital in helping regulators stay updated on how best to protect their constituents. Developments in technology often outpace the capacity of a state to design and implement new regulatory frameworks to best manage innovation. As a result, regulations are fragmented across jurisdictions, agencies and functions.

Third, **promoting equality and access** in TradeTech reduces the risks of exacerbating trade inequalities and locking in to outdated systems. Least developed countries and small businesses can struggle to access the efficiency advantages of digitalization. Efforts to remove barriers to engage with new technology systems will in the long run allow the whole ecosystem to progress faster.

3 Logistics information sharing

Technology could transform and streamline the way trade stakeholders interact and share information.

Shipping a single container from one country to another is an intricate process that involves many stakeholders. At least 15 distinct parties may be involved. A typical transaction includes 36 documents and 240 copies.[8] If stacked, the paperwork required to move a shipment of goods from Kenya to the Netherlands would be 25 cm thick.[9] The cost of processing documents alone can constitute as much as one-fifth of the overall shipping costs.[10] Technology could transform and streamline all of this.

The more cautious participants largely determine the pace of trade innovation and digitalization. The inherent need for interaction across countries and logistics actors means legacy networks and systems pose significant challenges for new players attempting to introduce innovative technologies. Large operators frequently operate multiple systems and interacting with rival platforms creates costs for traders seeking access to global markets.

Some intermediaries benefit from these challenges: freight forwarders may profit from inefficiencies in trade systems and be reluctant to experiment with potentially transformative ways of doing things. Organizations understand that carefully sharing data can increase competitiveness and lead to new opportunities. However, they fear that sharing could also lead to data misuse, loss of control of proprietary knowledge and compromised competitive advantage.

Without interoperable standards or alternative approaches to compatibility, logistics will continue to be a complex, fragmented and cost-intensive enterprise. New technology can increase the burdens on the industry, which already faces low margins and high costs because logistics firms must manage numerous data protocols, formats and other requirements.

Over the years, the logistics industry has piloted several initiatives to improve information sharing. Despite clear potential advantages for the industry, most of these initiatives have so far failed to achieve widespread adoption. The effort to digitalize bills of lading is a telling example. According to a 2022 McKinsey study, shifting this single trading document from a paper-based to a digital format could generate $6.5 billion in savings and potentially unlock an extra $40 billion in global trade.[11] Despite this, the effort has yet to achieve widespread success. Certificates of origin, packing lists, insurance policies and letters of credit are among the additional paperwork requirements that technological innovation could overhaul.

Several shipping lines have committed to an electronic bill of lading by 2030.[12] Yet, logistics firms – which generally operate on low margins and high volumes – have historically been conservative in their technology investments, typically allocating only single-digit percentages of their revenue to research and technology development.

CASE STUDY 3
Trade and Logistics Information Pipeline (TLIP)

The Trade and Logistics Information Pipeline (TLIP) originates from a collaboration between the IOTA Foundation and Trademark Africa. It leverages distributed ledger technology principles of transparency, traceability and immutability to foster trust and integrity in data that is shared between trade partners. TLIP has been trialled in Kenya and the United Kingdom.

TLIP is designed to disseminate supply chain information directly across commercial organizations and government entities directly from its origin, following predefined permissions governing data access. TLIP bridges connectivity gaps between traders, government agencies and logistics providers.
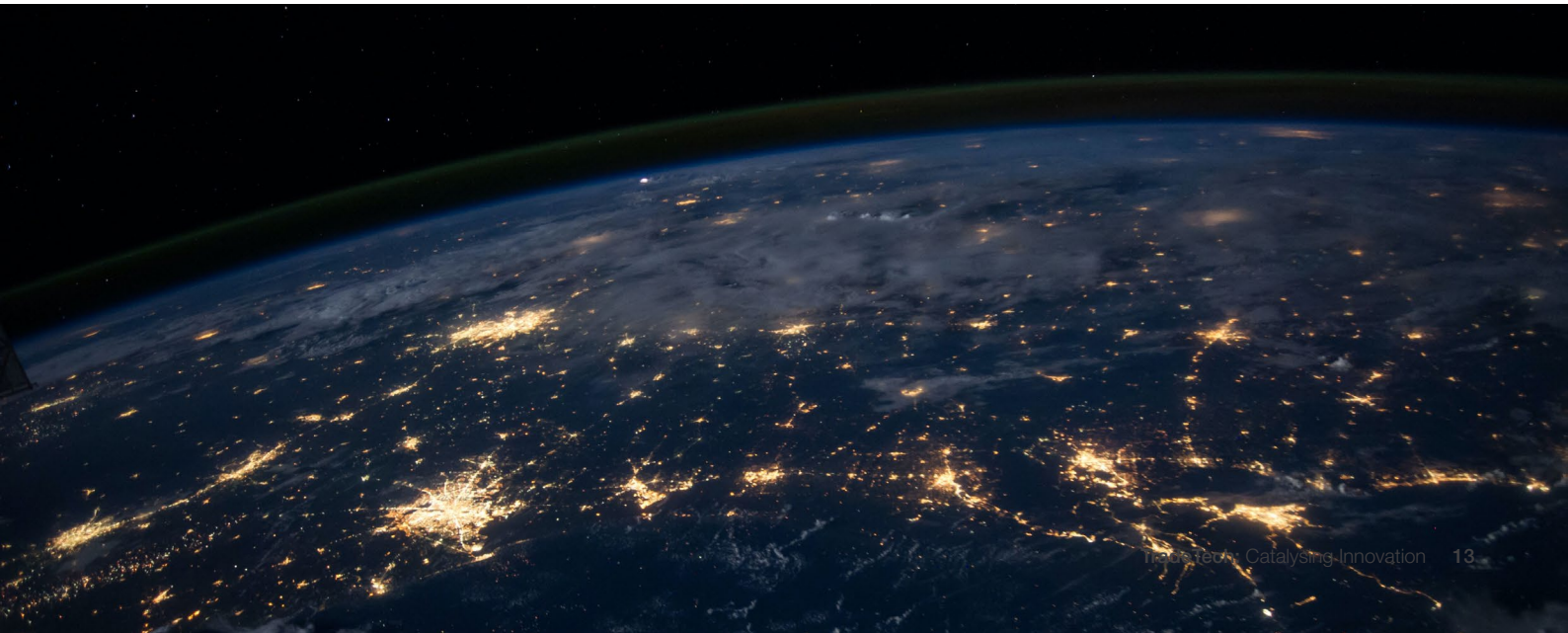
3.1 | Future logistics information

A more interoperable future for logistics information would entail trade-data platforms that facilitate collaboration on information. The success of collaborative platforms depends on their ability to promise several features, such as neutrality, openness and oversight. Artificial intelligence, with its capacity to integrate disparate data from multiple sources, promises the potential to overcome the standards bottleneck as long as data access is enabled.

Tech-enhanced third-party logistics (3PL), which characterizes intermodal transport firms, would not be the only result of the widespread incorporation of these tools. A new wave of logistics innovation – sometimes called 5PL and 6PL to refer to different layers of coordination and technological adaptation – can enable logistics providers to provide a full suite of supply chain services.

Successful integrated platforms would likely first focus on solving a specific problem or use case for target users. As trust among parties grows, data owners can gain confidence and exchange further information. Platforms might begin by focusing on a specialized use case, such as environmental data, and then expand services to focus on compliance or financial data.

Effective data sharing would change the way logistics operators interact with customers, partners and transit hubs. Embracing these changes would streamline current logistics operations, help

participants rethink the underlying principles of the industry and unlock value for the global economy.

While warehouse management systems and yard automation already exist, more granular cross-network information sharing would get the sector much closer to the vision of a physical internet. Efficient direct shipping, automatic replenishment, demand forecasting and AI scenario planning could become a reality. Tech-enabled trade can offer far greater effectiveness and efficiency in responding to customer needs.

④ Trade finance

Amid instability and mistrust, the burdens on trade finance entities and institutions, such as the responsibility to monitor and report suspicious or illegal activity, become greater.

In 2022, demand for financing outpaced approvals by $2.5 trillion. The inability to access credit hits those in developing economies – both existing traders and prospective newcomers – the hardest. Risk-aversion by creditors is understandable in an environment of heightened geopolitical tensions, regulatory barriers and changing compliance requirements.

Technology can help level the playing field. Data analytics has the potential to transform credit evaluations and provide lenders with a more nuanced view of creditworthiness more efficiently. Provided with the right data, algorithms can help lenders build confidence in the trustworthiness of borrowers. However, uneven access to data, particularly in developing economies, can create barriers to access for the communities most in need of access to financing.

In 2021, a Nigeria-based fintech start-up secured a record-breaking $170 million in a Series C funding round, making it the largest funding for an African tech start-up at the time. E-commerce payments are one of the business's core areas.[13] The success of this venture underscores the readiness of markets for innovative projects.

The trade finance opportunity emphasizes the need for innovation in regulatory and logistics information sharing as highlighted in the previous two sections. For example, in the absence of collaboration among financial service providers, logistics companies and regulators, opportunities for fraud abound. Lenders tend to extend trade credit based on invoices for goods but financial institutions have little ability to verify the authenticity of these records. Collaboration with logistics firms can resolve these information asymmetries: banks can use real-time tracking data or other technological verification to ensure the authenticity of goods being traded. Visibility of goods in transit allows for the linking of trade finance to compliance with safety and environmental policies.

CASE STUDY 4
UAE Trade Connect

UAE Trade Connect, developed by E& with a consortium of major banks, tackles the problem of fraudulent multiple use of the same invoice to secure financing. It provides a distributed ledger document clearing system through which financial documents can be verified for uniqueness, without compromising confidentiality.
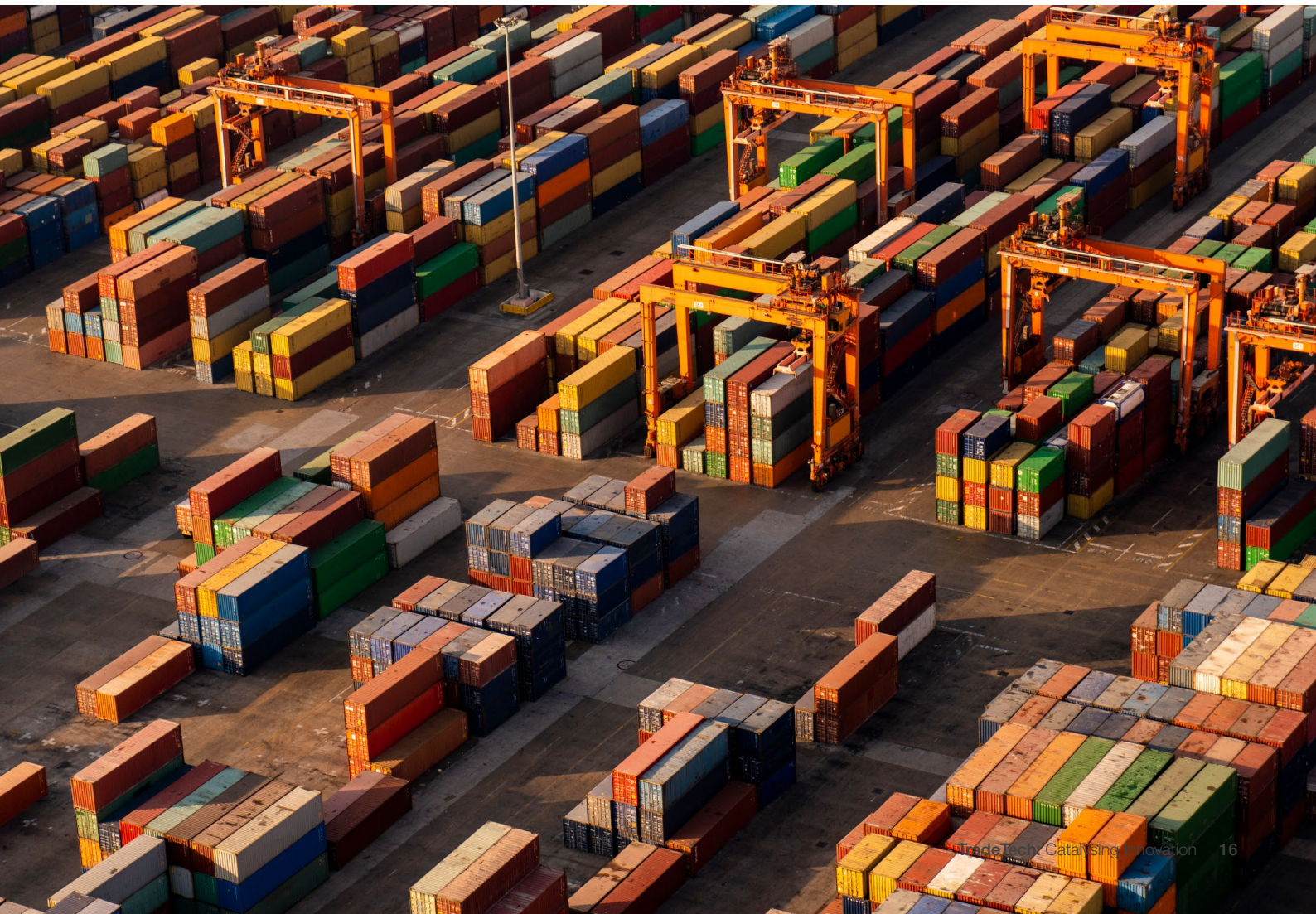
4.1 | Future trade finance

Tools can help democratize credit and allow lenders to shrink the trade finance gap with fewer risks.

TradeTech can **transform traditional approaches to pricing and managing risk** to make the marketplace fairer and more accessible. Traditional credit evaluations tend to be anchored to a borrower's past payment history. This approach to lending makes sense in the absence of data about the underlying goods involved in trade. However, internet of things (IoT) technology creates possibilities to better monitor the financed goods, thereby reducing risks to lenders. IoT and real-time monitoring allow a lender to know the whereabouts of goods and verify the safety of container cargo throughout its trade journey. These tools can help democratize credit and allow lenders to shrink the trade finance gap with fewer risks.

Parallel innovations in regulators' usage of technology could reduce many of the barriers to trade finance. For example, anti-money laundering regulations often require reams of paperwork to ensure the compliance of underlying transactions. Innovations in regulatory technology streamline these processes into automated operations that allow trading partners to upload documents only once, as goods and money move across borders. The interoperability of systems is vital to ensuring that the cost reductions and efficiency improvements from such innovations benefit diverse players in the trade ecosystem.

Risk distribution technologies are making trade finance accessible to a broader range of institutional investors for the first time. These technologies facilitate the conversion of trade finance into tradable securities, with the use of end-to-end workflow automation tools significantly reducing transaction costs. This innovation complements traditional risk-sharing practices between banks and credit insurers and holds the potential to channel a substantial amount of incremental liquidity from capital market investors, through lenders, to underserved businesses.

Tokenized digital assets offer possibilities to broaden trade finance investability. Tokenization involves transforming traditional trade-finance assets, such as letters of credit, into digital manifestations exchanged through distributed ledger technology.

Hedging tools, such as a newly launched market for container freight derivatives, provide additional security against future risks. Derivative trading has long served as a strategy for financiers and producers to offset potential losses in commodity trading. A market for trading future contracts related to container shipping was attempted in the early 2010s but never reached critical mass.[14] Renewed interest in supply chain security and greater container movement volumes suggest the time is ripe for markets to provide new hedging tools for financial institutions, logistics providers and shippers.

(5) Supply chain sustainability

Trade is the lifeblood of the global economy but moving goods thousands of miles inevitably involves carbon emissions as transport currently largely depends on fossil fuels.

Freight emissions account for about 30% of all transport-related emissions. Direct reductions in freight emissions through low-carbon transport and warehouse technology is not the focus of this report but significant efforts are underway involving green fuels, electrification and other measures,[15] though greater ambition is needed. Technology-driven operational efficiency provides a not-insignificant means to drive costs and emissions further down. Robotic process automation (RPA), for example, has become increasingly commonplace in the industry and uses technologies such as warehouse drones to manage inventory and optimize supply chains, supplemented by AI-driven route optimization.

At the same time, trade makes the spread of green technology and services possible. Trade in green goods grew by 243% between 2000 and 2020. Perhaps most significantly, trade ties production systems together through global value chains and connects producers to consumers. When technology enables the flow of granular emissions data along the supply chain, it can provide powerful market signals to incentivize greener production. For companies

to reduce scope 3 (supply chain) emissions, they depend on accurate information transfer along the supply chain. Reducing scope 3 emissions and preventing carbon leakage are goals of carbon border adjustment mechanisms – made more feasible by technology-enabled information flow.

TradeTech can analyse vast amounts of data and offer new ways to visualize, streamline and build sustainability into global supply chains. The use of emerging technologies will be crucial in enhancing visibility across all components of the value chain, thereby contributing significantly to greenhouse gas emissions reductions – as well as providing the basis for advanced recycling and circular economy initiatives.

Beyond environmental performance, supply chains are held to increasingly higher social impact standards. New due-diligence legislation in major economies, as well as tightened corporate standards, combine with stringent sanctions and trade restrictions compliance obligations to mandate accurate end-to-end supply chain traceability.

BOX 1 | **Smart container shipping**

Thanks to information from sensors and automated cargo-unloading technology, artificial intelligence programs determine the container's route and optimal timeline for departure. This software uses inputs such as weather, port traffic and inventory data to determine the best path for the container to reach its destination. These programs synchronize with enterprise resource planning (ERP) and warehouse management systems and customs to ensure seamless port arrival and unloading. Along the way, real-time tracking and sensors continually monitor the shipment's temperature and conditions. Technology can sense humidity changes, shocks, unauthorized tampering and safety anomalies.

When the box arrives at its destination, robotic forklifts and cranes offload it, without creating risks to human workers. Computers determine its storage to maximize safety and minimize downtime. Simultaneously, digital customs platforms help ensure the processing of compliance data through the necessary authorities. Computer vision facilitates swift inspections and streamlined platforms ensure that single-upload platforms share the necessary documentation with each government agency and authorized private bodies involved in monitoring incoming goods.

Throughout the container's journey, renewable energy has helped minimize emissions. Sensors alert operators about the need for maintenance or any other unexpected challenges along the way.

5.1 | Future sustainable supply chains

> Trade ties production systems together through global value chains and connects producers to consumers.

TradeTech can **transform the monitoring and reporting of emissions footprints** and other externalities. Distributed ledger technology creates new possibilities for attaching identifying information to goods along their life cycle to validate provenance and ensure compliance with environmental, social and security requirements. Companies have become increasingly focused on the impacts of direct suppliers and the larger ecosystem involved in their supply chains. The use of technology will be crucial to enhancing visibility and ensuring transparency across companies' value chains.

TradeTech can also directly **increase trade efficiency to reduce environmental impacts**. Data analytics and real-time tracking can help minimize emissions by improving route efficiency, reducing empty cargo space, combining shipments and avoiding unnecessary detours. Cargo vessels spend only 60% to 70% of their port time actually at a berth, according to some estimates.[16] The wait time and the compensating speed required at other stages of the journey are costly and inefficient for operators and also take a toll on the environment. Artificial intelligence, sensors and climate modelling give firms even more tools to optimize transport planning.

6 Realizing the TradeTech vision

The TradeTech Global initiative supports the emergence of competitive trade technology platforms and ecosystems.

These efforts require deep coordination among stakeholders. Interoperability is a crucial factor for the smooth and efficient functioning of global trade processes.

However, the path to achieving competitive interoperable innovation raises questions such as:

– What conditions are needed to help investors take risks in testing and scaling technology?

– How can entrepreneurs and corporations best collaborate on creating global trade technology platforms and applications?

– What steps do regulators need to take to support competitive and inclusive outcomes?

– Could a collaborative approach to developing global digital infrastructure, where a broad coalition of stakeholders shares initial costs and risks, prove effective?

The TradeTech initiative is identifying pilot projects to answer these questions incrementally in ways that build consensus among stakeholders. In recent years, promising trade harmonization initiatives have come and gone, providing useful lessons about how the trade community can move forward. TradeTech builds on the lessons learned from these experiments to help kickstart a new future for global trade.

The success of digitalizing the trade ecosystem hinges on effectively incentivizing all participants – including private and public organizations – to collaborate. The challenges that impede data collaboration are vast. Some stakeholders actually benefit from a lack of transparency and efficiency, as their businesses depend on helping traders navigate information gaps and complicated processes.

At the same time, multiple platforms have demonstrated the potential gains of greater data collaboration for a wide variety of trade participants. Various projects have created commercial data marketplaces that enable sellers and buyers to set the price of data, such as shipment booking information. As these examples indicate, the design possibilities for TradeTech solutions likely depend on protecting data ownership and rewarding data providers and collaborators for their contributions.

One lesson from prior ventures involves the need to support a wide range of industry players, from large corporations to small start-ups. Meeting the needs of small- and medium-sized enterprises is particularly important to ensuring the system promotes inclusion. As diverse partners engage with pilot initiatives in the TradeTech initiative sandbox, the initiative can identify proof-of-concept results to demonstrate a wide range of impacts – from straightforward technological changes to complex, interconnected solutions suited to large multinational businesses. By focusing on the identification of use cases, the TradeTech initiative can demonstrate the clear, compelling value proposition of lower transaction costs and greater efficiency that will justify investments in organizational and technological change. To sustain a supportive, interconnected ecosystem, public-sector actors can help encourage critical mass.

The initiative will advance a vision for sustainable, inclusive and efficient global trade among an ever-widening network of participants. Actors in the trade ecosystem can make progress at different rates and have different appetites for taking on technological risks. TradeTech's ecosystem approach respects these differences and seeks to calibrate its work such that ecosystem members remain connected while innovation flourishes.

TradeTech Global will support innovation through several initiatives. Horizon 1 work focuses on

building and strengthening a community, identifying shared challenges and articulating a vision for the future. This report reflects that focus.

In the year ahead, the initiative will focus on Horizon 2 – highlighting, supporting and integrating technology collaborations in innovative, experimental ways. In consultation with public- and private-sector partners, TradeTech Global will collaborate at local, regional and international levels to assemble best practices for the deployment of technology.

FIGURE 4 | **A holistic approach to innovation**
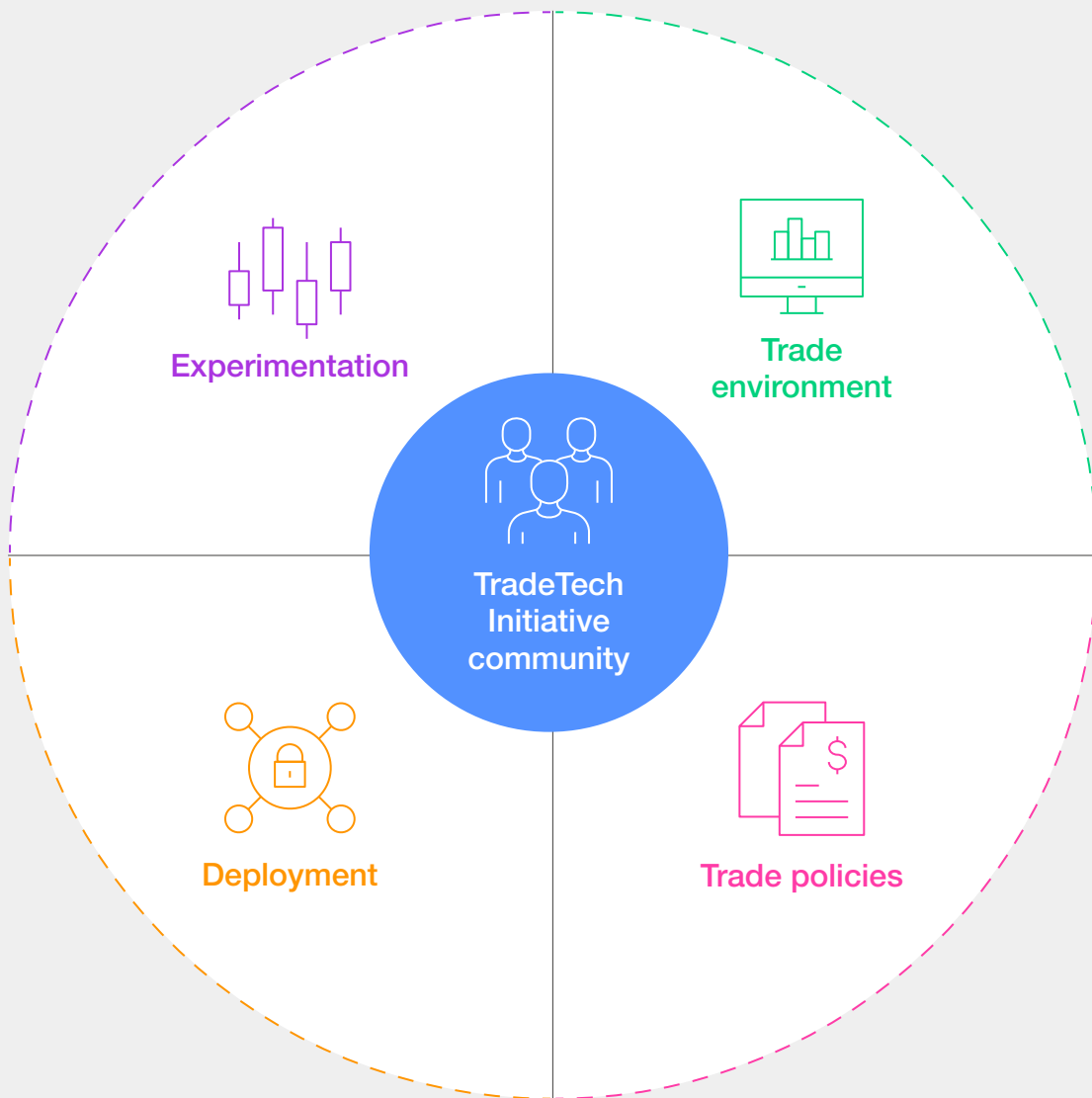
The project requires community building and information exchange as its foundation. Collaborative design can also help develop a reservoir of human talent for refining and deploying innovative technologies across the entire trade

ecosystem. It is only through sustained engagement that an ecosystem as complex and diverse as global trade can harness the full advantages of technological transformation.

Contributors

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