A Study On Impact Of Technology To Reducing Trade Barriers

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Abstract- *The technology has become a crucial driver in reducing trade barriers by enhancing efficiency, lower costs, and improving global market access. This paper explores the transformative role of digital advancement in overcoming traditional and non –tariff trade barriers. Key technological contributions include platforms, block chain, for secure transaction, artificial intelligence for supply chain optimization, and fintech solutions for seamless cross-border payments. Additionally, digital trade agreements and smart customs clearance systems streamline regulatory processes, reducing data and increasing transparency. Despite challenges such as cyber security risks and digital divides, technology continues to revolutionize global trade, making markets more accessible and inclusive. This study highlights the significant of technology integration in fostering economic growth and global trade expansion.*

Keywords- Technology, international trade, logistics, flow of goods and services, Seamless transaction, Innovation, block chain, technological tools, digital payments.

I. INTRODUCTION

Technology can help reduce trade barriers by making trade more accessible, efficient, and innovative. In an increasingly interconnected world, technology plays a vital role in transforming global trade by reducing barriers that once hindered cross-border transactions. Traditional trade barriers, such as high traffic, complex regulations, inefficient logistics, and restricted marker access, have long posed challenges for businesses. However, advancements in digital communication, financial technology, artificial intelligence, block chain, and automation have significantly streamlined international trade. By enhancing efficiency, reducing costs, and improving transparency, technology enables businesses -especially small and medium-sized enterprises – to participate in global markets more easily. From digital payment system facilitating seamless transactions to block chain securing trade documentation, technology is reshaping the way goods and services move across borders.

II. STATEMENTOF THE PROBLEM

Despite globalization, trade barriers such as high transaction costs, inefficient customs procedures, lack of transparency, and regulatory compliance issues continue to hinder international trade. Traditional trade processes often involve extensive paperwork, long processing times, and high costs, making is difficult for business-especially small and medium enterprises –to engage in cross- border trade. Technology has emerged as a key solution in reducing these barriers by enhancing efficiency, transparency, and accessibility in trade. Digital platforms, block chain, artificial intelligence, and financial technology solutions facilitate faster transactions, stream line supply chains, and improve regulatory compliance

However, challenges remain in the adoption and implementation of these technologies, particularly in developing economies where digital infrastructure is lacking.

III. REVIEW OF LITERATURE

Freund and Wein hold (2004)[1] highlight that the internet plays a crucial role in increasing international trade by reducing information asymmetry and facilitating business (B2B) transactions. Clarke and Wall s ten, (2006) further emphasize that e-commerce platforms enables small and medium enterprises (SMEs) to beyond local markets, reducing dependency on intermediaries and lowering trade costs.

Block chain technology has also transformed global trade by enhancing transparency and efficiency. Saberi et al (2019) argue that block chain facilitates secure and immutable trade documentation, which helps in reducing fraud and speeding up customs clearance. Moreover, smart contracts enable automated trade agreements, minimizing disputes and administrative delays.

Artificial intelligence and big data analytics have revolutionized supply chain management Waller and Fawcett (2013) suggest that AI –driven predictive analytics optimize

logistics, reducing delivery times and enhancing efficiency. Similarly Li et al. (2020) [1]emphasize that I improves demand forecasting, minimizing ensuring smoother cross- border trade.

IV. RESEARCH GAP

Despite advancements in technology, small and medium sized enterprises (SMEs) still struggle to reach the international trading level. Their goods and services are not easily accessible in every corner of the world. Therefore, the role of technology needs to be enhanced that small and medium sized enterprises (SMEs) can expand their reach globally.

My research is based on following objectives:

- Toanalyzehowtechnologicaladvancementsfacilitateinternationaltradebyreducing physical, regulatory and transaction barriers.
- To examining how digital technologies empower SME(small&medium sized enterprises) participate more actively in international trade.
- Toevaluatetheroleoftechnologyinreducingtransaction costs,increasing trade efficiency.
- Tofindthespecifictechnologicaltoolsthatcontributetoreducingtradebarriers.
- Tosuggestpoliciesandinitiativestoensureequitableaccesstotechnologicaltools,enabling inclusive participation in global trade.

V. METHODOLOGY

The research is based on doctrinal and non-doctrinal research. The sources data collected from various newspaper, magazine, books, reports, e-sources. The sample size of respondent is 5o.In this research based on statistical random sampling. In this research used some of the important statistical tools is percentage method and average method.

VI. SIGNIFICANT OF THE STUDY

Business can leverage technology (e-commerce), digital payments systems,)to expand into international markets without relying on costly physical infrastructure.

Technology reduces entry barriers, allowing SMEs from developing countries to participate in global trade.

VII. HYPOTHESESOFTHE STUDY

This research is based on following hypothesis:

H1. Communication with international trade partners has improved due to technology.

H2. Customs and compliance process of trade related operation have been simplified by technology.

VIII. LIMITATIONS OF THE STUDY

Reliable and up-to-date data on digital trade adoption, block chain transactions, and AI – driven trade facilities may be limited, especially in developing economies. Small and medium size enterprises may not have equal access to advanced digital tools, leading to unequal benefits. Political instability some regions may hinder the adoption of digital trade solutions. The increasing use of AI, big data, and digital tracking in trade raises concerns about data privacy, surveillance, and ethical considerations.

IX. RESULT AND DISCUSSION

E-commerce and digital platforms:

One of most significant technological innovations reshaping global trade is the emergence of e-commerce platforms like Amazon, Alibaba, and Shopify. These digital marketplaces have democratized access to international markets, enabling business-from large co operations to small start –ups –to reach customers worldwide. Traditional trade routes, which were previously limited to those with substantial resources, are no longer the only option for expansion. E-commerce platform sallow business to list and sell products to a global audience without needing to establish a physical presence in multiple countries. These platforms provide a ready-made infrastructure for marketing, payments, and logistics, which greatly reduces the barriers to entry for small and medium sized enterprises. By removing geographical constraints, e –commerce opens up opportunities for business to diversify their customer base and expand their reach across borders.

Block chain technology:

Block chain technology has gained significant traction in global trade, primarily due to its ability to provide transparency, security and trust in international transactions. By offering a decentralized and immutable ledger, block chain enables the secure tracking of goods from production to delivery, ensuring that the products history remains transparent and tamper – proof. This level of traceability reduce the risk of fraud , counterfeiting , and disputesbetween trading partners , which can otherwise slow down the trading

process and increase costs .For example , block chain can help verify the authenticity of goods, ensuring that consumers receive products as advertised. In industries like agriculture, pharmaceuticals, and luxurygoods,theabilitytotracetheoriginandjourneyofaproductis notonlycrucialfoquality assurancebut alsofor meetingregulatory compliance.Withblock chain,businesscan ensure the integrity of their supply chain while offering customers greater confidence in the product they purchases. Moreover, block chain technology also facilitates cross – border payments, making transaction faster, cheaper, and more secure. The use of cryptocurrencies and smart contracts enable business to transfer money and complete agreements without relying on traditional banking system, reducing transaction costs and delays associated with currencyexchange and cross-border transfers.

Streamlininglogistics:

Another area where technology has significantly reduced trade barriers is logistics. Theglobal supply chain relies on timely and efficient transportation, which historically involved complex systems and coordination across various stakeholders. Todayinn ovation in automation,suchasautomatedwarehouse,drones,andautonomou svehicles,arestreamlining the logistics process, making the transportation of goods faster, cheaper, and more reliable. Automated Warehouse, for example, use robotics to handle tasks such as inventory management,sorting,andpackaging.These technologiesminimizehumanerror,speed upthe fulfilment process and reduce operational costs. IN addition, the use of drones and autonomous vehicles for deliveries, especially in remote or congested areas, has the potential to further reduce transportation costs and improve delivery times. Furthermore, the development of smart ports and integrated logistics systems, which use the internet of things and data analytics, is optimizing global trade. These technologies allow port authorities and shipping companies to monitor and manage the movement of goods in real time, reducing delays and improving efficiency. With faster and more efficient logistics, business can better meet consumer demands and reduce the risks associated with inventory management and supply chain distributions.

Digital trade agreements and platforms:

In addition to physical goods, technology also enhancing the flow of services, intellectual property, and data across borders. Digital trade agreements , such as the trans-pacific partnership and the European union digital trade strategy, are helping to establish common rules for the digital exchange of services, including data protection, privacy, andcybersecurity standards. These agreements promote greater cooperation between countries and make it easier for business to negative the regulatory landscape of international digital trade. For instance, data flows are essential to the global economy, powering everything from cloud service to e-commerce platforms. Digital trade platforms allow business to transfer information and intellectual property across borders in real –time, without the traditional barriersofgeographicallocation andlocalregulations.Byensuringthatdatacan movefreely between countries, business can collaborate more efficiency and innovate faster, contributing to economic growth and competitiveness. Moreover, technological advancements in digital marketing, remote work, and online education have created new avenues for services based industries to participate in international trade. Companies offering software, consulting, digital content, and other services can now reach a global audience through digital platforms, reducing the barriers to market entry in industries that once required a physical presenc

AI,3D printing,andbeyond:

The role of technology in reducing trade barriers is far from complete. As new innovations emerge, they promise to further enhance the efficiency and accessibility of global trade. Artificial intelligence, for example, is already being used to optimize supply chains, predict consumer demand, and automate customer services, making it an invaluable tool for international trade. AI-powered algorithms can analyze vast amount of data improve decision making, helping business identify new opportunities and reduce risk associated with global expansion. In the near future, technology like 3D printing could revolutionize the way goods are produced and distributed. With 3D printing, businesses may be able to produce products on, demand, reducing the need for larger inventories and long supply chains. This could lead to more localized production, where products are made closer to the point of consumption, reducing the environmental impact of transportation and improving sustainability. Technology is undoubtedly transforming international trade,breaking down barriers that once seemed insurmountable. E-commerce Platforms, block chain technology, automation in logistics, and digital trade agreements are enabling business to engage in cross- border trade with greater ease and efficiency. As new technologies like AI and 3D printing continue to evolve, the global trade landscape will become even more interconnected, creating new opportunities for business to expand, innovate, and thrive in the global marketplace.

Technologies today incorporate standards that vary in character, subject, and medium. Atthe same time, they serve the multiple purposes of innovation, efficiency, safety, quality, reliability, and interoperability among the various complementary products and services. A standard can be defined broadly as any set of technical specifications that either provide or is intended to provide a common design for a product or process. Unlike in earlier times , when government or inter government bodies might set standards, now many different types of entities , including private standards setting organizations develop them , in part to respond to time –to – market resource. The development of standards by different type of standards setting organization , whether government , quasi- government, or private complicate the situation with respect to appropriate regulation .As a further complicating feature, it is important to recognized that standards setting organizations operate in a more global context for the technology that is the standards settings process. With this point comes the corollary that compliancewithrelevantregulations requires a globalview: an awareness ofrelevantlaw in principal markets of innovation, manufacture, and trade.

Internalforcesaffectingadoptionofinformation technologyintradefacilitation: Customs modernization:

A modernized customs regime is characterized as using IT for the administration of its procedures as well as being interactive with other border agencies and transpiration its operations . However, behind these characteristics is a more modern customs law that sheds archaic requirements of the such as 100 per cent inspection, voluminous documentation and extendedstorage. Theotherrelatedcharacteristicsistheprocessofcustomsvaluation. Changesin customs law invariably incorporatehow goodsareto bevalued and howcustoms takes them into account.

Table No.1:CustomslawsinsomeAsian countries:

Country	Titleoflaw	Yearpassed/latest amendment	Revising
Bangladesh	Customsact	1969	
BruneiDarussalam	Customsact	1984	Yes
India	Customsact	1962	Yes
Malaysia	Customs act/customdutyact	1967/1978	Yes
Singapore	Customsact	1960/2003	No
SriLanka	Customsact number 10	1983	
Thailand	Customsact	1926/2000	Yes

sorces: United Nations Conference On Trade and Development,2007

Electronic commerce:

When commercial transactions are carried out electronically, it is important that they are legally recognized as being similar to manual transactions. Thus, there must be legislationthat has the effect of legal recognition of electronic records , the same legal effect as writing or as an original record, and the legal effects of electronic signature. The application of IT to trade transactions –for commercial purchases and sales of goods and services and for transaction with governmentagencies in the course of goods declaration , the acquisition of licence and permits , the payments of duties and taxes , the clearance of cargoes and their release from records of storage –involves actual effects that mimic writing, creating records and files , and signatures affixed to the transactions .There are many concerns regarding the promulgation of an e-commerce law .Once of the most important of these is the use of an electronic signature to signify agreement to terms and conditions of transactions, submission of forms and application, concurrence with liabilities and debt instruments etc.. Even more importantly , an electronic transaction must be able to authenticate an electronic signature as attributable to the owner as well as ensure the integrity of contracts. The use of electronic or digital signature to recognize submission, the protection of the privacy of data and personal information, and other security concerns all are integral part of e-commerce . The authenticationof signaturesmay require the useofpublickeyinfrastructureand othersmeans to legitimize the transactions .As fraudulent and deceptive electronic practices increase, e- commerce laws may have to be made more comprehensive, which will also affect the integrity of IT inTF. On the other hand a, custom law that uses electronic means for transactions without a concomitant legal basis may not be effective and will therefore make traders hesitant such a system.

E-commercelegislationinASEAN:

Country	2004	2007
BruneiDarussalam	Enacted	Enacted
Malaysia	None	Enacted
Singapore	Enacted	Enacted
ThaiLand	Enacted	Enacted
Viet Nam	None	Enacted

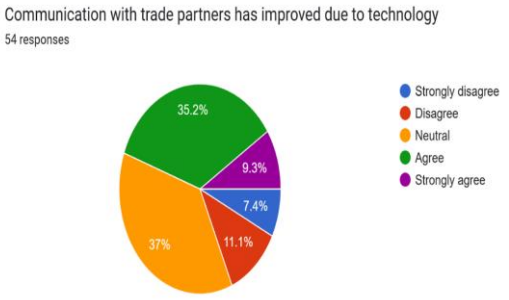
Sources:UnitedNationsConferenceonTrade andDevelopment,2007

Thedeveloping countries ofAsiahavealsoadoptedtheuseofIT invaryingdegrees but allin the name of facilitating trade. Crucial among these are the measures on the table of the WTO NGTF. Once these are accepted as binding obligations on the part of WTO members, they may havelimited choices in terms of carrying them out.However itis also truethatthereare inherently important merits to the use of IT, especially on part of border authorities. As countries modernize their customs organizations they cannot avoid the need for computerization and automation of transactions with international commercial stakeholders. Ontheotherhand, aspointedoutin the previoussection, there mustbeassociated legislation so that electronic transactions in the general ,and with government authorities in particularly, provide the necessary legal recognition.

Table No.1: Communication with International Trade Partners has improved due to technology

Indicators	Male	Female	Transgender	Total
Agree	5 (9.25)	14 (25.92)	0 (0.00)	19 (35.18)
Disagree	0 (0.00)	6 (11.11)	0 (0.00)	6 (11.11)
Neutral	5 (9.25)	15 (27.77)	0 (0.00)	20 (37.03)
Strongly agree	0 (0.00)	5 (9.25)	0 (0.00)	5 (9.25)
Strongly disagree	2 (3.70)	1 (1.85)	1 (1.85)	4 (7.40)
Total	12 (22.22)	41 (75.92)	1 (1.85)	54 (100)

Source: Primary Data

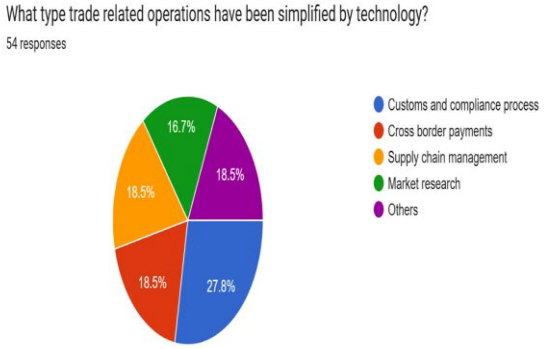


The table presents opinions on whether technology has improved communication with trade partners. A significant 35.18 percentage agree, While 37.03 percentage remains neutral. Only 11.11percentage disagree, and 9.25 percentage strongly agree. A small 4.70 percentage strongly disagree. Female respondent 75.92 percentage dominate the responses, with males at 22.22 percentage and transgender individuals at 1.85 percentage. The results suggests that while many acknowledge the benefits of technology in trade communication, a considerable portion remains neutral

Table No. 2 : Trade related Operations have been simplified by Technology

Indicators	Male	Female	Transgender	Total
Customs and compliance process	2 (3.70)	13 (24.07)	0 (0.00)	15 (27.77)
Supply chain management	2 (3.70)	8 (14.81)	0 (0.00)	10 (18.51)
Cross boarder payment	2 (3.70)	7 (12.96)	1 (1.85)	10 (18.51)
Market research	3 (5.55)	6 (11.11)	0 (0.00)	9 (16.66)
Others	3 (5.55)	7 (12.96)	0 (0.00)	10 (18.51)
Total	12 (22.22)	41 (75.92)	0 (0.00)	54 (100)

Source: Primay Data



The table highlights trade-related operations simplified by technology. The highest percentage 27.77 percentage is for customs and compliance processes, with more females respondents 24. 07 percentage acknowledging this than male s3.70 percentage. Supply chain management, cross boarder payments, and other operations each account for 18. 51 percentage market research follows at 16.66 percentage. Overall, females 75.92 percentages dominates the responses, while males contribute 22.22 percentage, and transgender representation is minima 1.85 percentage**.** This suggests that technology has significantlyimpacted various trade processes with customs and compliance benefiting the most.

Case laws:

EUvs.USonhormone–treatedBeef:

The European Union has banned the important of hormone –treated beef,citing health concerns ,while the united states maintains that the hormone levels used in beef production are safe. This difference in regulatory standards has led to a prolonged trade dispute between the two economies.

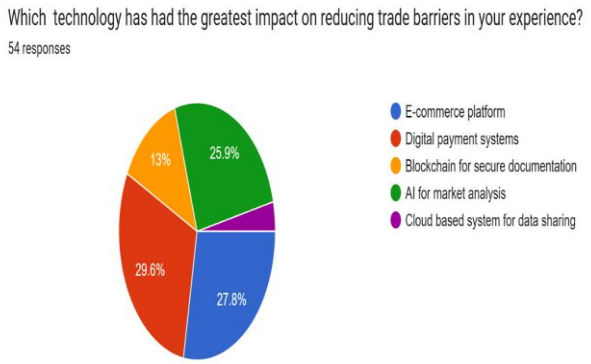
Chinaregulations on E-Waste:

Chinastrictregulationsonelectronicswasteimportshave impacted globalrecyclingindustries . Countries exporting e-waste to china must comply with stringent environmental standards, which hassignificantly altered trade flows and business models in the recycling sector.

Table No.3: Technology has had the greatest impact on Reducing Trade Barriers

Indicators	Male	Female	Transgender	Total
E-Commerce Platform	2 (3.70)	13 (24.07)	0 (0.00)	15 (27.77)
Digital Payment System	4 (7.40)	12 (22.22)	0 (0.00)	16 (29.62)
Al for market analysis	5 (9.25)	9 (16.66)	0 (0.00)	14 (25.92)
Cloud based system for data sharing	1 (1.85)	1 (1.85)	0 (0.00)	2 (3.70)
Black chain for secure documentation	0 (0.00)	6 (11.11)	1 (1.85)	7 (12.96)
Total	12 (22.22)	41 (75.92)	1 (1.85)	54 (100)

Source: Primary Data



The table presents the impacts of various technologies in reducing trade barriers. The most influential is the digital payments system 29.62 percentage, followed by e-commerce platforms 27.77 percentage and AI for market analysis 25. 92 percentage. Black chain for secure documentation 12.96 percentage and cloud –based systems for data sharing 3.70 percentage have lower contribution. Females 75. 92 percentage havedominates the responses,with males at 22.22 percentage and transgender representation at 1. 85 percentage. This indicates that digital payments systems and e-commerce platforms are the most impactful in simplifying trade processes.

Testing of hypothesis:

The hypothesis test was conducted on that statement H1 shows that the study on the role technology in reducing trade barriers. The communication with trade partners has improve due to technology. At the beginning of the research, it was assumed that it was neutral that technology has enhanced the way trade partners interact and collaborate. After conducting the survey, the results shown as on table 1 that communication with the trade partners has improved due to technology was neutral. The respondents 37 percentage out of 100 percentage was responded as neutral.

A hypothesis test was conducted on that statement H2 shown that the customs and compliance process of trade related operation have been simplified by technology. At the beginning of the research, it was assumed that technology has streamlined the customs and compliance process in trade operations. After conducting the survey, the results shown as on table 2 that customs and compliance process of trade related operations have been simplified by the technology. The customs and compliance was responded 27.81 percentage out of 100 percentage respondents. Therefore the hypothesis was accepted.

X. CONCLUSION

The role technology in reducing trade barriers is significant and transformative. Advances in digital infrastructure, e-commerce, automation, and block chain technology trade facilitated smoother international trade by reducing costs, improving efficiency, and enhancing transparency. Digital payments systems, artificial intelligence, and cloud computing have further streamlined cross-border transactions and regulatory compliance. However, challenges such as cybersecurity risks, digital divides, and regulatory inconsistencies remain. To maximize the benefits, policymakers and business must work together to foster inclusive technological adoption, invest in digital literacy, and create harmonized regulations. Overall, technology continues to be a key driver in minimizing trade barriers, promoting global economic integration, and expanding market opportunities,

XI. SUGGESTION

1. Expand high-speed internet and digital connectivity to ensure broader access to global markets.
2. Enhance transparency, security, and efficiency in trade documentation and supply chain management.
3. Support small and medium sized enterprises (SMEs) in reaching international markets through digital trade.
4. Improved trade efficiency with real-time tracking, automated warehouse, and AI-driven supply chain management.
5. Protect business and consumers rom cyber threats in digital transactions.
6. Enable faster, safer, and more cost-effective financial transactions across borders.

REFERENCES

[1] 1.Freud, C.,& weinhoif, D.(2004). The effect of the internet on international trade. Journal of international Economics , 62(1), 171-189.
[2] Clarke, G. R., &. 92006). Has the internet increased trade? Developed and developing country evidence. Economic inquiry, 44(3), 465-484.
[3] Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen , L. (2019). Block chain technology and its relationship to sustainable supply chain management. International journal of production Research, 57(7), 2117-2135.
[4] Waller, M. A., & Fawcett, S. E. (2013). Data science, predictive analytics, and big data. A revolution that will transform supply chain design and management. Journal of business logistic, 34(2), 77-84.
[5] Li, Y., Dai, J., & Cui, L. (20200. The impact of artificial intelligence on supply chain management: The role of predictive analytics. International journal of production economics 228, 107763.
[6] Berger, A. N., & Udell, G. F. 92006). A more complete conceptual framework for SME finance. Journal of banking & Finance, 30(11),2945-2966.
[7] Manyika , J ., Chui, M., Bisson, p., Woetzel, J., Dodds, R., Bughin, j., & Aharon, D. (2016). The internet of things: Mpping the value beyond the hype. McKinsey Global Institute Report.
[8] 8.Rodrik, D. (2018) Straight talk on trade: Ideas for a sane world economy. Princeton university press.
[9] http://www.linkedin.com/pulse/role-technology-reducing-trade-barriers-aftrade-oygze
[10] 10.http://www.linkedin.com/pulse/understaning-technical-barriers-trade-tbt-impact-global-gaurav-mehta-kdp2c
[11] http://ustr.gov/trade-agreements/wto-multilateral-affairs/two-issues/technical-barriers-trade