Data Empowered Governance: AI-Driven Advancements in Bangla Sahayata Kendra for Grassroots Empowerment

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Abstract

This study examines the impact of data-driven research and development (R&D) on the services of Bangla Sahayata Kendra (BSK) and grass-roots communities in West Bengal. BSK is a state government program that offers free delivery of online public services through digital kiosks from the gram panchayat level. By analyzing service usage data and user feedback, the BSK data analysis process identifies and highlights gaps and trends, guiding R&D efforts to enhance BSK services and improve citizen experiences in dealing with the government. The findings emphasize the vital role of data-driven R&D in addressing shortcomings and optimizing the BSK service delivery model, resulting in citizen empowerment and a transformative service delivery process. This paper underscores the critical role of utilizing Artificial intelligence in various phases of the study and project to upgrade the BSK system and prioritize citizen-centric service delivery of public services aligning the process with the mission of "Viksit Bharat."

Keywords: Artificial Intelligence, E-Governance, Bangla Sahayata Kendra, Digital Governance

1.Introduction

Building upon the foundations of e-governance and the transformative potential of the Bangla Sahayata Kendra (BSK), this report delves into the empowering role of AI tools to strengthen BSKs in West Bengal, particularly emphasizing grassroots communities. Recognizing that these communities have historically been marginalized in the developmental process due to socio-economic complexities, the BSK network aims to bridge the gap by bringing them into the realm of digital governance. The paper elaborates on the need for clean data and focused use of data to strengthen R&D processes that enhance the scope of the BSKs - the citizen-centric online delivery system of the government of West Bengal. To be able to achieve that, AI tools are used extensively, especially in the reporting and visualization of the data to be able to eventually make actionable decisions.

The key themes central to the approach are:

Empowering Citizens at the Grassroots - Clean and accurate data lies at the core of understanding and addressing the needs of grassroots communities. By harnessing the power of clean data, the BSK system gains valuable insights into the challenges faced by marginalized communities, enabling evidence-based decision-making, targeted interventions, and a sustainable public delivery system.

The Critical Role of Data-Based Research and Development - Empowering citizens at the grassroots level is intricately connected to the utilization of data-based research and development. Through detailed analysis of service usage data and user feedback, the Bangla Sahayata Kendra (BSK) gains a deeper understanding of the dynamics and demands of the communities it serves. This invaluable data-driven approach informs ongoing research and development initiatives, facilitating service improvements.

Strengthening the Bangla Sahayata Kendra (BSK) - Building upon the critical role of data-backed research and development, the application of insights within the specific context of the BSK is imperative to address the diverse challenges and unique needs of various districts in West Bengal. By tailoring data-driven solutions to the nuances of the BSK framework, observations indicate that the approach significantly enhances service delivery, improves user experience, and strengthens the overall system building accountability, transparency, and trust toward the government, ultimately empowering citizens across the state. [2].

2.The Primary Role of Data

Data Utilization and Identification of Service Gaps - Data collected from the BSK portal through the 3561 BSK center across West Bengal serve as a valuable resource for identifying patterns, trends, and anomalies in the state's public service delivery system. Utilizing big data analytics, this information helps uncover potential service gaps that require attention and rectification. For instance, by analysing the data over a specified period, it was possible to determine if certain districts consistently had lower usage rates or a higher number of complaints, indicating areas where improvements were needed. In May 2023, the monthly performance report (MPR) from the Cooch Behar district revealed that out of the 140 BSKs in the district, the delivery of informational services was abysmally high while other key performance parameters exhibited poor results. Further analysis revealed that BSKS of a particular block in the district were providing a specific informational service over a certain period, coinciding with a considerable demand for caste certificates in

that area. Similarly, for this study, North 24 Parganas district with 260 BSKs was followed for the Bangla Shasya Bima (Crop Insurance) Scheme of the Department of Agriculture.

Objectives:

- Low footfall of citizens at the BSK centers, resulting in inactive BSKs and underutilization of human resources.
- Limited number of public service deliveries despite the rush for the Bangla Shasya Bima scheme through intermediaries.
- Low enquires at BSKs despite the presence of an adequate number of BSKs in the district.

Word of mouth and surveys provided inputs that farmers did not find BSKs useful enough and relied on conventional methods and agent guidance to avail this scheme, Despite the following competitive advantages BSKs offered, the number of farmers visiting BSKs were abysmally low.

a) Guided multiple services of multiple departments, multiple times available free of service cost from any BSK.

b) Acceptance of cash for any public service payments yet receive rebates earmarked for online service deliveries.

Method to capture Agriculture Department's Bangla Shasya Bima Scheme (Crop Insurance):

Sample Selection - Data collection involved multiple sources, including performance metrics, interviews, focus groups, and observation focused interventions. Data retrieved from BSK Portal for the scheme is given in Table 1:

Description	BSB Scheme	Krishak Bandhu	Other Services
No. of Farmers used Mobile App of deptt.	N/A	N/A	N/A
Farmers Registered at BSK	9,370	88,699	3,685
BSK end to end Delivery	8,461	N/A	590
Search Application Status	24,566	34,467	5,362
Application Rejection	N/A	N/A	N/A

TABLE 1: FARMERS DATA FOR BANGLA SHASYA BIMA SCHEME (CROP INSURANCE) THROUGH BSK

3. Data Collection Points

To analyse the scheme and its performance through BSK, data collection points at the BSK portal were activated and sanitized to retrieve clean data from all districts. Specific parameters customized for the program were set through a mix of administrative data (registration data, application data), surveys (awareness, reasons for discontinuation), and complaint records. That information not available in the previous datasets were incorporated with Application Programming Interface (API) with the department. The data was stored in a specific database for easy access. The patterns and potential gaps in the BSB scheme's service delivery were then identified by analysing the detailed backend data. Issues such as low awareness for the scheme, high rejection rates, or large numbers of complaints indicated areas that needed improvement, such as customized awareness camps for farmers through the department, capacity building of the BSK operators, simplification of the application forms, and acceptance of online submission of documents. A BSK tagline, such as the one provided for Seed License, given in Fig 2. was introduced to enhance trust for the BSK operators, dismiss middlemen or agents, and increase dependence on government systems near homes of the farmers.

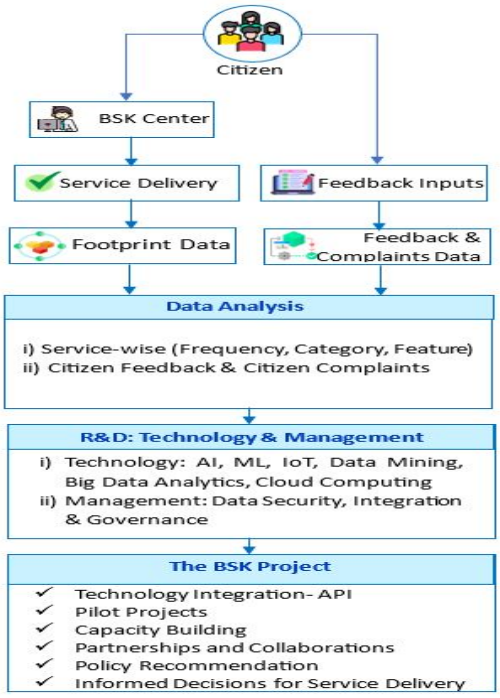

Figure 1: Flow Chart - The BSK R&D Model.

Application No: 168136545757714064345 9
Application Date: 13/04/2023

FORM 'I'

APPLICATION FOR
(1) GRANT OF LICENCE TO SELL, STOCK OR EXHIBIT FOR SALE OR DISTRIBUTE INSECTICIDES
[See sub-rules (1) of rule 10]
(Submit separate application for different licence)

To,
The Licensing Authority,
JDA (PP&QC) , WB

1. Name, address and e-mail address of the applicant:

Name of the applicant: Arindam Ray

Name of the concern: Arindam Ray

Communication Address: Baranagar, Kolkata

Email: arindam.ray2009@gmail.com

Mobile No: 9350778625

Aadhaar number: XXXXXXXX 9158

2. Whether the application is for Sell,stock/exhibit for sale/distribution of insecticides

3. Complete address (including name of the lane, PIN Code, etc.) of the premises, where the insecticide(s) shall be:

(a) stored/stocked: Details attached on Annexure - A

(b) sold or exhibited for sale or issued for use:

Post office : Baranagar
Police station : Baranagar
Pin code : 700039
Road : sarat bose
Municipality : NORTH 24 PARGANAS
Ward no : 34
Holding no : 442
Land mark :
Subdivision : Barasat Sadar
District : North 24 Parganas
State : West Bengal

(c) whether any of the above premises is situated in residential area (undertaking to be submitted):
no

Place:_____Dated : ___/___/_____ Signature of Applicant

Bangla Sahayata Kendra [

Figure 2: BSK-eCert for Seed License

4. Data Analysis

The vast amount of online data generated daily on the portal, encompassing service usage and citizen footfall at BSKs (individuals visiting BSKs to access online public services), undergoes comprehensive analysis to reveal trends, correlations, and areas of inefficiency [4]. By examining data patterns, such as frequent application rejections or a surge in complaints, merchant limit enhancement requests using e-wallets, etc., specific issues within the application process could be identified. Additionally, low levels of awareness indicated the need for enhanced promotional efforts.

The data analysis process of the BSK system uses statistical and data visualization tools such as Google Big Query, Apache Kafka, Python, R Programming, and Power BI to measure efficacy and impact.

1. Efficiency Measures – involved developing metrics such as:

- *Conversion Rate*: To measure the ratio of farmers who successfully applied for and downloaded crop insurance certificates (BSB certificates) seeking end-to-end deliveries to the total number of farmers who visited BSKs and merely registered for BSB or searched their application status.
- *Success Rate*: To measure the ratio of approved applications to the total number of applications submitted through BSKs.
- *Complaint Rate*: To measure the ratio of complaints received to the total number of applications submitted.
- *Non-Availability of Adequate Data*: Technological interventions and brainstorming to retrieve usable and practical data.

2. **Benchmarking and Improvement**

The efficiency measures serve as benchmarks for other BSK centres and future improvements of other services in the following steps.

- Data on rejections, complaints, and service discontinuations, along with BSK visit data, served to identify areas for process improvement.

3. **Follow-up and Monitoring**

- Regular update and monitoring the provided data over a specific period allowed tracking improvements over time and prompt responses to emerging issues.

5. Data Validation

Implementing the data validation step included ensuring accuracy and reliability of the real-time data generated through the portal. It involved cross-verification from multiple sources and the use of data validation techniques such as cross examining the parameters, range, format, consistency, uniqueness, referential integrity and cross reference checks. Data from the banking partner, individual departments, Government Receipt Portal System, BSK Reconciliation System, District Administration are validated to verify the accuracy.

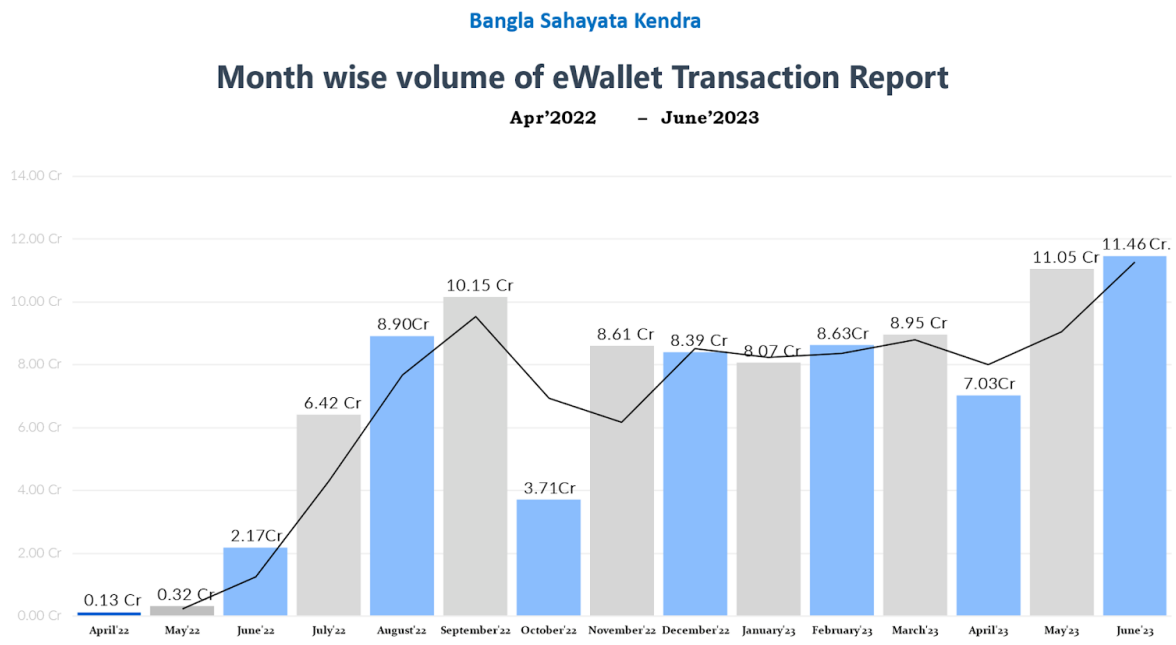

Figure 3: Month-wise e-wallet collections across BSKs.

6. Reporting

Regular reports are created to communicate the results of data analysis in order to strengthen the BSK network and facilitate communication with stakeholders. These reports highlight trends, identify areas for improvement, and serve both internal and external purposes. One specific report focuses on the relationship between informational services, non-e-wallet services, and e-wallet services provided by BSKs at the district level, offering a comprehensive overview of their distribution across different districts as given in Fig 4.

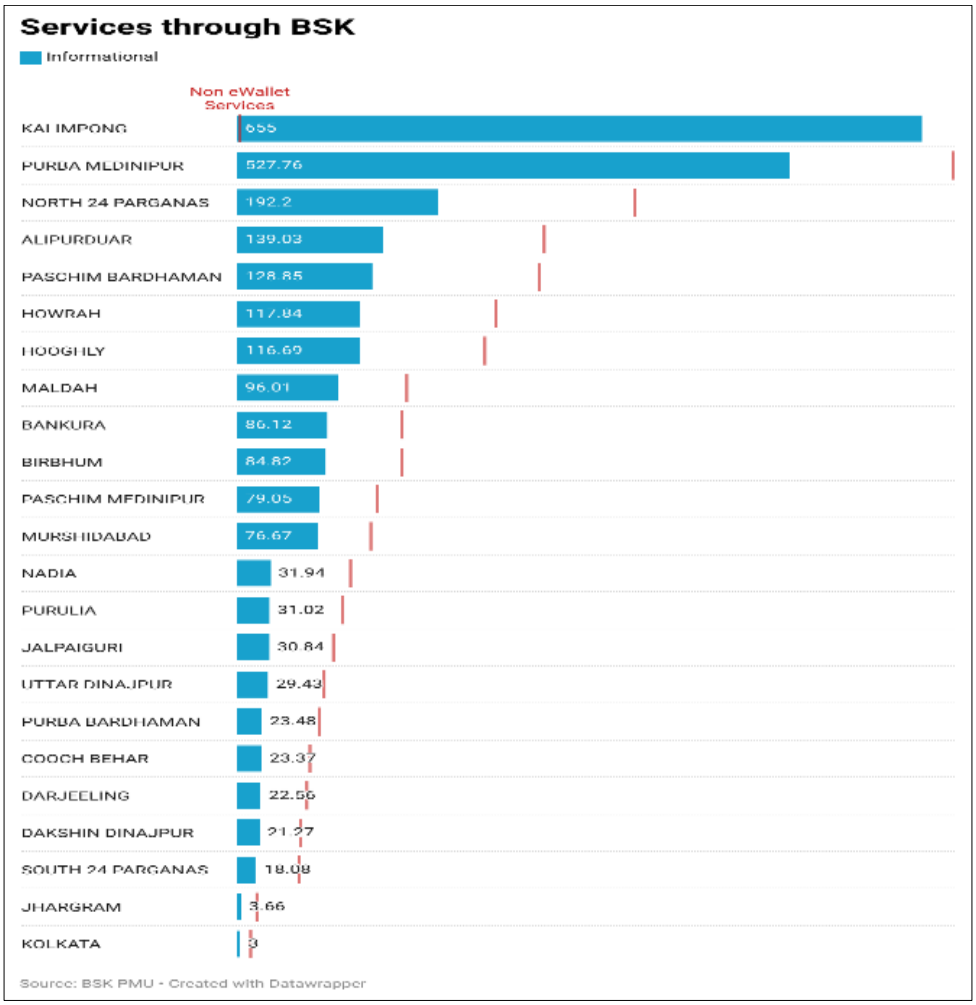

Figure 4: Data through BSKs for informational, non-e-wallet and e-wallet services.

It is here that AI tools are significantly used to enhance the reporting processes for the Bangla Sahayata Kendra (BSK). Numerous tools were utilized that allow for all the steps listed below. In particular, Python and R, with their extensive libraries and packages, were pivotal for handling the complex datasets; Microsoft's Power BI and Tableau enhanced business analytics through interactive dashboards that reduced dependence on IT staff whereas Apache Kafka was valuable in our environments that required some degree of real-time data processing. Simultaneously, Google BigQuery offered a cost-effective solution for the large-scale data analytics with quick query capabilities and real-time error detection. Additionally, Natural Language Processing tools like Google's BERT and OpenAI's GPT aided in text analysis, automated feedback, and generating insightful reports, supporting predictive analytics and decision-making processes as described later in the paper. These technologies collectively facilitated efficient data management, analysis, and visualization, to derive meaningful insights and make informed decisions as shown below:

1. **Automated Data Aggregation**: AI streamlines the data collection process by automatically aggregating data from various sources such as the BSK portal, department portal, bank and other independent sources that provide feedback forms, and performance metrics. This step reduces manual entry errors and frees up resources for other critical tasks.

2. **Advanced Analytics**: AI-driven analytics tools process large datasets quickly to extract meaningful patterns, trends, and anomalies. For instance, machine learning models analyze service usage data to predict which services will be in high demand, allowing for proactive adjustments.

3. **Real-Time Reporting**: AI enables real-time data processing, which means that stakeholders can access up-to-date reports anytime. This has particularly been useful for dynamic environments where data changes frequently, allowing for swift decision-making based on the latest information.

4. **Predictive Insights**: Beyond traditional reporting, AI tools provide predictive insights using historical data. For example, since AI can forecast future trends in service demand or identify potential areas of concern before, they become problematic, enabling pre-emptive measures.

5. **Customized Reporting**: AI tools customize reports for different audiences. For stakeholders interested in high-level overviews, AI generates summary reports highlighting key metrics and trends. For operational teams, more detailed reports with actionable insights are prepared, focusing on day-to-day improvements.

6. **Natural Language Generation (NLG)**: NLG is used to automatically generate textual summaries of data findings. This step helps in explaining complex data in a simpler form, making the reports more accessible to stakeholders who may not have a technical background.

7. **Visualization**: AI also enhances the visual aspect of reporting by automatically creating charts, graphs, and other visual aids that help in illustrating data points clearly and effectively. This makes the reports more engaging and easier to understand.

8. **Anomaly Detection**: AI algorithms automatically detect anomalies or outliers in the data that might indicate errors, fraud, or areas needing attention. These issues can be highlighted in reports for further investigation.

By integrating the AI capabilities into the reporting processes, BSK has ensured that their reports are not only accurate and comprehensive but also actionable and tailored to meet the needs of various stakeholders, ultimately enhancing the decision-making process and improving service delivery.

7. Resource Allocation

District-wise data analysis is essential for effective resource allocation, with higher usage districts requiring additional resources and lower usage districts needing targeted interventions. The resource allocation process employed a mixed-methods approach, combining quantitative and qualitative data. For e.g., BSKs located near SBI branches had advantage of faster e-wallet refills facility while others did not. On the other hand, the strategic relocation of BSKs to include 1836-gram panchayat offices improved access to public services at grassroots.

a) **Quantitative Resource Allocation**: Resources were distributed based on user numbers and service usage frequency. Such as underperforming BSKs in the Kolkata area with high electricity bill payers and proximity to SBI branches received targeted assistance through promotions and incentives, such as a 1% rebate for online bill payments.

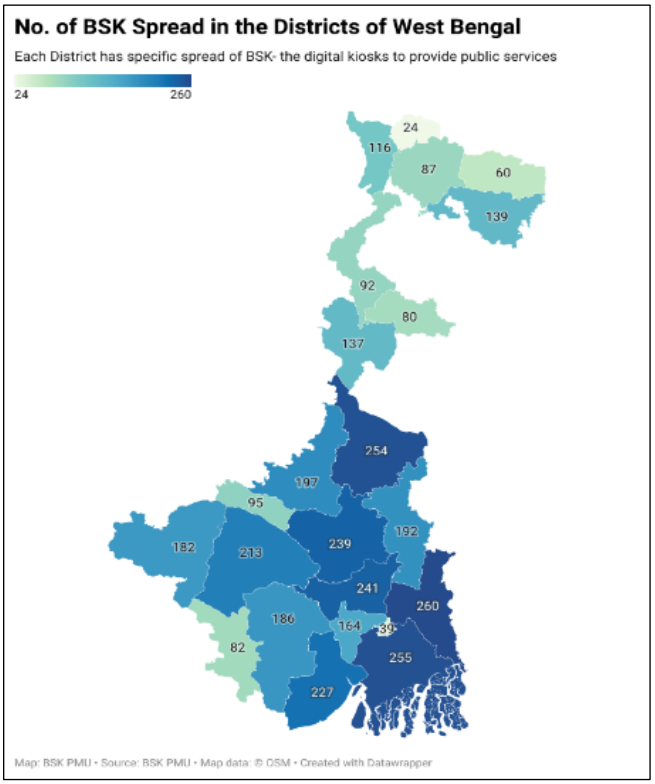

Figure 5: District-wise BSK Spread across West Bengal.

b) **Qualitative Resource Allocation:**

i) Needs-Based: In districts like Nadia, interventions like the "Experiential Learning Program" empowered students to access BSKs on behalf of their families. For example, in May, 2023, 25 girl students from

Krishnagar Women's College visited the Nadia BSK center collectively, paying bills, applying for caste certificates, and checking application statuses.

ii) Potential Growth: Resources were redirected to services with low usage but high eligibility, integrating schemes like Manabik Pension for citizens with disabilities and widow pensions and Rupashree scheme for women, through the BSKs.

iii) Efficiency-Based: Resources were allocated to BSKs with a Model BSK Certification, DEO Performance Recognition, instilling trust among citizens.

iv) Equity-Based: Steps were taken to ensure equal access, including re-designating BSKs as BSK Aadhaar Centers, relocating BSKs to gram panchayat offices, approving new BSKs for underserved areas, and channelizing government office payments through BSKs, including that of the gram panchayat offices.

8. Predictive Analysis

By leveraging data from BSK portals, predictive analysis was utilized to forecast service demand, predict service outages, anticipate service gaps, and optimize resource allocation:

a) Forecasting Service Demand: Historical data enabled the forecast of service demand in different districts, guiding resource allocation for initiatives like the launch of new term loans for minorities in districts such as Malda, Murshidabad, and Nadia etc. in the first phase.

b) Predicting Service Outages or Downtime: System performance monitoring and pattern identification allowed the anticipation of potential issues leading to service outages or downtime, leading to proactive measures such as equipment maintenance and staff training to minimize disruptions, especially during election times.

c) Anticipating Service Gaps: Predictive analysis identified patterns and factors contributing to service gaps or underutilization of BSKs in specific districts, prompting relocations of low footfall BSKs to high citizen footfall areas like Cooperative Bank premises or Collectorate buildings.

d) Optimizing Resource Allocation: Predictive models highlighted peak demand periods, bottlenecks, and underutilized areas, informing resource allocation strategies to ensure BSK centers had the necessary staffing, equipment, and infrastructure to meet anticipated demand effectively.

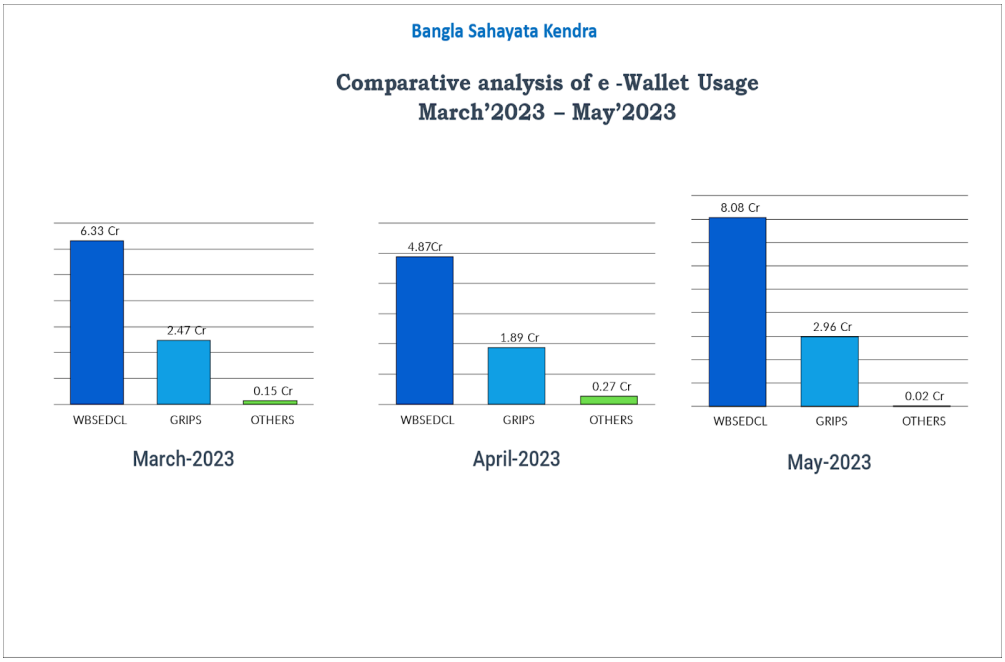

Figure 6: Comparative analysis of popular services in a specified period.

9. Role of the Research and Development

i) Development of New Services: R&D used data to create and improve services within the BSK network, incorporating user feedback and innovative technologies through API integration.

ii) Technology Integration: R&D focused on integrating advanced technologies like AI, machine learning, and blockchain to enhance operational efficiency, user experience, and introduce new functionalities, data storing and security.

iii) Monitoring and Evaluation: R&D developed the attendance system to monitor and evaluate BSK operators' performance, ensuring operational efficiency.

iv) Pilot Projects: Carefully monitored pilot projects are testing new initiatives, such as enabling limited banking services and online health consultations, voter registration or collaboration with the police force through the BSK network.

v) Capacity Building: R&D played a vital role in certifying BSK operators to provide Aadhaar-related services and conducted training programs to enhance their skills and capabilities.

vi) Partnerships and Collaborations: R&D facilitated collaborations with NGOs, private companies, and academic institutions, bringing fresh perspectives, additional resources, and innovative solutions to strengthen

the BSK network. A2i tech team from Bangladesh visited BSKs to study its model of digital governance at the grassroots in March 2023 [5].

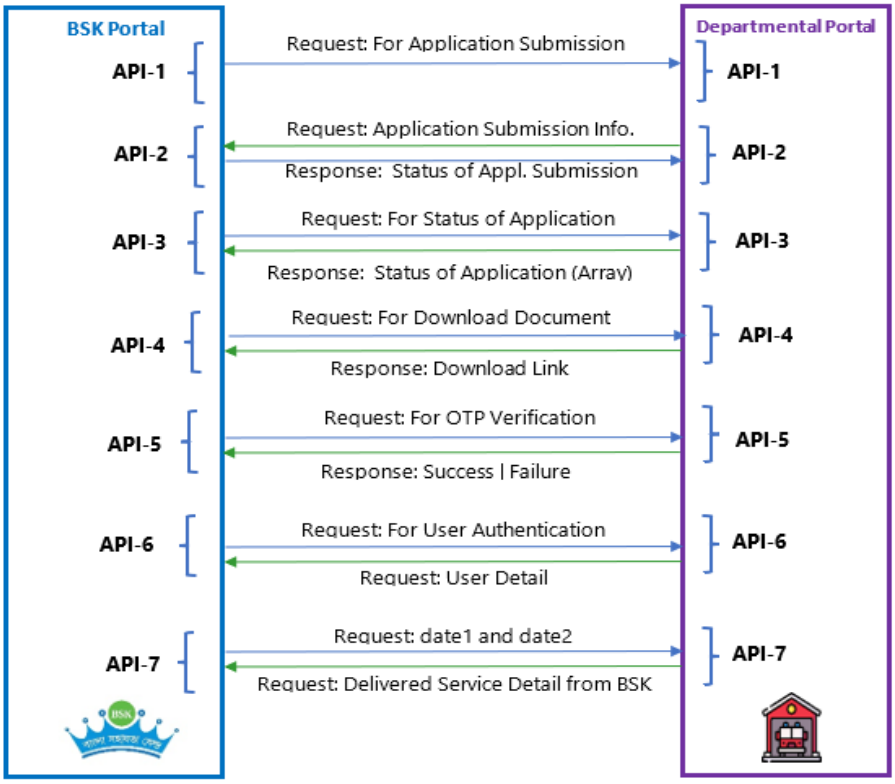

Figure 7: BSK API Integration Model.

Policy Recommendations: R&D provided evidence-based insights that informed policy recommendations, contributing to effective strategies and policy changes within the BSK network. It involved building a Mobile App for BSK operators and citizens separately for independent use. The development of a citizen-focused mobile app (mBSK) and a customized app for operators (BSK Connect) is in pipeline, improving accessibility and real-time availability of services.

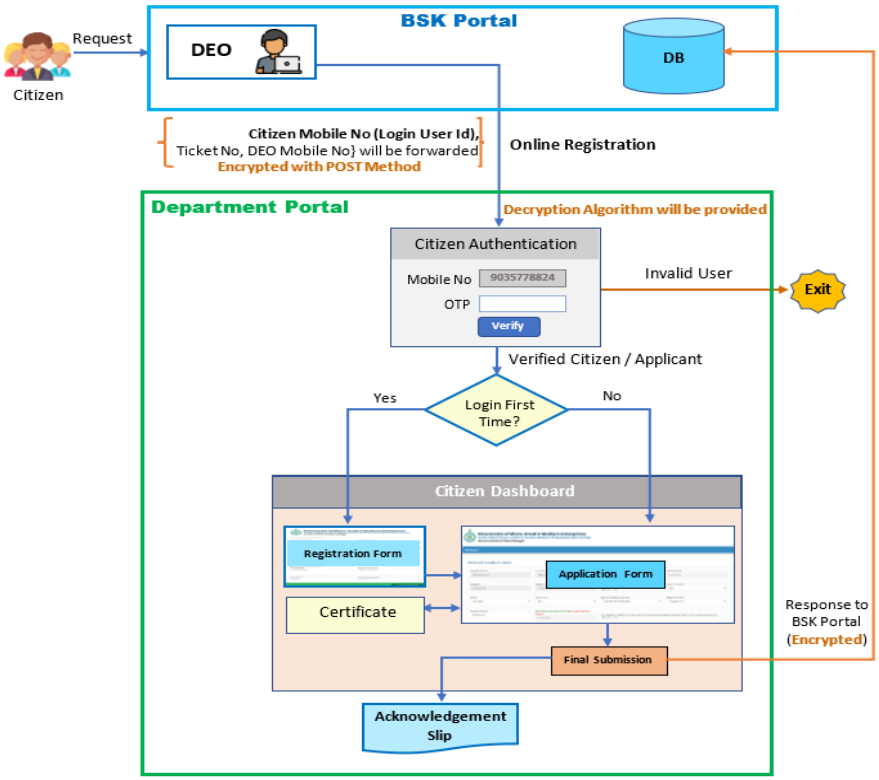

Figure 8: Secure BSK delivery model.

10. Conclusion

The implementation of a data-driven research and development framework within the Bangla Sahayata Kendra (BSK) has undeniably propelled significant strides in enhancing the effectiveness, efficiency, and citizen-centricity of public service delivery. Leveraging advanced AI tools to analyse and interpret vast datasets, BSK has been able to not only streamline service delivery but also tailor its offerings to better meet the diverse needs of the populace it serves.

Through sophisticated AI-driven analytics and reporting mechanisms, BSK has successfully processed feedback and performance data to uncover valuable insights. These insights have informed the development of more responsive policies, ensuring that services are not only accessible but also effectively address the specific requirements of different community segments. By doing so, the BSK has significantly improved its reach and impact, as evidenced by the substantial numbers from FY 2022-23, where approximately 5 crore citizens availed 8 crore e-services, thereby channelling 100 crore of government revenue.

Furthermore, the utilization of AI in predictive analytics has enabled the BSK to anticipate service demands and potential issues before they escalate, allowing for pre-emptive policy adjustments. This proactive

approach in policymaking ensures that services are continuously refined and optimized, thus reinforcing the BSK's commitment to a citizen-first strategy.

In conclusion, the data-driven advancements facilitated by AI have not only enhanced the operational capabilities of the BSK but have also played a crucial role in shaping policies that are both informed and impactful. This integration of AI into the BSK framework epitomizes the transformative potential of technology in governance, setting a benchmark for how public services can be dynamically administered to meet the evolving needs of citizens.

By implementing a data-driven research & development framework, the BSK has achieved significant improvements in effectiveness, efficiency, and citizen-centricity. For instance, in FY 2022-23, BSKs served approximately 5 crore citizens and delivered around 8 crore e-services, channelizing 100 crore of government revenue.

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