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Technology Sanctions and India Russia Strategic Resilience in the Digital Age

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Abstract

The slow but steady rise in use of technology sanctions in the contemporary political scenario is changing strategic policies across the world and making possible the rise of digital politics. The subject matter of research in this case is the influence of the global technology sanctions on the strategic cooperation between India and Russia in the era of digitalization, specifically cyber security, artificial intelligence, semiconductors and digital infrastructure. This paper analyzes the nature of the strategic and technological resilience of India and Russia amidst increased west-led technology sanctions. Using a qualitative and analytic method of secondary source analysis, the paper discusses the geopolitics and economics of the consequences of the disruptive effect of technology sanctions on their cooperation and digital politics in general. It concludes that India-Russia cooperation is becoming deeper as a result of alternative technological cooperation, new financial instruments of transactions and innovations to reduce dependence on western technological systems.

Keywords: Digital, Geopolitics, Cybersecurity, Semiconductors, Sovereignty.

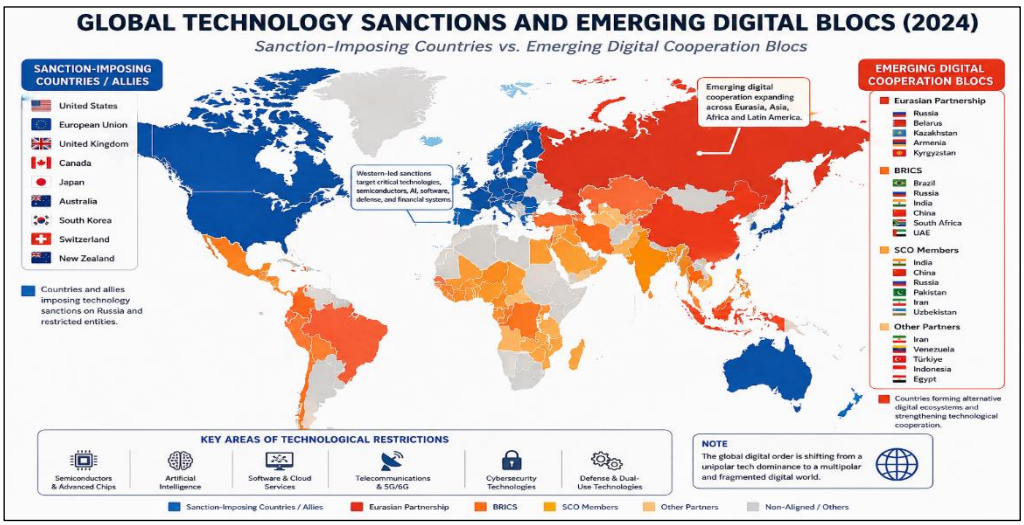
Introduction

Geopolitics has become increasingly shaped by technology in the modern international system, and the ability to control advanced technologies is one of the new sources of strategic power. Today, in the digital era, technological capabilities – including artificial intelligence (AI), semiconductors, cyber security, quantum computing, and digital infrastructure – are no longer limited to economic development, and are now invaluable to national security and global political influence. As a result, technology sanctions are now becoming an increasingly significant tool in geopolitical competition, especially between the great, powerful nations, who want to maintain technological supremacy and strategic advantages (Truby et.al., 2026).

The Russia–Ukraine war in 2022 was a watershed moment in the world of digital geopolitics, as countries started to impose sanctions that affected user access. Countries began to impose sanctions that impacted users' access to content after the Russia–Ukraine War in 2022 was a turning point in digital geopolitics. The Western world, especially the United States and the European Union, restricted Russia's access to the most important technologies, software systems, components of semiconductor systems, financial networks, and digital infrastructure. These measures did not just impact Russia's economic power, but they also sought to undermine its technological and strategic capacity to withstand the impact of the sanctions (European Commission, 2026). The rising weaponization of technology is exacerbating the discussion about digital sovereignty, technological independence and reconfiguring global technological supply chains.

Meanwhile, the west's dominance in key technologies and digital platforms has led to concerns about outsourcing technologies and technological ecosystems from other powers. In this new geopolitical landscape, India and Russia have branched out into other areas of technological collaboration and invested in indigenous innovation, alongside continued efforts in traditional areas of defence and energy (Mayer & Lu, 2025).

As more and more technology becomes a tool of geopolitical power, there have been serious challenges to the states that are reliant on the global technological networks. Russia has suffered hugely from Western technology restrictions, which have disrupted industrial production, financial systems and digital infrastructure. The developments have important consequences for India, which has strategic relations both with Western countries and Russia (Jones, 2025). The Image 1.0 shows the widening cleavage between states that uphold the West's sanctions and new digital cooperation networks like BRICS. It emphasizes the role of technology sanctions in fostering digital sovereignty, innovation, and alternative technological collaborations, to develop a multipolar digital order.



Global Technology Sanctions and Emerging Digital Blocs (2024)

Image 1.0 Generated by ChatGPT

Research Problem

The increasing use of technology sanctions as tools of geopolitics has created many challenges for nations using technology networks. Investments in technology from the West have drastically reduced in Russia, leading to problems with manufacturing, finance, and digital infrastructure. These issues have major impacts on India, considering that the nation has strategic alliances with the West and Russia.

The primary research question that this paper attempts to answer is related to how India and Russia cope with technology sanctions and build their resilience in terms of technology. The paper will also explore whether the new technological cooperation between India and Russia is capable of helping both countries construct a new digital and geopolitical order in a multipolar world order.

Research Objectives

1. To examine the impact of global technology sanctions on strategic cooperation between India and Russia in the digital age.

2. To analyse how India and Russia are developing technological resilience and strategic autonomy in response to international sanctions regimes.

3. To evaluate the role of emerging technologies such as artificial intelligence, cybersecurity, digital infrastructure, and semiconductors in strengthening Indo–Russian relations.

4. To assess the geopolitical and economic implications of technology sanctions on the future of India–Russia strategic partnerships and global digital governance.

Significance of the Study

This research bears relevance to academia and policy makers. In terms of academic contributions, this study will help to add further to the growing literature on the intersection between international relations and technological change, which has emerged in the form of digital geopolitics and technology sanctions, and strategic autonomy. From a policy perspective, the paper focuses on how technological resilience and digital sovereignty, alongside new alliances through alternative technologies, become important for an increasingly fragmented international system. Finally, the paper contributes to the literature on strategic studies and changing forms of power politics and geopolitics in the twenty-first century as a consequence of emerging technologies.

Review Literature

Weaponized interdependence is one term described by Farrell and Newman as the ability of states who have control over the centres of global networks to spy, bully, and block access. This theory by Farrell and Newman is highly significant in terms of the understanding of technology sanctions since it helps us to understand how financial networks, supply chains, and the Internet can become tools of geopolitical coercion. The article will help us in understanding the consequences of the Western dominance of semiconductor supply chains and computer software and financial networks from 2022 onwards (Farrell & Newman, 2019).

In addition, Drezner expands the discussion of weaponized interdependence to consider how powerful countries leverage global economic entanglements for strategic benefit. He believes sanctions and network-based restrictions are not only economic weapons, but also political ones that change the relations between the countries. This is helpful when considering technology sanctions as a type of digital era statecraft (Drezner, 2020).

CSIS report notes that following the invasion of Ukraine by Russia, the United States enforced the strictest export restrictions ever applied to Russia, including new bans on semiconductors, microelectronics, telecommunications, sensors, navigation systems and aircraft components. This literature reveals technology sanctions as having a direct effect on aspects of national security and industrial capability (Jones, 2025).

A U.S. Senate report on technology export controls says Russia has been continuing to import restricted semiconductors and microelectronics via third parties and indirect supply chains. This shows pressure and adaptation that technology sanctions have brought to the sanctioned states, pressuring them to find other means of procurement (The U.S. Senate Report).

The study on India – Russia relations states that despite the changing global order, the relationship has been strong. The research highlights the importance of strategic trust, defence collaboration, and India's primal concern to keep the balance between Russia and other major powers. It is helpful to comprehend India's strategic autonomy in the context of sanctions politics (Kapoor, 2019).

IDSA's India–Russia strategic partnership research focuses on defence, nuclear energy, hydrocarbons and trade. It believes that energy and defence are key pillars of bilateral relations and economic diversification provides new opportunities for partnership. This underlines the shift from traditional security cooperation to increased technological and economic engagement with Russia (IDSA, 2009).

The article explores the concepts of digital sovereignty and strategic autonomy particularly on the European level. Their efforts demonstrate that digital sovereignty is becoming more associated with control of infrastructure, data, platforms, and technological standards. This concept applies to India and Russia, as both are aiming to gain independence from Western digital systems. This concept becomes relevant in India and Russia where both parties are looking to become independent from the Western-based digital systems (Broeders et al., 2023).

Digital sovereignty is a worldwide policy debate, as it merges local industrial policies, foreign policies, infrastructure policies and multilateral institutional policies, explains Musoni. The study suggests that the big powers push different types of digital governance. This helps to put India–Russia cooperation within the global digital governance contest (Musoni, 2023).

CSIS studies export controls on AI and semiconductors and finds that the U.S. is targeting to keep control of "technology chokepoints" in the world semiconductor supply chain. The importance of this literature lies in the fact that AI chips, semiconductor manufacturing equipment, and advanced computing systems are currently at the heart of the geopolitical competition of the present day (CSIS, 2025).

Research Gap

The current body of scholarship dedicated to technology sanctions is oriented primarily towards economic pressure, export restrictions, and geopolitical rivalry between the main actors, especially the U.S., China and Russia. Likewise, research on Indo–Russia relations almost exclusively focus on defence cooperation, energy diplomacy, and traditional strategic partnership. While over the last few years there has been some scholarship on notions of digital sovereignty, techno-nationalism, and strategic autonomy, little focus has been placed on the relationship between technology sanctions, digital resilience and Indo-Russian strategic adaptation in today's digital era. Further, the study of the impact of new technologies, including artificial intelligence, cyber security, semiconductors and digital infrastructure, on bilateral relations between India and Russia in the context of technological constraints and geopolitical fragmentation is limited. Hence, this study endeavours to fill this gap by examining how the use of technology sanctions affects India–Russia strategic partnership and their efforts towards technological resilience and digital sovereignty in the evolving multipolar order.

Theoretical Framework

The study is based mainly on Realism Theory and Complex Interdependence Theory to examine the relationship between technology sanctions, the competition of powers and strategic cooperation between Indo and Russia in digital age. These two theories together give a complete picture of the international relations of the modern times and its strategic adaptation as well as global interdependence and technological power.

The theory of Realism focuses on the use of security, strategic rivalry between states, national interests and power politics in an anarchic international system. Today, cutting edge technologies—including artificial intelligence, semiconductors, cybersecurity, digital infrastructure, and financial technologies—are emerging as key national power and geopolitical tools. Advanced technologies like artificial intelligence, semiconductors, cybersecurity, digital infrastructure and financial technologies are now becoming key instruments of national power and geopolitical influence (Little, 2007). A U.S. and allied technological embargo on Russia after the Ukraine conflict illustrates how technological power is now being deployed as a strategic weapon to undermine a competing nation. Technological competition in geopolitical aspects is manifested in export restrictions on digital finance, telecommunications equipment, software systems, and semiconductors (W. J, 2010). It is a practice that has been termed "weaponized interdependence" by Farrell and Newman (2019), whereby dominant states use their dominance over global technological and financial networks to exercise coercive power. However, from a realist standpoint, India and Russia are reacting to such geopolitical pressures by increasing defence technology cooperation, cyber security, digital payments, energy security and emerging technology cooperation to maintain strategic autonomy and national security interests (Farrel & Newman, 2019).

Robert Keohane and Joseph's theory describes the complex interdependence states have with each other through global economic, technological and institutional networks. Highly integrated global supply chains for semiconductors, telecommunications equipment, cloud computing, software systems and digital finance are core to modern technological systems. These interlinked networks were broken by technology sanctions against Russia and vulnerabilities were revealed through relying on Western controlled technologies and infrastructures (Keohane & Nye, 1997). This theory is applicable to the study as it elucidates cooperation and vulnerability in technological order in the global context. Hence, India and Russia are trying to diversify the technological partnership, boost the internal innovation system, find alternative payment methods and promote cooperation through organisations like the BRICS and the Shanghai Cooperation Organisation (SCO). These efforts toward technological self-reliance and technological digital resilience are an attempt to decrease dependence on others and participate in global technological networks. As explained below in image 1.1, both Realism and Complex Interdependence Theory are the most appropriate theories in explaining the impacts of technology sanctions on the changing nature.

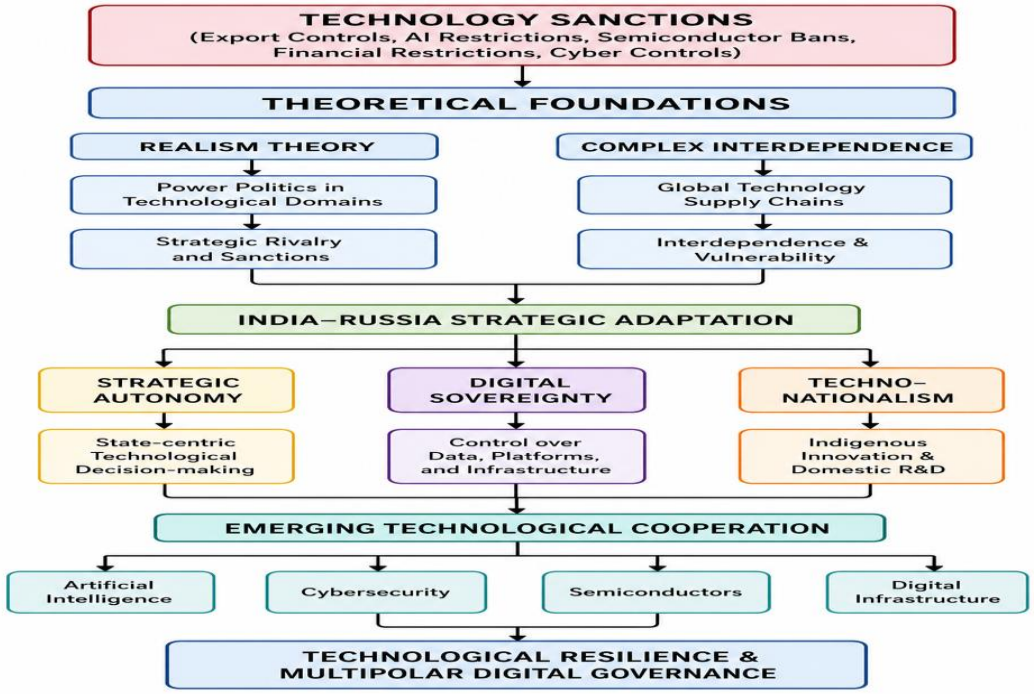


Image 1:1 Conceptual and theoretical framework of the Study

(Generated by ChatGPT)

Research Methodology

The present study is descriptive qualitative and conceptual research studies in nature, which is designed as an overview and conceptual research paper. It analyzes how technology sanctions affect India–Russia strategic cooperation in the digital era with special emphasis on geopolitical competition, technological resilience and strategic autonomy. The study aims at examining the impact of new technologies like Artificial Intelligence, cyber security, semiconductors and the digital infrastructure on bilateral trade and partnerships between India and Russia in a changing multipolar world. Given the nature of the research, which focuses on geopolitical changes, strategic adaptation and digital governance, a qualitative method has been deemed most appropriate to grasp the complex geopolitical dynamics.

This study uses secondary sources of data gathered from academic journals, Government publications, policy reports, think-tank analyses and strategic affairs databases. The institutions like SIPRI, IMF, World bank, CSIS, ORF, Carnegie endowment, and IDSA have extensively contributed to the study of technology sanctions, global supply chains, cyber security, digital sovereignty, emerging technologies, and many more. Furthermore, scholarly works, international policy documents and reports from the economic sector have been used to gain insight into the geopolitical and technological impacts of the sanctions regimes on Indo–Russian cooperation.

The study uses strategic analysis, comparative policy analysis, and thematic interpretation which involves a detailed analysis of the two countries, India and Russia, in terms of strategic adaptation and technological cooperation. The study primarily aims to examine the post-2014 and post-2022 sanctions environment, especially following the Russia–Ukraine conflict, specifically in the field of digital and technological sectors. But the study is based on secondary data and without primary data collection and filed investigation.

Global Technology Sanctions and the Changing International Order

The transformation of the international system currently underway is characterized by the emergence of the new role of technology in interstate relations. Previously, economic sanctions were related primarily to the prohibition of trade and financial contacts and diplomatic interactions. Modern sanctions include prohibitions in the sector of technologies that are crucial for both the development of economic activities and military actions. Technology has now become a serious tool in geopolitics.

The war between Russia and Ukraine has led to an even greater emphasis on technological restrictions as tools of influence on other states. In reaction to the war, a number of sanctions against Russia included restrictions on advanced chip exports, software services, cloud computing, artificial intelligence technologies, and access to certain financial communications (Thakur, 2025). This step sought to restrict Russia not only immediately but also to limit its further development.

Unlike traditional sanctions, sanctions against technological products have a direct impact on spheres of innovative and competitive development. Restrictions regarding advanced computer chips, software platforms, telecoms, supercomputers and similar devices may hinder the technological modernization of production, weakening the capabilities of a state to maintain its military power and remain competitive in the digital world. It means that technological restrictions have become one of the key factors of current geopolitical competition.

Sanctions against Russia provide an insight into how dependent countries become victims of a technology-based strategy. Countries that occupy prominent positions in global supply chains and software, cloud computing, and finance communications have substantial control over the processes. Dominant positions in the network provide substantial political and strategic power in international affairs (Segal, 2021).

According to the report of the International Monetary Fund (IMF) (2023), sanctions against Russia prevented the country from accessing advanced technological components and limited its participation in global chains. Problems in the sectors such as aerospace industry, telecommunications, defence industry, and digital infrastructures have been mentioned. They reflect the vulnerability of states to the consequences of their dependency on global technological networks.

Below Table 1 presents restrictions by Western Nation and its impact on Russia and response.

Table 1: Major Western Technology Restrictions on Russia

Restriction Area	Major Measures	Strategic Impact
Financial Systems	SWIFT Restrictions	Reduced global financial access
Semiconductors	Export Controls on Chips	Industrial and defence disruptions
Software Services	Cloud & Licensing Restrictions	Digital infrastructure challenges
Telecommunications	Restrictions on Advanced Equipment	Connectivity and cyber vulnerabilities
Artificial Intelligence	Computing & AI Technology Controls	Slower technological advancement

The increase in the number of cases involving technology sanctions can be considered indicative of the fact that the technological network is increasingly turning into another arena of strategic competition for countries. Having a dominant position in the areas of semiconductor manufacture, provision of cloud computing services, operating systems, digital payments, and telecommunication infrastructures, countries receive geopolitical influence. With the increasing embedding of technology into economic and military structures, the technological dominance of states will soon turn into an essential component of their global power.

As the application of technology sanctions is becoming more frequent, the phenomenon of the technological landscape of the planet getting fragmented emerges as another major implication of such actions. Escalating geopolitical tensions contribute to the formation of rival technological landscapes which are often viewed as manifestations of "digital cold war" between certain countries. Countries led by the USA, for example, keep leading positions in areas of semiconductor innovation, advanced computing, artificial intelligence, and cloud infrastructure (Polyakova & Meserole, 2019). China and Russia, on the other hand, promote alternative technological systems that feature digital sovereignty and focus on domestic innovations and reduction of reliance on Western technologies.

The formation of rival technological ecosystems has important consequences for globalization. In contrast to the previous tendency towards creation of the single technological network of the planet, now the world is

witnessing the rise of several overlapping ecosystems that have different standards and priorities. Such changes will likely affect international cooperation and competition in various areas.

India can be said to occupy a unique place in the current situation due to its ability to maintain good relations with both western and eastern countries. The focus on strategic autonomy, production of semiconductors domestically, construction of digital infrastructure, and cyber security are clear indications of the efforts made to reduce the dependence on the technological ecosystem of one or the other group of countries (Rajagopalan, 2023).

Consequently, it is possible to say that the change in the global political landscape manifests itself through the transition from economic globalization to technologically-driven geopolitical competition. The ability to impose sanctions on technologies and develop innovative digital infrastructure becomes the factor contributing to state power and competitiveness.

India–Russia Strategic Cooperation under Technology Sanctions

The segmentation of technological systems has resulted in the creation of competing digital blocs that are referred to as the "Digital Cold War." The US and their allies have remained the dominant powers within advanced technological ecosystems, owing to their supremacy in innovations within semiconductor technology, artificial intelligence, cloud computing, and digital financial services. In contrast, China and Russia have been promoting competing technology ecosystems based on digital sovereignty, local innovations, and trading through the use of local currencies and separate digital infrastructures (Polyakova & Meserole, 2019).

India plays an important role within the shifting technological system. India maintains strong strategic ties with the western world while engaging technologically and economically with Russia at the same time. The country's strategic autonomy, semiconductor production initiatives, cybersecurity improvements, and development of digital infrastructure suggest that India does not want to depend upon one particular technological bloc (Schottli, 2026). Therefore, shifting sanctions have led to a shift among emerging economies towards creating diversified partnership networks.

Image 1.3 Major Areas of India-Russia Strategic Cooperation

(Generated by ChatGPT)

From Image 1.3 above, it can be seen that Defence Technology (35%) and Energy Cooperation (25%) are the most prominent pillars in the India-Russia strategic relationship, comprising 60% of the total cooperation in place between the two states. The security and energy interests thus still continue to play an important role in furthering the relationship. However, new areas like cybersecurity (15%), digital payments (10%), telecommunications (7%) and Space/Nuclear Cooperation (8%) show a trend towards diversification of the partnership into more advanced technologies and digital cooperation.

Energy cooperation has increasingly been related to financial and technological adaptation to the changing circumstances. Due to sanctions imposed on Russia and its inability to use the SWIFT system, India and Russia have strengthened their Rupee-Ruble trade relationships and payment systems (Reserve Bank of India, 2023). By adopting local currency settlements, India and Russia have lessened their reliance on US-dominated dollar payments and increased their resilience to potential future sanctions. Both countries also sought cooperation in other aspects of digital finance including alternative payment systems. Digital financial cooperation and digital payments reflect larger efforts on behalf of the rising economies to create alternative digital financial infrastructures beyond Western-dominated ones (Remy, et.al., 2025).

In addition to cybersecurity, cooperation in terms of cyber-infrastructure has increasingly gained prominence. Increasingly important are cyber sanctions, digital espionage and other forms of information warfare in contemporary geopolitics, highlighting the need for cyber resilience (Segal, 2021). India-Russia cooperation on information security, cyber-governance, digital sovereignty, telecommunications has been enhanced. Russia has much experience in cyber-defence and India's rapidly developing digital environment provide the grounds for collaboration between the two states in such spheres as cyber-resilience, artificial intelligence and digital governance. Cooperation within the BRICS countries and SCO has provided a platform for further dialogue in terms of cybersecurity and alternative internet governance models (Parepa, 2026).

While increasing, the cooperation between the two states has faced several obstacles. The first one is the dependence on Western technology and semiconductor supply chains. Manufacturing of advanced semiconductors, cloud technology and industrial technology remains highly concentrated in Western countries and its allies (Thadani & Allen, 2023). Thus, the sanction-based disruptions have resulted in limited accessibility to technological inputs required by Russia which have hindered further cooperation. Disruptions in the global semiconductor and telecoms supply chain revealed a number of problems in international technology supply networks (OECD, 2023).

One of the other barriers to India-Russia technological cooperation is secondary sanctions imposed on organizations working together with Russia from Western nations. India, with its objective of maintaining a balance, aimed to continue the collaboration without going into direct conflict with the sanctions policy. Thus, the scope for cooperation was limited (Kumar, 2026). Issues like payment barriers, logistics hurdles, and technology transfer constraints were among those that made such cooperation difficult. There have been a number of advancements in terms of indigenous innovation, cyber security cooperation, and technology resiliency in both countries due to their geopolitical position. The following table demonstrates some of the barriers to India-Russia technological cooperation.

Table 2: Key Challenges in India–Russia Technological Cooperation

Challenge Area	Major Issues	Strategic Implications
Semiconductor Dependency	Reliance on Western chip ecosystems	Industrial vulnerability
Financial Restrictions	SWIFT and banking sanctions	Payment disruptions
Secondary Sanctions	Pressure from Western countries	Strategic balancing challenges
Supply Chain Disruptions	Technology and logistics barriers	Delays in cooperation
Software Restrictions	Limited access to advanced systems	Reduced technological efficiency

Overall, technology sanctions have transformed Indo–Russian strategic relations from conventional defence cooperation toward broader technological and digital partnerships. The growing focus on cybersecurity, digital

finance, indigenous innovation, and technological self-reliance indicates that India and Russia are attempting to adapt to an increasingly fragmented and competitive global technological order. Their cooperation reflects broader efforts by emerging powers to build alternative strategic and technological frameworks in response to geopolitical fragmentation and technological coercion.

Technological Resilience and Strategic Autonomy

As the world grows increasingly fragmented, with states imposing sanctions, restrictions, and supply chain disruptions becoming commonplace, the concepts of technological resilience and strategic autonomy have taken on added significance. For countries like India and Russia, where dependence on foreign technologies poses particular challenges, this trend has only served to underscore the importance of developing the necessary skills and capacities.

Technological resilience can be defined as the ability of a state to sustain its technological development, industrial output, and digital communications irrespective of any external disruptions. Strategic autonomy, for its part, involves the ability of a country to pursue its interests without having to depend on other states excessively. In the contemporary geopolitical environment, these two concepts are inseparable from national security, economic development, and international competitiveness. Some of the most prominent examples of India's approach to technological resilience include Digital India, Make in India, the India Semiconductor Mission, and the various national strategies concerning artificial intelligence and cybersecurity. The goal of these programs is to improve India's technological development, enhance its industrial output, increase its domestic digital infrastructure, and minimize its reliance on foreign technologies (Government of India, 2022). Significant investments into the creation of digital public infrastructure, fintech solutions, and e-government have strengthened India's standing within the digital economy even further.

In particular, India has paid much attention to semiconductors in recent years. Indeed, the India Semiconductor Mission was launched with the purpose of creating a viable domestic industry capable of producing semiconductor chips (PIB, 2025). Given the importance of semiconductors to defence industries, telecommunications, artificial intelligence, and industry in general, building domestic capacities has become a matter of national importance. Cybersecurity and responsible AI governance have also become increasingly significant for India. Indeed, given the country's rapid growth in digital technologies, it has become apparent that these issues will need to be addressed. As with other areas of technological policy, there have been attempts at achieving a certain balance between innovation and regulatory oversight (NITI Aayog, 2021).

Russia, on the other hand, has been pursuing its own technological resilience agenda in recent years. In response to sanctions and restrictions imposed on Russian businesses and research institutions, Moscow has tried to foster innovation and limit dependency on foreign technology. As Connolly (2018) notes, since 2014, and particularly after 2022, Russia has focused on import substitution, creation of domestic operating systems and software, creation of sovereign digital infrastructure, and the establishment of domestic ecosystems of technologies.

Efforts towards the creation of a sovereign Internet and cybersecurity infrastructure have continued. While many of these programs remain in the planning stages, Russia has certainly taken several steps towards minimizing its vulnerability in terms of digital technologies. As for bilateral cooperation, India and Russia have considered several options for strengthening technological resilience. First, it is worth noting the importance of diversifying supply chains, especially in the sectors of semiconductors, telecommunications, defence technologies, and energy infrastructure. At the same time, India and Russia have attempted to develop alternative approaches to financial cooperation that would allow both sides to withstand sanctions-based disruption Expansion of the local currency trade system, discussion about alternative payments systems, and efforts to improve the digital financial infrastructure are good examples of this (BRICS Economic Report, 2023). Finally, international organizations like BRICS and the Shanghai Cooperation Organisation have provided platforms for discussing digital governance, cyber collaboration, innovation, and digital sovereignty.

Emerging Technologies and the Future of Indo–Russian Relations

Future cooperation in emerging technologies probably be an important factor influencing the evolution of India–Russia relations. With technology innovation gaining strategic importance as a driving force behind economic

development, military capacity, and geopolitical power projection, collaborative efforts in developing high-tech industries will likely be a growing aspect of bilateral ties.

Among the most important innovations shaping the twenty-first century is artificial intelligence. Increasingly, governments throughout the world have come to see artificial intelligence as a revolutionary tool with applications ranging from military to governance to healthcare to cybersecurity to manufacturing to economic development. This has led to growing competition between states in the field. India and Russia have been identified by their governments as important AI areas of development. Specifically, while Russia has largely focused on military applications of AI, autonomous systems, and innovative defense technologies, India has emphasized innovation and economic modernization, as well as the application of AI to governance and building digital infrastructure (NITI Aayog, 2021). Such complementary areas of specialization present an opportunity for fruitful collaboration in the sphere of technological development.

At the same time, the two countries also face similar issues of regulating AI, ensuring its responsible development, and developing relevant ethical guidelines. This opens up possibilities for engaging in global dialogues on responsible development of artificial intelligence technology. An important area of future cooperation concerns cybersecurity. Modern cybersecurity has gained much strategic significance due to contemporary security threats extending far beyond conventional military threats to encompass issues of ransomware, digital espionage, cyberattacks, and even attacks on critical infrastructure. As the digitalized economy has become the backbone of modern national economies, cybersecurity has grown into one of the core areas of national security. The Indian experience of building a digital economy and Russian experience with cybersecurity and defending itself from cyber threats present opportunities for increased cooperation in this important area.

Finally, semiconductors represent another strategically vital area of technology. Modern semiconductor chips are crucial for many advanced technologies, including artificial intelligence systems, defense, telecommunications, cloud computing services, and automated manufacturing. However, production of advanced semiconductors is concentrated in only a few countries.

Export restrictions on semiconductor technologies have underlined their strategic vulnerability. India and Russia have faced similar difficulties, with Russia experiencing problems caused by export restrictions, while India has rapidly been developing its semiconductor production capabilities through targeted policy measures (PIB, 2026). This area of shared interest offers opportunities for cooperation in research, diversifying supply chains, and developing new capabilities.

The Image 1.2 demonstrates that the global semiconductor value chain is highly interconnected, with the bulk of design taking place in the US, manufacturing concentrated in Taiwan and South Korea, and assembly in East and Southeast Asia.

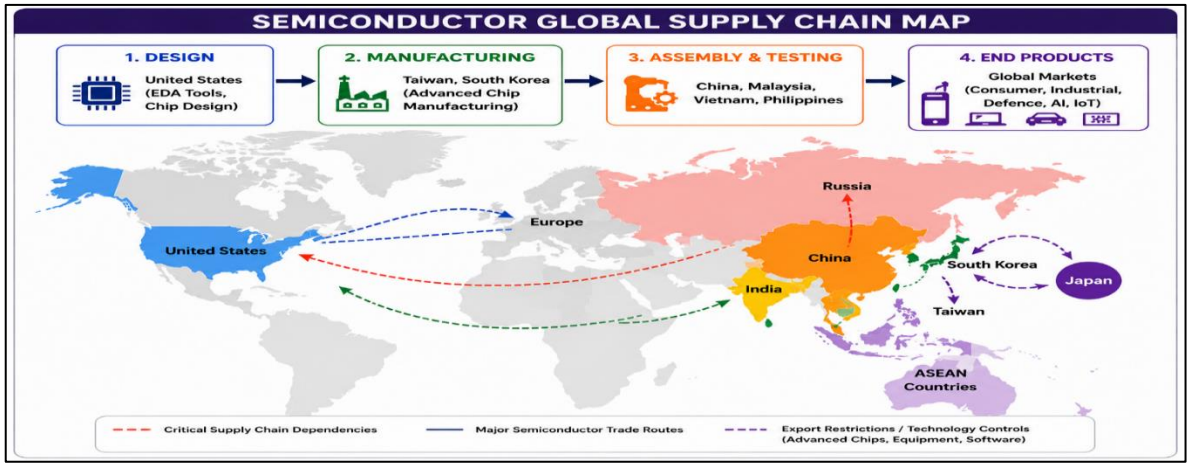


Image 1.2 Semiconductors Global Supply Chain Map

(Generated by ChatGPT)

Digital infrastructure and telecommunications technology are also growing in importance. Technologies like 5G and the future 6G systems, cloud computing, digital payments, and secure communications infrastructure are vital for modern economic development and national security (Nye, 2022). Data sovereignty, digital infrastructure independence, and technological independence have been emphasized by both India and Russia. Russia's investment in its sovereign internet infrastructure and India's expansion of its digital public infrastructure point towards an interest in building digital sovereignty and independence from key technologies (Government of India, 2022). Thus, it can be said that the future relationship between India and Russia will be not just about conventional strategic considerations, but about their ability to cooperate in the emerging technological areas as well. With rising technological competition around the world, advanced technologies will continue to influence patterns of cooperation and strategic alliance formation.

Geopolitical and Economic Implications

As technology sanctions become more prevalent, there will be several consequences for the fields of international politics and economic development. Since strategic competitions become increasingly dependent upon advanced technologies, technological control begins to play an important role in shaping the power structure of the international system.

One of the major consequences will be the development of alternative forms of digital governance promoted by different states and regional groups. There are already different visions of the digital sphere promoted by the US, China, and other actors. This tendency can be viewed as one of the aspects of the fragmentation of the global technological order and the gradual disappearance of the universal digital ecosystem.

In this situation, India faces new challenges but also some opportunities. For instance, India is maintaining its policy of strategic autonomy, which implies the need for balancing relations with a number of states. At the same time, India cooperates with Western countries in the areas of semiconductors, digital infrastructure, and advanced technologies while maintaining relations with Russia in the spheres of defence, energy, and new technologies (Allen et, al., 2023). Thus, it is clear that the balancing policy allows gaining some advantages in international politics.

Nevertheless, it is important to pay attention to other countries, which are also interested in developing technological independence. Many countries from the Global South rely on externally managed technologies and digital infrastructures, which have been exposed due to technology sanctions and supply chain disruptions. Therefore, many states became interested in developing innovations and collaborating with each other in different technological spheres (UNCTAD, 2023).

Moreover, regional organizations such as BRICS and the Shanghai Cooperation Organization have begun to promote cooperation in terms of cybersecurity, digital finance, technological innovation, and digital governance as means to develop alternative frameworks aimed at minimizing dependence on existing technological structures.

Expansion of regional currencies, payments systems, and de-dollarization processes can also be considered as means of building new frameworks (IMF, 2023). In this case, even though there may be many challenges, it is clear that this process reflects the growing interest in diversifying international economic relations.

It can be argued that technologies become one of the key factors defining geopolitical trends of the twenty-first century. Countries, which manage to strengthen their technological positions, control infrastructures and evolve together with new technologies, will have substantial geopolitical advantages.

Findings and Discussion

According to the results of this research, technology sanctions have gained a great significance as a tool of geopolitical rivalry and competition in recent years. While traditional sanctions were usually imposed through economic and financial measures, current sanctions are based upon restricting technological access to critical technologies, digital infrastructure, semiconductor chains, artificial intelligence, and telecommunications. Such trends are indicative of the rising significance of technology as the source of strategic influence and power.

Another key finding presented herein demonstrates that technology sanctions are contributing to the fragmentation of the global technological order. Instead of having to deal with one global technological system, nations tend to ally themselves with competing technology ecosystems determined by geopolitical considerations and interests.

It has been revealed that in recent years India and Russia have made strategic efforts to achieve greater technological independence and build their respective technological resilience. In particular, it has been demonstrated that India has sought to address issues of vulnerability and risks associated with its technological dependence on others by taking a number of measures concerning digital infrastructures, semiconductors, innovations, and cybersecurity issues. At the same time, the Russian response to current sanctions included focusing on such matters as import substitution, technological ecosystems and sovereign digital infrastructure.

Another interesting finding is that there has been a rise in importance of emerging technologies within Indo-Russian cooperation. For instance, in addition to the conventional sectors such as defence and energy, cybersecurity, digital payments, artificial intelligence, telecommunications and other domains have also emerged. Such findings suggest that the importance of technological cooperation might increase in future.

It appears that sanctions are a powerful driver of strategic adjustment, as they reveal a number of vulnerabilities in global supply chains and technological networks. Simultaneously, sanctions encourage nations to seek for alternative alliances, develop innovative capabilities domestically and explore new opportunities for cooperation. Thus, the imposed sanctions have acted both as a means of restriction and incentive in this case.

Lastly, the rising importance of digital sovereignty is evident. Nations are seeking ways to gain greater control over data governance, digital infrastructures, clouds, cybersecurity systems and technological standards.

Conclusion

The current research considers the implications of technological sanctions for strategic cooperation between India and Russia amid the rapidly evolving technological order. Thus, according to this research, modern technologies are becoming powerful instruments in geopolitics, while technology sanctions affect significantly the patterns of international cooperation, economic collaboration, and strategic decision-making.

The changes brought about by technology sanctions introduced in recent years have contributed significantly to the fragmentation of the global technological order and enhanced the importance of strategic and technological resilience. The measures introduced by countries such as the US include restrictions on semiconductors, software, digital infrastructure, and other technologies that form critical technological ecosystems.

Due to the identified trends and the new technological realities, India and Russia have developed their strategies aimed at achieving technological autonomy and resilience, developing innovative economies, and implementing digital transformations. Therefore, in the case of India, digital infrastructure development, semiconductor production, and innovative growth are priorities. The Russian counterpart includes import substitution, development of sovereign digital infrastructure, and alternative technological partnerships.

The findings suggest that modern technologies have acquired increasing importance for Indo-Russian relations as well. Cybersecurity, artificial intelligence, digital finance, telecommunications, and digital governance are increasingly supplementing classical areas of collaboration such as defence and energy. The development trend indicates that technologies and technological collaboration will be of great significance for Indo-Russian bilateral relations in the future.

As far as a more general context of international relations is concerned, there is an obvious tendency towards multipolar technological order and different governance approaches in the global technological landscape. The role of BRICS, the Shanghai Cooperation Organization, and similar institutions in the sphere of technology and digital collaboration is likely to grow further.

Despite numerous challenges (dependence on semiconductors, supply chain risks, secondary sanctions, etc.), the long-term development trends indicate a rising emphasis on technological resilience and strategic adaptation.

Author Contributions

Urvashi Singh contributed to the conceptualization of the study, review of relevant literature, collection and analysis of data, interpretation of findings, and drafting of the manuscript. Dr. Showkat Ahmad Dar, as the Corresponding Author and Research Supervisor, provided academic supervision, methodological guidance, critical assessment of the research framework, interpretation of results, and substantial revisions to the manuscript. Both authors contributed to the overall development of the study, reviewed and approved the final version of the manuscript, and accept responsibility for the accuracy, integrity, and scholarly quality of the research.

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