ISSN (Online): 2583-5203

JOURNAL OF ACADEMIC ADVANCEMENT

Bi-Annual Peer Reviewed Refereed Journal

VOL. 2
ISSUE NO. 02
DECEMBER, 2023

KOLKATA BIDHANNAGAR
SOCIETY FOR ACADEMIC ADVANCEMENT
WEST BENGAL, INDIA

JOURNAL OF ACADEMIC ADVANCEMENT

(Bi-Annual Peer Reviewed Refereed Journal)

ISSN (Online): 2583-5203 | Volume: 2| No. 02| December, 2023

EDITORIAL BOARD

JOURNAL OF ACADEMIC ADVANCEMENT
(Bi-Annual Peer Reviewed Refereed Journal)
ISSN (Online): 2583-5203 | Volume: 2| No. 02| December, 2023
https://doi.org/10.58574/jaa.2023.v2.i2.03

Research Article: 3

An Exploratory Study of the Market Opportunities of NavIC: Leveraging NavIC Technology in Commerce

Fatema Kazi
Former Post Graduate Student
Dept. of Commerce
University of Calcutta, India

Abstract

This study is a comprehensive exploration of the dynamic market opportunities arising from the strategic implementation of NavIC (Navigation with Indian Constellation) technology in the commerce sector. NavIC, India's indigenous satellite navigation system operated by ISRO (Indian Space Research Organization), is poised to revolutionize commerce operations by enhancing navigation precision, supply chain logistics, and customer experiences. By meticulously assessing NavIC's capabilities and pinpointing its potential applications, this research underscores the substantial economic benefits awaiting businesses and industries that embrace this technology.

Case studies on companies operating in India exemplify the transformative influence of NavIC on commerce, revealing cost reductions, expedited delivery timelines, and heightened operational efficiency. In navigating the path forward, the study candidly addresses challenges such as signal interference and cybersecurity, presenting actionable strategies for risk mitigation and regulatory compliance. As commerce in India and beyond continues to evolve, this study serves as an indispensable guide, offering strategic insights for businesses and policymakers keen on harnessing NavIC's full potential, thereby catalyzing economic growth, competitiveness, and self-sufficiency.

Keywords: *Navigation with Indian Constellation (NavIC) technology, Commerce, Economic Growth and Development, Market Opportunities.*

1. INTRODUCTION

India's commerce sector has begun to reap substantial rewards and revolutionary transformations owing to the introduction of NavIC technology: a resource that stands as a testament to precision, trustworthiness, and regional specificity. It dovetails perfectly with the country's strategic plans, giving it solid stature amongst key contributors in the commerce sector. NavIC utilities unlatch riches brought about by tactically placed satellites in both geostationary and geosynchronous orbits. They flawlessly fulfil accuracy and coverage needs across a plethora of commercial tasks, presenting a satisfactory substitution that matches the constantly evolving schematics of businesses within a technologically connected era. Consequently, NavIC technology has surfaced as shiny and attractive to the contemporary eye because its stature expands constantly to match favourable levels of readiness and compliance required in current business climates. This examination focuses its scope on unveiling how NavIC technology moulds the shape and escalates the ascension of the commerce sector. Additionally, it provides pictorial illustrations of the edge that this technology holds, while charting pathways that elucidate fruitful market opportunities advancing behind this technological marvel. Having been birthed and nurtured by team ISRO, NavIC brilliantly throws light upon the enveloping importance of India's foray into impressive accomplishments in satellite navigation. It strives to breathe fumes of innovation into usage and collateral uptake frame of market opportunities and the potential challenges tied up with its entering into the commercial kingdom. When it comes to sharpening efficiency, minimizing financial layoffs, and discarding seam upon a seam of best-ever customer services NavIC packs a wallop. The use of satellite navigation technology, most notably NavIC, has cast unquestionably long shadows across the plane of progress in our boundary-less, digitization-embrace, and data-fueled surroundings.

Capitalising on NavIC's robust set of utilities, India gears to holster its cattle to traverse prominent pathways in domestic commerce composition. With this manoeuvring, the country isn't far from grabbing hold of an esteemed leader board position across a compelling, global commerce platform, simultaneously allowing it to heartily own up to parsed freedoms of self-reliance and technological jurisdiction.

2. BACKGROUND

The rapid evolution of satellite navigation technology has fundamentally reshaped industries and sectors across the globe. Prior to NavIC, India, like many other countries, relied heavily on the US-operated GPS aka Global Positioning System. Among the constellations of satellite navigation systems, NavIC (Navigation with Indian Constellation) emerges as a distinctive player in this transformative landscape.

NavIC's Genesis and Development

The development of India's regional satellite navigation system, NavIC or Navigation with Indian Constellation commenced in the early 2000s with the first satellite, IRNSS-1A, launched in July 2013. In April 2018, NavIC became operational, operating on L5 and S frequency bands, offering continuous real-time coverage across India and up to 1500 km beyond its borders. The system comprises seven strategically positioned satellites in geostationary and geosynchronous orbits, representing a remarkable achievement in India's technological advancement.

NavIC's Unique Architecture

What sets NavIC apart is its unique constellation architecture. While most global navigation satellite systems (GNSS) employ satellites in the Medium Earth Orbit (MEO) or Low Earth Orbit (LEO), NavIC primarily uses Geosynchronous Orbit (GEO) and Geostationary Orbit (GSO) satellites. This strategic positioning ensures that the NavIC constellation provides continuous, real-time coverage over India and the surrounding region. The seven satellites work in harmony, with each satellite providing overlapping coverage, leading to high accuracy and reliability. Hence, for enhanced security, it is advisable to upgrade from a GPS module to a **NavIC** module,[2] as relying on systems like **GPS** might compromise India's strategic defence moves and there are chances of further exposing civilian data.

NavIC's Technical Prowess

The technical prowess of NavIC lies in its ability to provide precise positioning, navigation, and timing (PNT) information. The system operates on two frequency bands, L5 and S, which are reserved globally for satellite navigation. This dual-frequency capability enhances accuracy and mitigates the impact of signal distortions caused by the Earth's atmosphere. NavIC also employs a unique messaging system called "S-Band," which allows the delivery of messages to users, further expanding its utility.

3. LITERATURE REVIEW

Any useful research study is thought to be built on a review of the literature. That is also true of this investigation. Studies about the functionality, sensitivity, and compatibility of NavIC are widely available. On the market potential for NavIC, there aren't many written works, though. Snaps of some of them that are currently available are shown in this section.

Devadas Kuna and Naveen Kumar Perumalla (2023)[6] "This study examines smartphone positioning with dual-frequency GNSS chipsets compared to single-frequency ones and explores the impact of NavIC L5 signals. Single-frequency measurements offer 2.75 m MRSE precision, while dual-frequency improves it to about 1.11 m. With NavIC integration, precision further enhances to

around 1.05 m. NavIC L5 signals modestly enhance smartphone positioning precision.".

Raj Gusain; Anurag Vidyarthi; Rishi Prakash; A.K Shukla (2023)[5] "The aim of this research paper is to evaluate the performance of the Indian Regional Navigation Satellite System (NavIC) in the low latitude northern region of India. The results showed that the Circular Error of Probability (CEP) was within acceptable limits for most of the time, but occasional outliers were observed due to the low elevation of the satellites".

Sanketh B Prabhu; U R Ravithejaswi; Suraksha Shetty; Spoorthi S Hegde; S M Prasad (2022)[3] "The paper discusses using NavIC tracking units in ambulance allocation. These units provide continuous location data to a server. The system calculates the quickest response time using distance matrix API (Application Programming Interface) and sends an SMS (Short Message Service) to the user specifying the ambulance's position and estimated arrival time using the Haversine formula, aiding hospital selection.".

Devadas Kuna, N. Santhosh, Naveen Kumar Perumalla (2020)[4] "This investigation compares standalone IRNSS/NavIC and Galileo satellite configurations, focusing on parameters like Dilution of Precision (DOP), satellite visibility, and horizontal accuracy. Findings show that NavIC and Galileo consistently outperform other systems, enhancing position accuracy for civilian navigation applications when combined."

Based on the literature, NavIC offers superior domestic navigation but remains underutilized. Its potential for improvement is evident, especially after US Tech giant, Apple incorporated it in the iPhone 15 pro series. However, there's a lack of literature on NavIC's emerging market opportunities in the current business landscape, which this study aims to address.

4. OBJECTIVES OF THE STUDY

This study seeks to gain a comprehensive understanding of the market opportunities created by NavIC technology in the commerce sector and also aims to explore the potential applications of NavIC, identify key challenges and opportunities, and provide insights into the economic impact of NavIC integration.

5. RESEARCH METHODOLOGY

Secondary Data has been collected from different journals, articles, official reports, publications, websites, newspapers etc. to get the principal objective of the study. For conducting the exploratory study diverse set of companies from different sectors within commerce, including logistics, e-commerce, agriculture, telecommunications, and disaster management have been taken into consideration for exploring the data and to get desired information.

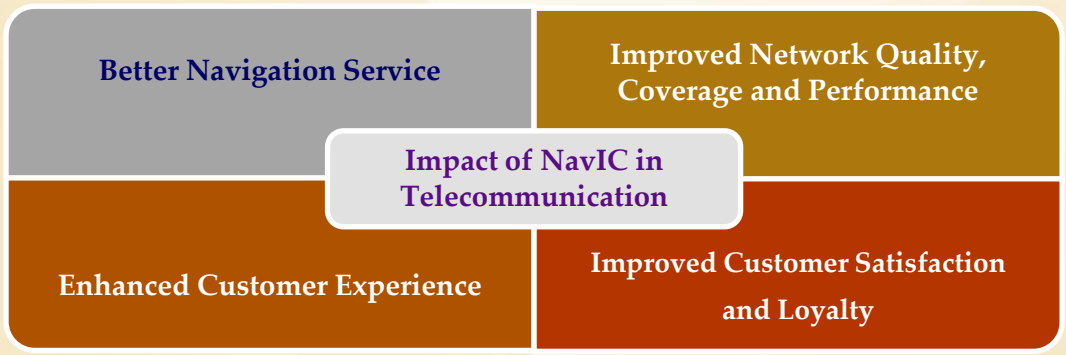
6. DATA ANALYSIS AND FINDINGS

This section presents insights into how NavIC technology has been leveraged in various sectors. Here, the findings are organized in such a way that it can provide an overview of the usage and impact that NavIC has had in each sector. NavIC, India's autonomous regional satellite navigation system, has a wide range of applications across various sectors. Here's how NavIC is utilized in different sectors

Telecommunication	Tracking Capability enhancer Signal connectivity improvement
Logistics	Fleet Management, Vehicle Tracking, and Optimizing Routes Managing Vehicles by Offering Wide Coverage Across Remote Areas
E-Commerce	On-time tracking of deliveries Ride-Hailing integration
Agriculture	Precision farming, soil moisture monitoring, crop yield estimation Calibration/validation of satellite-derived products
Disaster Management	Precision in mapping Accurate positioning and timing services during natural calamities

NavIC's role in these sectors demonstrates its importance which is stated below:

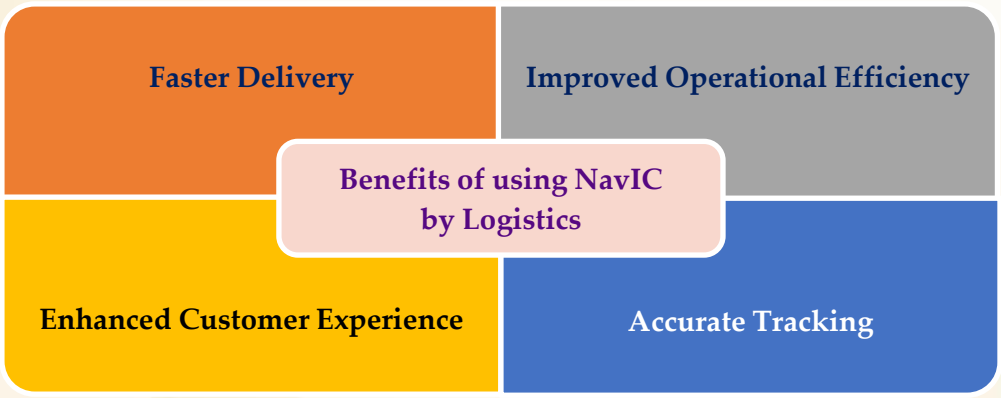
1. Telecommunication Sector



Impact of NavIC on Telecommunication Sector	
Reliance Jio - Integration of NavIC in Jio Phone and Jio Phone Next for better location-based services. - Improved Maps, Navigation, e-commerce, and Emergency Response Services. - Enhanced Customer Experience and Satisfaction through precise location data.	**Bharti Airtel** - Adoption of NavIC in Airtel Xstream Fiber and Airtel Xstream Box improved network quality, coverage, and performance, especially in rural areas. - Better Connectivity and Internet Services for customers.
Vodafone Idea - Utilization of NavIC in Vi Wi-Fi Calling and Vi Movies & TV services. - Enhanced customer experience with voice-over Wi-Fi and video streaming. - Improved customer satisfaction and loyalty.	

In summary, the incorporation of NavIC technology by these telecommunications companies has had a positive impact on location-based services, network quality, and overall customer experience, leading to increased customer satisfaction and loyalty.

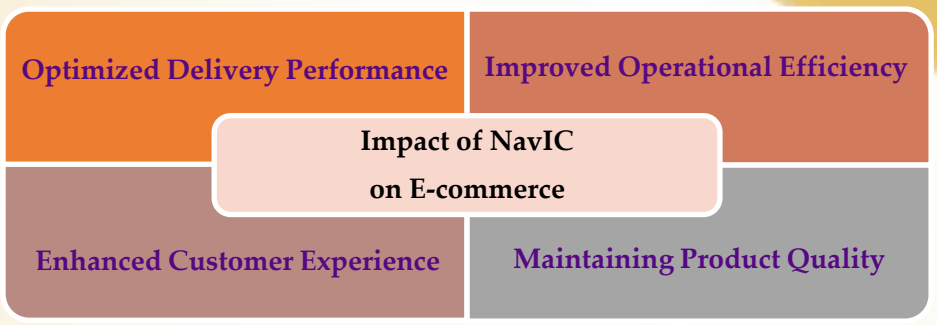
2. Logistics Sector



Impact of NavIC on the Logistics Sector	
Delhivery - Partnership with ISRO for fleet management and delivery optimization. - Accurate tracking of vehicles and shipments, especially in remote areas. - Improved operational efficiency and customer service.	**Rivigo** - Collaboration with ISRO for fleet management and reduced transit time. - Decreased fuel consumption and carbon footprint through optimized routing. - Improved route planning and navigation for faster deliveries.
Flipkart - Integration of NavIC in the logistics network for improved delivery speed and accuracy. - Precise location data for delivery partners and customers, even in urban areas. - Enhanced customer experience and competitive advantage.	

The adaptation of NavIC by these companies has led to improved operational efficiency, reduced carbon footprint, and faster deliveries, ultimately enhancing customer service and competitive advantage in the logistics industry.

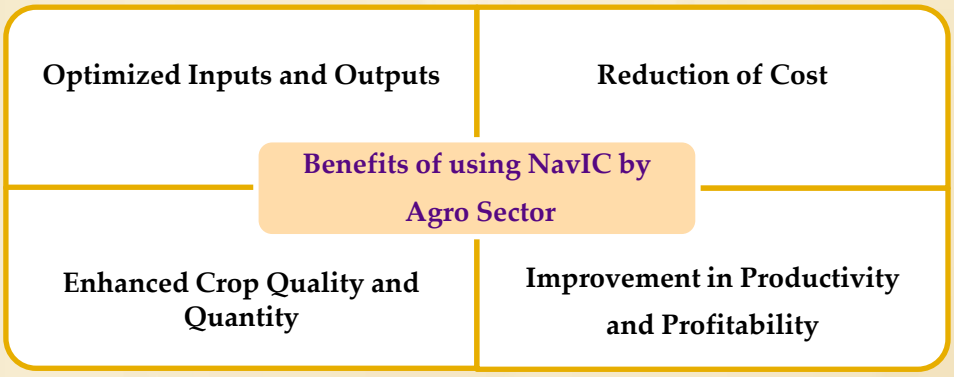
3. E-Commerce Sector



Impact of NavIC on E-Commerce Sector	
Amazon	**BigBasket**
- Adoption of NavIC in the logistics network for better delivery efficiency and reliability. - Improved tracking of shipments and vehicles, especially in remote regions. - Enhanced customer satisfaction through accurate and timely deliveries.	- Utilization of NavIC in the logistics network to optimize delivery performance. - Monitoring of temperature and humidity in refrigerated trucks for product freshness. - Improved delivery quality and customer trust.

Strategical integration of NavIC technology into E-Commerce results in significant improvements. The adoption has led to enhanced delivery efficiency and reliability, particularly in remote regions, which has translated into higher customer satisfaction due to accurate and timely deliveries, ensuring product freshness.

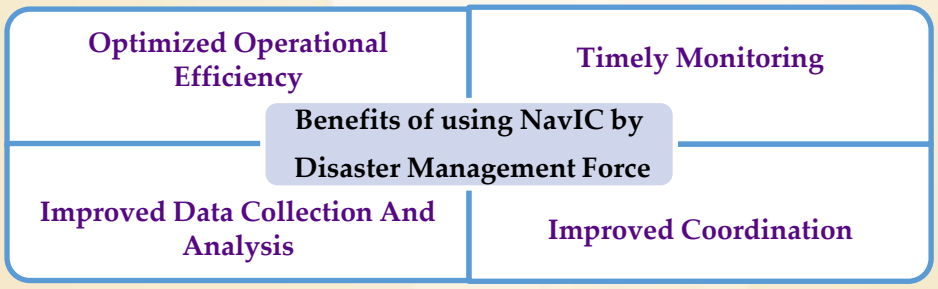
4. Agriculture Sector



Impact of NavIC on the Agricultural Sector	
Mahindra & Mahindra - Integration of NavIC in tractors for precision farming and smart irrigation. - Monitoring of crops, soil, and water levels for optimized inputs and outputs. - Potential for up to 20% improvement in productivity and profitability for farmers.	**CropIn** - Partnership with ISRO for crop monitoring and advisory services. - Timely data collection on crop health, weather, pests, and diseases. - Enhanced crop quality and quantity, with potential gains of up to 30%.
AgNext - Collaboration with ISRO for quality testing and certification services. - Verification of commodity origin, location, and movement. - Reduced cost and time of quality testing by up to 50%.	

These findings underscore the transformative impact of NavIC technology in agriculture, enhancing precision, productivity, and profitability for farmers while reducing operational costs and time in quality testing and certification services. The successful integration of NavIC by these organizations exemplifies the technology's potential to drive positive change in the agriculture sector.

5. Disaster Management



Impact of NavIC on Disaster Management	
National Disaster Management Authority (NDMA) - Integration of NavIC to improve situational awareness and coordination. - Monitoring of disaster-affected areas, rescue team tracking, and timely alerts. - Enhanced damage assessment and recovery planning capabilities.	**National Disaster Response Force (NDRF)** - Adoption of NavIC for operational efficiency and safety in disaster response. - Precise location data for disaster sites and obstacle avoidance during rescue operations. - Improved safety for personnel and victims during disaster response.
National Centre for Coastal Research (NCCR) - Utilization of NavIC for coastal research and management. - Improved data collection, analysis, and dissemination of coastal parameters. - Providing advisories and alerts to coastal communities on various coastal issues.	

Integration of NavIC technology by the National Disaster Management Sector improves situational awareness, coordination, and disaster monitoring, and enhances operational efficiency, precise location data, and safety during disaster response.

These findings demonstrate the widespread adoption and positive impact of NavIC technology across multiple sectors. The integration of NavIC has improved operational efficiency, customer satisfaction, and safety, making it a valuable asset for businesses and organizations in India.

CONCLUSION

Market Opportunities: NavIC's versatility holds great potential across various sectors, with commerce leading the way. Its precision and real-time tracking capabilities can revolutionize logistics and supply chains, optimizing routes, reducing delivery times, and cutting operational costs. In e-commerce, NavIC can elevate delivery accuracy, enhance last-mile navigation, and provide customers with real-time tracking, bolstering service quality. In agriculture, NavIC aids in crop monitoring, soil analysis, and water resource management, boosting productivity and rural development. During disaster management, accurate positioning and timing from NavIC aid search and rescue efforts, saving valuable time and lives. Telecom operators benefit from NavIC's precise timing, ensuring seamless network synchronization and communication services. The construction and infrastructure sectors can utilize NavIC too for precise surveying, land mapping, and construction site monitoring, leading to more efficient project management.

Economic Impact: NavIC has the potential to deliver significant economic benefits to India, aligning with the vision of the government, that is of "**Atmanirbhar Bharat**" aka self-reliant India. These economic advantages can manifest in various ways:

- **Cost Reduction:** By route-optimizing, reducing fuel consumption, and minimizing downtime, businesses are most likely to experience substantial savings in cost in logistics and transportation.
- **Competitiveness:** Improved efficiency and customer service can enhance the competitiveness of Indian businesses in both domestic and international markets.
- **Job Creation:** As NavIC adoption grows, there will be opportunities for skilled employment in industries related to navigation technology, software development, and system integration.

CHALLENGES AND FUTURE DIRECTIONS

While NavIC holds immense promise, it also faces challenges. Signal interference, cybersecurity threats, and the need for continuous technological advancements are among the hurdles that must be addressed. As technology evolves, NavIC must adapt and improve to remain competitive.

NavIC is not limited to India alone. Its coverage extends well beyond the Indian subcontinent, encompassing a significant

portion of Asia. This makes NavIC a valuable regional asset, with potential global the advantage for commerce and recommends policymakers incentivize its adoption. India has explored collaborations with neighbouring countries to leverage NavIC for mutual benefit, demonstrating its potential as a global navigation system. Qualcomm Technologies, Inc. has collaborated with ISRO and announced support for NavIC, in various chipset platforms within the upcoming product lineup, the company aims to implement this feature. This endeavour is set to boost the utilization of NavIC, elevating the geolocation functionalities of mobile, automotive, and Internet of Things (IoT) solutions within the specified region – Benefiting from the engineering expertise in India. On September 19th of 2023, using the Qualcomm Snapdragon Mobile Platforms, through this partnership, the initial NavIC demonstration was successfully presented and on October 14-16, at India Mobile Congress, they have plans to exhibit the solution once more. The government has plans to mandate an India-made NavIC system in the future for the automotive industry. The Government of India has also passed a mandate stating that all smartphone manufacturers will have to enable NavIC in all of their smartphones to be sold in India by 2025. This will incentivize mobile manufacturers to adopt NavIC, the desi GPS to combat the initial increase in cost due to some necessary changes in manufacturing.

implications. NavIC technology offers a substantial competitive

LIMITATIONS OF THE STUDY

The Limitations of the study are:

- Most of the sources only mention that these companies have integrated NavIC in some of their devices and services, but do not provide any quantitative evidence of how NavIC has improved their performance, efficiency, or customer satisfaction.
- The study's findings may not be fully generalizable to all commerce sectors due to the limited number of cases.

REFERENCES

[1] Chamoli, V., Prakash, R., Vidyarthi, A., & Ray, A. (2020). Capability of NavIC, an Indian GNSS constellation, for retrieval of surface soil moisture. *Progress In Electromagnetics Research C*, 106, 255-270.

[2] Govardhan, R., Hariharan, S., Mary, T. B., Paul, J. J., Manimekalai, M. A. P., & Thilagavathi, K. (2023, March). IoT-Based Health Monitoring and Tracking in Combat. In 2023 4th International Conference on Signal Processing and Communication (ICSPC) (pp. 297-301). IEEE.

[3] Gusain, R., Vidyarthi, A., Prakash, R., & Shukla, A. K. (2023, May). Assessing NavIC Accuracy at Dehradun in the Winter Season: A Case Study. In *2023 International Conference on Signal Processing, Computation, Electronics, Power and Telecommunication (IConSCEPT)* (pp. 1-5). IEEE.

[4] Kuna, D., Santhosh, N., & Perumalla, N. K. (2020). Preliminary analysis of standalone Galileo and NavIC in the context of positioning performance for low latitude region. *Procedia Computer Science*, *171*, 225-234.

[5] Kuna, D., & Perumalla, N. K. (2023). Assessment of Android Smartphones positioning in multi-GNSS/NavIC environment. *Journal of Applied Geodesy*, (0).

[6] Prabhu, S. B., Ravithejaswi, U. R., Shetty, S., Hegde, S. S., & Prasad, S. M. (2022, February). NavIC Driven Dynamic Ambulance Allocation and Tracking. In 2022 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS) (pp. 1-6). IEEE.

ISSN (Online): 2583-5203 December, 2023 | Vol. 2 | Issue No. 02

Kolkata Bidhannagar Society for Academic Advancement West Bengal, INDIA

KOLKATA BIDHANNAGAR SOCIETY FOR ACADEMIC ADVANCEMENT (hereinafter referred to as the 'KBSAA') established in the year 2022 as a registered Society under the West Bengal Societies Registration Act (West Bengal Act XXVI) of 1961 bearing registration No. S0025851 of 2021-2022.

KBSAA is a Non-Profit seeking Society for Promotion and Advancement of Learning and Research in the field of Social Sciences and other allied areas.

Visit our website: kbsaa.org/journal/

The main objectives of the KBSAA are as follows –

- To promote and develop the Academic Advancement of Learning in the field of Research and Academics.
- To publish Research Journals, Books, Newsletters, Periodicals, Magazines, Brochure etc. with an objective of furthering academic research, information and knowledge.
- To organize and participate in Conferences, Seminars, Webinars and Workshops in collaboration with other Societies, Corporates and other Organizations / Associations / Foundations etc. for the promotion and development of research in the field of Social Sciences and other allied areas.

Published by
Pema Lama - Secretary and Editor on behalf of
Kolkata Bidhannagar Society for Academic Advancement, West Bengal, INDIA