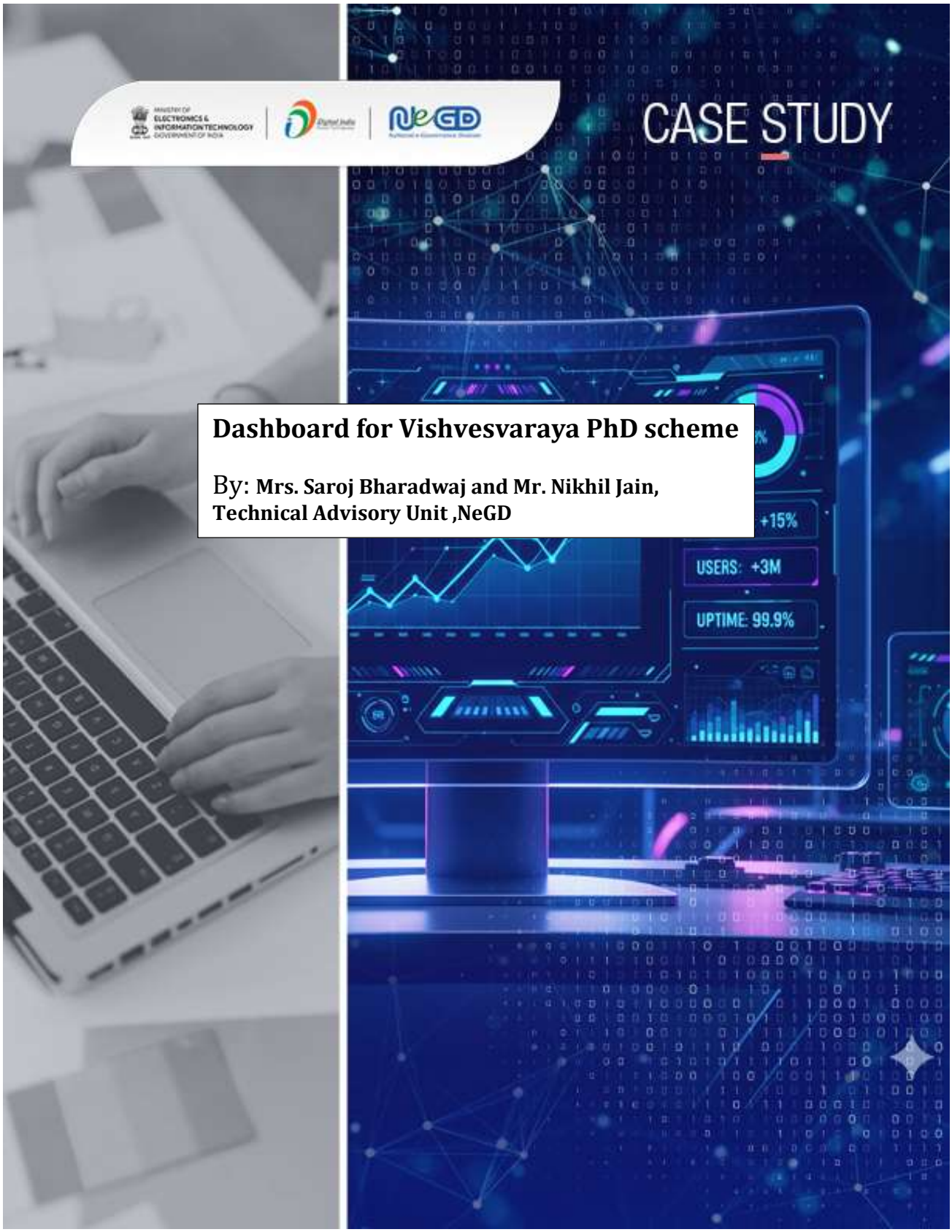

Dashboard for Vishvesvaraya PhD scheme

By: **Mrs. Saroj Bharadwaj and Mr. Nikhil Jain, Technical Advisory Unit ,NeGD**

Introduction

The National e-Governance Division (NeGD), under the Ministry of Electronics & Information Technology (MeitY), is at the forefront of driving the Digital India vision. A critical pillar of this mission is Capacity Building (CB), aimed at equipping government officials and stakeholders with the knowledge and skills required to implement and sustain transformative digital initiatives.

This case study on the "Vishvesvaraya PhD Scheme Dashboard" is a part of NeGD's ongoing effort to document, analyse, and disseminate best practices in digital governance and innovation. Developed by our internal experts at the Technical Advisory Unit (TAU), this study provides a comprehensive examination of the design, implementation, and impact of a data-driven dashboard created to monitor and evaluate the progress of the Visvesvaraya PhD Scheme—a flagship initiative to promote research and innovation in the field of electronics and IT.

Our case studies are developed through a rigorous methodology that involves in-depth research, detailed analysis of program frameworks and policy documents, and, most importantly, interviews with key stakeholders and domain experts who have been instrumental in shaping and executing the dashboard solution. This ensures that the narratives are not only accurate but also rich with practical insights and firsthand perspectives.

The objective of this repository is to create a valuable knowledge asset for policymakers, program managers, technologists, and implementers across all levels of government, facilitating learning and enabling the development of responsive digital solutions under the broader Digital India umbrella

Acknowledgment

The Capacity Building Division, NeGD, extends its sincere gratitude to **Ms. Saroj Bharadwaj** and **Mr. Nikhil Jain** from the Technical Advisory Unit (TAU) for authoring this insightful and detailed case study.

We are deeply thankful to **Mr. Sandeep Bansal**, **Ms. Sonal Sinha** and **their team**, for their invaluable cooperation, time, and insights during the research process. Their willingness to share their experiences was crucial in capturing the true essence of **Visvesvaraya PhD Scheme** journey.

We also acknowledge the contributions of the various Government leaders, Nodal Officers, and departmental users whose feedback provided critical perspectives on the system's on-ground impact and usability.

Furthermore, we extend our thanks to the internal experts at NeGD who meticulously reviewed this document, ensuring its alignment with our pedagogical standards and its value as a tool for capacity building.

Disclaimer

This case study has been developed by the National e-Governance Division (NeGD) under its Capacity Building mandate for the purpose of knowledge sharing and academic reference. The information presented herein has been compiled from official government sources, project documents, and interviews with relevant stakeholders involved.

While every effort has been made to ensure the accuracy and reliability of the information, this document is intended for educational and illustrative purposes only. It should not be interpreted as an official policy statement or a guideline for implementation. The views and conclusions expressed are those of the author and contributors based on their analysis and do not necessarily reflect the official position of the Ministry of Electronics & Information Technology (MeitY) or the National e-Governance Division (NeGD).

The commercial use of this material is strictly prohibited. This case study is meant to be used as a learning tool for government officials, trainees, and individuals interested in e-Governance and public policy.

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Executive Summary

The **Visvesvaraya PhD Scheme**, initiated by MeitY in 2014, aims to strengthen India's research ecosystem in Electronics and IT by supporting PhD scholars, young faculty, and post-doctoral researchers. Despite its success in enrolling over 1,000 scholars across 97 institutions, the scheme faces challenges such as limited industry-academia collaboration, inconsistent data reporting, and infrastructure disparities. To address these, a data-driven Business Intelligence (BI) dashboard was proposed to be developed for enabling real-time monitoring of key performance indicators (KPIs) like scholar progress, fund utilization, publication impact, and institutional performance for better visibility and reporting.

The dashboard intends to integrate various analytics methodology to support strategic decision-making. It consolidates data from academic institutions, national repositories, and industry partners, ensuring standardized reporting and actionable insights. The key features include institutional performance comparisons, scholar lifecycle tracking, geospatial distribution maps, and predictive models for dropout risk and fund optimization.

The major outcome of building the dashboard includes data accuracy in scholar tracking, improvement in fund utilization, and significant cost and time savings in reporting and compliance. The dashboard also enhances transparency, stakeholder satisfaction, and policy alignment. Lessons learned emphasize the importance of centralized data systems, stakeholder-centric design, and scalable infrastructure. Overall, the development of dashboard transforms the Visvesvaraya PhD Scheme into a data-driven, transparent, and impactful initiative supporting India's innovation goals.

Context & Background

The Visvesvaraya PhD Scheme, launched in 2014 by the Ministry of Electronics and Information Technology (MeitY), Government of India, aims to boost research capacity in the domains of Electronics System Design & Manufacturing (ESDM) and Information Technology (IT/ITES). Named after the eminent engineer Sir M. Visvesvaraya, the scheme was conceptualized to address the shortage of high-quality researchers in India and to strengthen the country's innovation ecosystem. In its first phase (2014–2023), the scheme successfully supported over 1,000 full-time and 330 part-time PhD candidates across 97 institutions. The second phase (2021–2030), with a budget of ₹481.93 crore, expands its scope to include 1,000 full-time PhD seats, 150 part-time seats, 50 Young Faculty Research Fellowships (YFRFs), and 225 Post-Doctoral Fellowships (PDFs). Financial support includes monthly fellowships ranging from ₹38,750 to ₹43,750, annual research contingency grants, and provisions for international conference participation and overseas lab visits.

Problem Statement

Despite its ambitious goals, the scheme faces several business and operational challenges. One major issue is the limited collaboration between academia and industry, which hampers the translation of research into commercially viable solutions. Additionally, ensuring timely completion and retention of PhD scholars remains a concern, as many researchers transition to industry roles or pursue opportunities abroad. The scheme also grapples with maintaining research quality while scaling up the number of PhDs, risking dilution of academic rigor. Infrastructure disparities across institutions further affect the consistency of research output. Moreover, to enhance global competitiveness, there is a pressing need to encourage high-impact publications and patent filings. Lastly, effective utilization and monitoring of funds are critical to ensure transparency and accountability in the implementation scheme.

In addition, Visvesvaraya PhD Scheme presents several business and operational challenges that impact its effectiveness and scalability. One of the primary concerns is the lack of integrated data systems across participating institutions, which makes it difficult to track real-time progress, research output, and fund utilization. Without centralized dashboards or analytics platforms, monitoring key performance indicators (KPIs) such as completion rates, publication impact, patent filings, and industry collaborations become fragmented and inefficient. Additionally, **data quality and consistency** pose a challenge, as institutions may follow different formats and standards for reporting, leading to discrepancies and delays in decision-making.

Another major issue is the absence of predictive analytics to forecast scholar performance, identify dropout risks, or optimize resource allocation. For example, using machine learning models to analyze historical data could help identify patterns in successful PhD completions or flag scholars who may need additional support. Furthermore, the scheme lacks robust feedback loops powered by data, which could otherwise inform policy adjustments, curriculum improvements, or mentorship strategies. The limited use of geospatial and demographic analytics also hinders efforts to ensure equitable distribution of research opportunities across regions and social groups.

Lastly, the scheme could benefit from data analysis to assess its long-term impact on India's innovation ecosystem, including tracking alumni career paths, contributions to industry, and academic influence. Without these analytical capabilities, the scheme risks underutilizing its vast data potential and missing opportunities for strategic refinement and evidence-based policymaking.

Analytical Approach

To prepare an effective dashboard for the Visvesvaraya PhD Scheme, an effective analytical approach should integrate multiple layers of analytics such as descriptive, diagnostic, predictive, and prescriptive to provide a comprehensive view of the scheme's performance and impact.

The descriptive analytics layer focuses on summarizing key metrics such as the number of enrolled PhD scholars (full-time and part-time), institutional participation, research outputs (publications, patents), and fund disbursement. These are visualized through bar charts, maps, and summary cards to give stakeholders a snapshot of the scheme's reach and scale. Diagnostic analytics helps uncover the reasons behind trends, for example, identifying institutions with low completion rates or scholars with delayed progress. This is achieved through drill-down capabilities and filters that allow users to explore data by state, institution, or research domain.

To support forward looking decision-making, various analytics can be applied using models such as linear regression to forecast completion rates or classification algorithms to identify scholars at risk of dropping out. Clustering techniques like K-means can segment scholars based on performance, funding utilization, or publication frequency, enabling targeted interventions. These insights can be visualized using trend lines, heat maps, and scatter plots.

Finally, prescriptive analytics offers actionable recommendations based on predictive insights. For instance, it can suggest optimal fund allocation strategies, identify high-performing institutions for scaling, or recommend mentorship programs for underperforming scholars. Optimization models and rule-based logic can support this layer.

The implementation of the Visvesvaraya PhD Scheme involves collaboration across multiple functional domains. At the core are academic institutions (IITs, NITs, central and state universities) responsible for scholar selection, mentoring, and research supervision. These are supported by administrative units within the **Ministry of Electronics and Information Technology (MeitY)**, which oversee policy execution, fund disbursement, and compliance. Additionally, **industry partners** and **research labs** contribute to collaborative projects, internships, and technology transfer. A dedicated **data analytics and IT team** is essential for managing the scheme's dashboard, integrating data from institutions, and ensuring real-time reporting. These cross-functional teams work together to ensure that academic, financial, and operational goals are met efficiently.

Implementation of Project

A. Data Collection

To prepare the digital dashboard for Visvesvaraya PhD Scheme, a robust and multi-source data collection strategy is essential. Data should be gathered from **academic institutions**, including internal research databases, student information systems (SIS), and grant management portals. These sources can provide granular details on scholar progress, publications, patents, and fund utilization. Additionally, **industry partners** and **research collaborators** can contribute data on internships, joint projects, and technology transfers. Integration of data with surveys and feedback forms from scholars, mentors, and administrators can also serve as valuable qualitative data sources to assess program effectiveness and identify bottlenecks.

B. Data standardization and Cleaning

To ensure data quality, several methods have been employed. These include data validation rules at the point of entry, automated anomaly detection to flag inconsistencies, and standardized reporting formats across institutions. Regular data audits and cross-verification with external databases can further enhance reliability. Implementing metadata standards and data dictionaries helps maintain consistency and interpretability across diverse datasets. Moreover, role-based access controls and data governance policies are crucial to ensure data integrity and security.

C. Analytical Tool Used

For analytics and visualization, Business Intelligence (BI) platforms play a pivotal role. Tools like Microsoft Power BI have been used to create interactive dashboards that track KPIs such as PhD completion rates, publication impact, fund utilization, and regional distribution. The platform supports real-time data integration, predictive modeling, and drill-down capabilities, enabling policymakers to make informed decisions. Additionally, cloud-based data lakes and ETL pipelines have streamline data ingestion and transformation from multiple sources, ensuring scalability and flexibility in analytics.

The dashboard itself, built using Microsoft Power BI, includes interactive visuals such as slicers, KPI indicators, and drill-through reports. Stakeholders like MeitY officials, academic administrators, and funding agencies can use these dashboards to monitor real-time progress, compare institutional performance, and make data-driven policy decisions. Power BI's AI-driven features like Quick Insights, anomaly detection, and trend analysis further enhance the analytical depth, making the dashboard not just a reporting tool but a strategic decision-support system. Using platforms like **Microsoft Power BI**, the dashboard can feature:

- **Institutional Performance Dashboards**: Comparing scholar progress, research output, and fund utilization across universities.
- **Scholar Lifecycle Reports**: Tracking individual scholar milestones, publications, and international engagements.
- **Geospatial Maps**: Showing regional distribution of PhD seats and research impact.
- **Trend Analysis Panels**: Forecasting future enrollment and completion patterns.
- **Stakeholder Views**: Customized dashboards for MeitY officials, academic administrators, and funding bodies.

These visualizations enable real-time monitoring, strategic planning, and evidence-based decision-making.

The **Visvesvaraya PhD Scheme dashboard**, ideally built using Microsoft Power BI, is designed to serve multiple stakeholder groups such as **MeitY officials**, **academic institutions**, **funding agencies**, and **research collaborators**. The dashboard should be modular, interactive, and data-rich, enabling both high-level overviews and granular drilldowns.

1. Institutional Performance Dashboard

- **Purpose**: Compare performance across participating institutions.
- **Visuals**:
    - Bar charts showing scholar enrollment, completion, and dropout rates.
    - Heat maps indicating research output intensity (publications, patents).
    - Tables ranking institutions by KPIs such as fund utilization and scholar productivity.
- **Filters**: Institution name, state, research domain, funding year.

2. Scholar Lifecycle Reports

- **Purpose**: Track individual scholar progress and milestones.
- **Visuals**:
    - Timeline charts showing enrollment, coursework completion, thesis submission, and graduation.
    - Cards displaying publication count, patent filings, and international exposure.
    - Status indicators (e.g., “On Track”, “Delayed”, “Completed”).
- **Filters**: Scholar ID, institution, domain, funding type (full-time/part-time).

3. Geospatial Distribution Maps

- **Purpose**: Visualize regional spread and impact of the scheme.
- **Visuals**:
    - Choropleth maps showing number of scholars per state.

        - Bubble maps indicating research hotspots and institutional density.
    - **Filters**: State, zone, funding year.

4. Funding & Resource Utilization Dashboard

- **Purpose**: Monitor financial disbursement and usage.
- **Visuals**:
    - Stacked bar charts showing fund allocation vs. utilization.
    - Pie charts for contingency usage, travel grants, and international visits.
    - Trend lines for year-wise fund flow.
- **Filters**: Institution, year, funding category.

5. Research Output & Impact Dashboard

- **Purpose**: Showcase scholarly contributions and innovation.
- **Visuals**:
    - Line charts for publication trends over time.
    - Tables listing top-cited papers and patents filed.
    - Word clouds for research themes and keywords.
- **Filters**: Domain, scholar, institution, year.

6. Predictive & Prescriptive Analytics Panel

- **Purpose**: Support strategic planning and decision-making.
- **Visuals**:
    - Forecast models for scholar completion rates (e.g., linear regression).
    - Risk indicators for dropout likelihood (e.g., classification models).
    - Prescriptive suggestions for mentoring, funding reallocation, or institutional support.
- **Filters**: Scholar profile, institution, performance metrics.

7. Stakeholder-Specific Views

- **MeitY Officials**: National-level summaries, policy impact metrics, budget tracking.
- **Academic Institutions**: Scholar progress, research output, fund usage.
- **Funding Agencies**: ROI metrics, innovation indicators, compliance reports.
- **Researchers & Scholars**: Personal progress dashboards, publication tracking, grant status.

These dashboards are required to be updated in real-time or at regular intervals (monthly/quarterly), with exportable reports in PDF or Excel formats for offline review. Power BI's capabilities like drill-through, slicers, tooltips, and AI-driven insights (e.g., anomaly detection, trend analysis) can significantly enhance usability and decision support.

Details of Visvesvaraya PhD Scheme Dashboard:

A. Institute Dashboard Overview:

The Institute Dashboard under the Visvesvaraya PhD Scheme for Electronics & IT offers a real-time, data-driven overview of the scheme's implementation across participating institutions. It consolidates key performance indicators (KPIs) and financial metrics, enabling stakeholders to monitor progress, identify gaps, and make informed decisions.

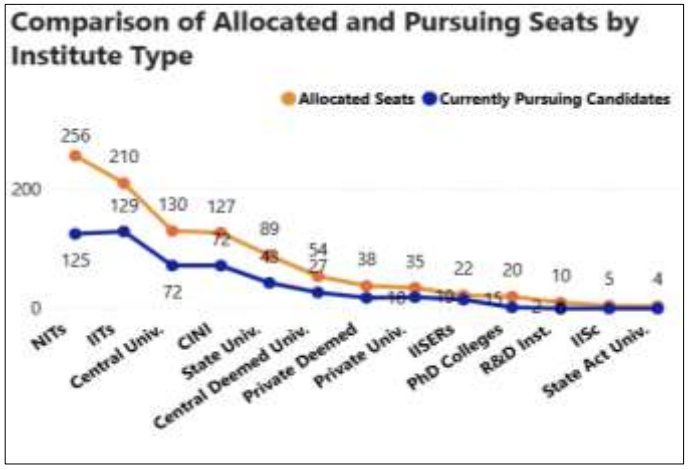
B. Seat Distribution:

The dashboard presents seat allocation and scholar engagement across five admission rounds. Out of a total of 1000 PhD seats, 558 have been filled, with 522 scholars currently pursuing full-time research. The scheme has experienced 47 dropouts, and 11 substitute seats have been allocated to manage attrition, leaving 478 seats unfilled, as a significant gap that may require strategic outreach or policy adjustments.

The consistent pattern of substitute seat allocation ranging from 3 to 5 per round demonstrates a responsive mechanism to manage scholar attrition, though its scale remains limited. Overall, the dashboard highlights early success in seat filling and scholar engagement, followed by a plateau in

later rounds, underscoring the need for targeted interventions to improve seat utilization and reduce dropout rates in future cycles.

C. Comparison of Allocated / Pursuing Seats by Institutes Type

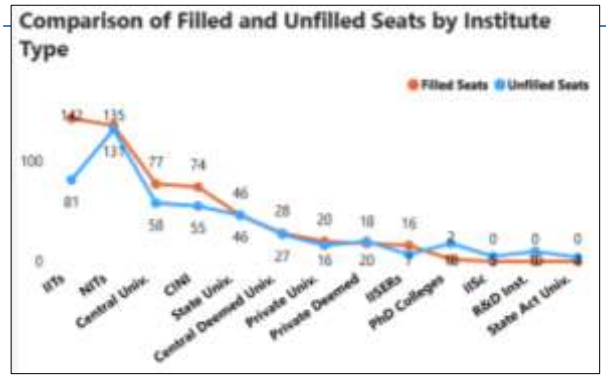


The comparative analysis of allocated seats versus currently pursuing candidates across various types of academic and research institutions is shown in this dashboard. The data reveals notable disparities in enrollment efficiency. NITs led with the highest number of allocated seats at 256, but only 125 candidates are currently pursuing their PhDs, indicating a utilization rate of less than 50%. IITs follow with 210 allocated seats and 129 pursuing candidates, showing relatively better engagement. Central Universities display a closer alignment, with 130 seats allocated and 72 candidates enrolled.

As the analysis moves across other institution types such as CINI, State Universities, Central and Private Deemed Universities, Private Universities, IISERs, PhD Colleges, R&D Institutes, IISc, and State Act Universities, there is a consistent decline in both allocated seats and active enrollment. Particularly concerning is the case of R&D Institutes, which show zero currently pursuing candidates despite having allocated seats, pointing to potential gaps in implementation or institutional readiness.

This comparative insight underscores the need for targeted interventions to improve seat utilization, especially in institutions with high allocations but low enrollment. It also highlights the importance of aligning institutional capacity, outreach, and support mechanisms to ensure that allocated resources translate into active research.

D. Comparison of Filled and Unfilled Seats by Institutes Type

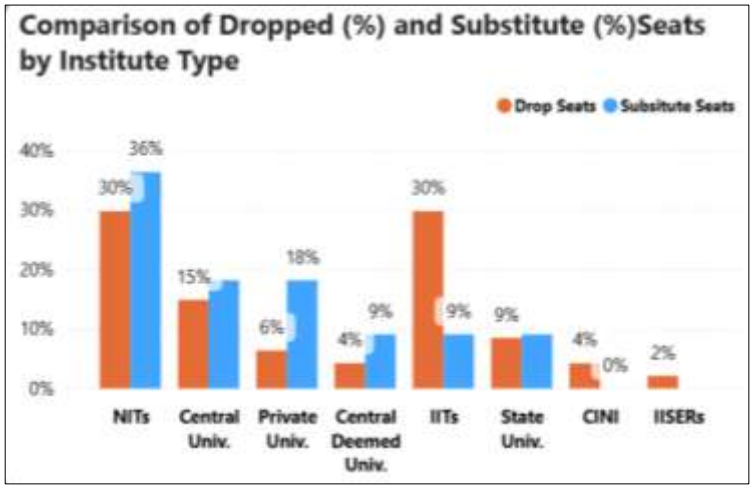


The dashboard presents a comparative analysis of filled versus unfilled PhD seats across various types of academic and research institutions. The data reveals significant disparities in seat utilization, highlighting areas for strategic improvement. IITs and NITs, which are among the top-tier institutions, show relatively higher numbers of filled seats, indicating strong engagement and outreach. Central Universities and State Universities also demonstrate moderate success in seat filling, though gaps remain.

As the analysis moves across other institution types such as CINI, Central and Private Deemed Universities, Private Universities, IISERs, and PhD Colleges, the difference between filled and unfilled seats becomes more pronounced. For instance, PhD Colleges report 18 filled seats and 16 unfilled seats, suggesting nearly equal distribution and potential underutilization. More concerning are categories like R&D Institutes and State Act Universities, which show low or negligible filled seats despite allocations, pointing to systemic challenges in attracting and retaining scholars.

This comparative insight underscores the need for targeted interventions, such as enhanced outreach, improved institutional readiness, and policy support, to ensure that allocated seats translate into active research engagement.

E. Comparison of Dropped and Substitute Seats by Institutes Type



The dashboard presents a comparative analysis of dropped and substitute seat percentages across various types of academic institutions, offering insights into scholar retention and institutional responsiveness. The data reveals that NITs have the highest percentage of substitute seats at 36%, indicating a proactive approach to managing scholar attrition. However, they also show a significant dropout rate of 30%, suggesting underlying challenges in scholar retention. Similarly, IITs exhibit a high drop seat percentage of 30%, but only 9% substitute seats, pointing to a gap in replacement mechanisms.

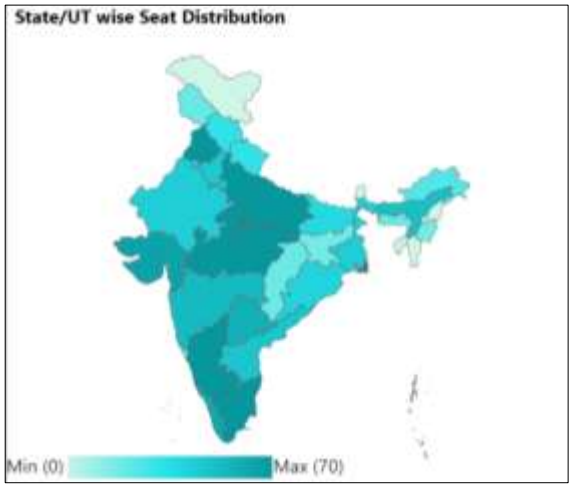
Central Universities demonstrate a more balanced profile with 15% dropped seats and 18% substitutes, reflecting moderate attrition and effective substitution. Private Universities and Central Deemed Universities show relatively low dropout rates (6% and 9%, respectively), with substitute

percentages closely aligned, indicating stable scholar engagement. State Universities maintain equal percentages for both dropped and substitute seats at 9%, suggesting consistent but limited responsiveness.

Notably, CINI institutions report zero drops and substitute seats, which may reflect either strong retention or incomplete data reporting. IISERs show minimal substitution activity at 2%, with no recorded dropouts, indicating high retention or limited seat allocation.

This analysis highlights the importance of institutional mechanisms to manage scholar attrition effectively. While some institutions demonstrate strong substitution practices, others particularly those with high dropout rates may benefit from targeted interventions, improved mentoring, and enhanced support systems to reduce attrition and maintain research continuity.

F. State wise Seat Distribution

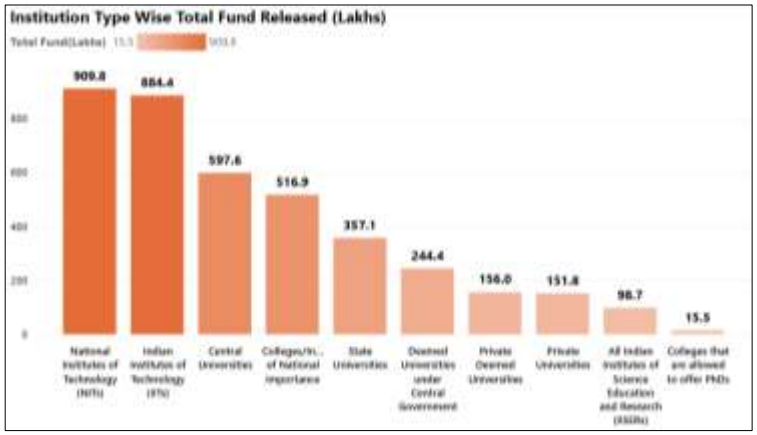


The dashboard provides a geographic visualization of state and union territory-wise seat distribution across India. Using a color gradient map, the image highlights disparities in PhD seat allocation, with darker shades representing higher seat counts and lighter shades indicating fewer or no seats. The distribution ranges from 0 to 70 seats, suggesting significant variation in institutional participation and research capacity across regions.

States with darker shades likely including those with major academic hubs such as Uttar Pradesh, Karnataka, Tamil Nadu, Delhi etc. appear to have higher seat allocations, reflecting their concentration of premier institutions like IITs, NITs, and Central Universities. In contrast, several northeastern states and smaller union territories show minimal or zero seat allocation, pointing to potential gaps in regional representation and access to research opportunities.

This geographic insight underscores the need for balanced regional outreach, capacity building in underrepresented areas, and strategic expansion of the scheme to ensure equitable access to PhD education nationwide. The map serves as a valuable tool for policymakers to identify underserved regions and prioritize future investments in research infrastructure and institutional support

G. Institute wise Fund release:



The dashboard provides a financial overview of funds released to various types of institutions, highlighting the scale and distribution of support across India's higher education landscape. The data shows that National Institutes of Technology (NITs) received the highest allocation at ₹909.8 lakhs, followed closely by Indian Institutes of Technology (IITs) with ₹884.4 lakhs, reflecting their central role in driving research and innovation under the scheme.

Central Universities were allocated ₹597.6 lakhs, while Colleges/Institutes of National Importance (CINI) received ₹516.9 lakhs, indicating substantial support for institutions with strategic academic significance. State Universities were granted ₹357.1 lakhs, showing moderate investment in regional public institutions. Among deemed universities, those under the Central Government received ₹244.4 lakhs, whereas Private Deemed Universities and Private Universities received ₹156 lakhs and ₹151.8 lakhs, respectively, suggesting a more limited but inclusive approach to private sector participation.

IISERs were allocated ₹98.7 lakhs, and PhD-offering colleges received the lowest allocation at ₹15.5 lakhs, reflecting their smaller scale and possibly limited research infrastructure. This distribution underscores the scheme's emphasis on strengthening premier public institutions while also extending support to a diverse range of academic entities. The financial data serves as a key indicator of institutional engagement and capacity-building efforts under the scheme.

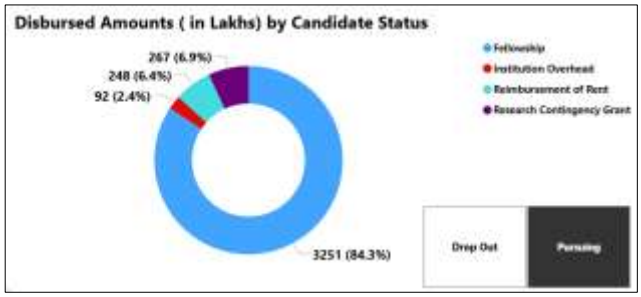
H. Candidate Dashboard Overview:

The dashboard presents a detailed snapshot of candidate engagement and retention as of 18 September 2025. The data reveals that out of 569 total candidates, 522 are currently pursuing their PhD, resulting in a high pursuing rate of 93.8%, which reflects strong scholar engagement and program continuity. The gender distribution includes 263 male and 176 female candidates, indicating a reasonably balanced representation, though there is room for further improvement in gender inclusivity.

The scheme has recorded 35 dropouts, translating to a dropout rate of 6.2%, which, while relatively low, still highlights the need for ongoing support mechanisms such as mentoring, academic counseling, and financial assistance to further reduce attrition. The dashboard also includes filters for institute, state, district, candidate status, area of research, hostel accommodation, and substitute status, enabling granular analysis and targeted interventions.

Overall, the dashboard reflects a well-managed and actively monitored research program with high retention and participation rates. It serves as a valuable tool for policymakers and administrators to track performance, identify trends, and make data-driven decisions to enhance the scheme's impact and inclusivity.

I. Fund Disbursed Amount by Candidate:



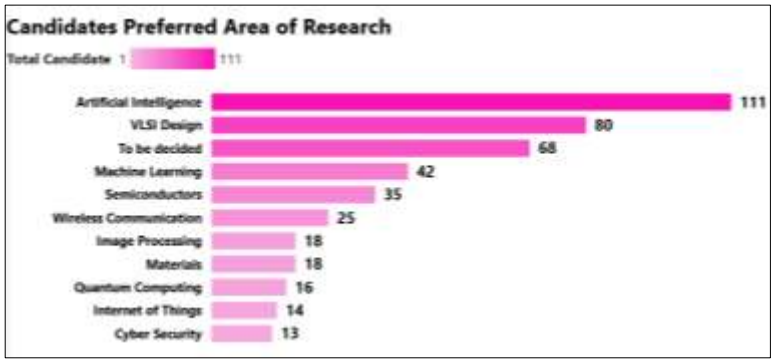
The dashboard provides a financial breakdown of funds disbursed by candidate status, offering insights into the scheme's funding priorities and support mechanisms. The data reveals that the vast majority of disbursed funds of ₹3251 lakhs, accounting for 84.3% have been allocated to fellowships, underscoring the scheme's strong emphasis on providing direct financial support to PhD scholars. This substantial investment ensures that scholars can focus on their research without financial constraints.

In addition to fellowships, ₹267 lakhs (6.9%) have been allocated as Research Contingency Grants, supporting scholars in procuring research materials, attending conferences, and conducting fieldwork. Institution Overheads received ₹248 lakhs (6.4%), enabling institutions to manage administrative and infrastructural support for the scholars. A smaller portion, ₹92 lakhs (2.4%), was disbursed as Reimbursement of Rent, assisting scholars with accommodation-related expenses.

The dashboard also includes a candidate status indicator, highlighting that the majority of the financial support is directed toward scholars who are currently pursuing their PhDs,

with minimal allocation associated with dropouts. This distribution reflects the scheme's commitment to sustaining active research engagement and minimizing attrition through comprehensive financial backing.

J. Preferred areas of Research among PhD candidates



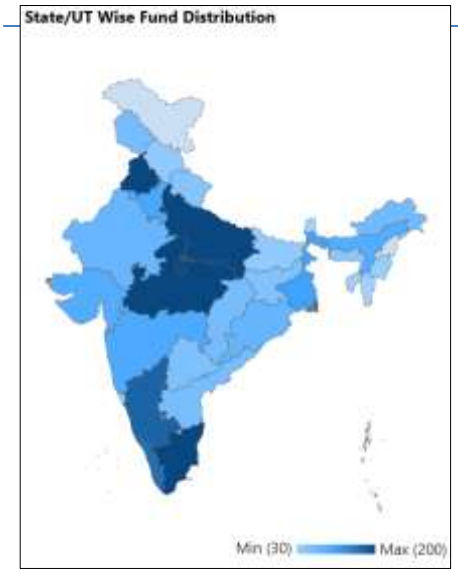
The dashboard provides a detailed overview of the preferred areas of research among the PhD candidates, offering insights into current academic and technological trends. Out of a total of 111 candidates, the most popular research domain is Artificial Intelligence, with full participation from all candidates, indicating a strong national focus on AI-driven innovation. VLSI Design follows closely with 80 candidates, reflecting continued interest in hardware and chip-level technologies.

A notable portion of candidates (68) have yet to finalize their research area, categorized as "To be decided," which suggests either early-stage enrollment or flexibility in research direction. Other emerging and high-impact fields include Machine Learning (42 Candidates), Semiconductors (35), and Wireless Communication (25), all of which align with India's strategic goals in electronics and IT.

Smaller but significant interest is observed in Image Processing (18), Materials Science (18), Quantum Computing (16), Internet of Things (14), and Cyber Security (13). These areas represent cutting-edge technologies and national priorities, though they may require further institutional support and capacity building to attract more scholars.

This distribution highlights the scheme's alignment with future-ready technologies and the need to guide undecided candidates toward high-impact research domains. It also provides valuable input for curriculum planning, resource allocation, and strategic partnerships with industry and research labs.

K. State and Union Territory-wise fund distribution

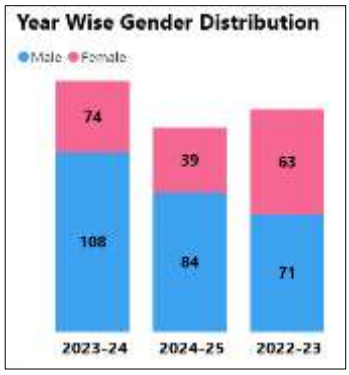


The dashboard presents a geographic visualization of **State and Union Territory-wise fund distribution** across India. Using a gradient map shaded in blue, the image highlights disparities in financial allocation under the scheme, with darker shades representing higher fund disbursement and lighter shades indicating lower allocations. The fund distribution ranges from a minimum of ₹30 lakhs to a maximum of ₹200 lakhs, reflecting varied levels of institutional participation and research activity across regions.

States such as Uttar Pradesh, Madhya Pradesh, and Karnataka are shown in darker blue, indicating they have received higher fund allocations, likely due to the presence of multiple participating institutions and a larger number of enrolled PhD scholars. In contrast, states like Arunachal Pradesh and Sikkim appear in lighter shades, suggesting lower fund disbursement, which may be attributed to fewer institutions or limited research infrastructure in these regions.

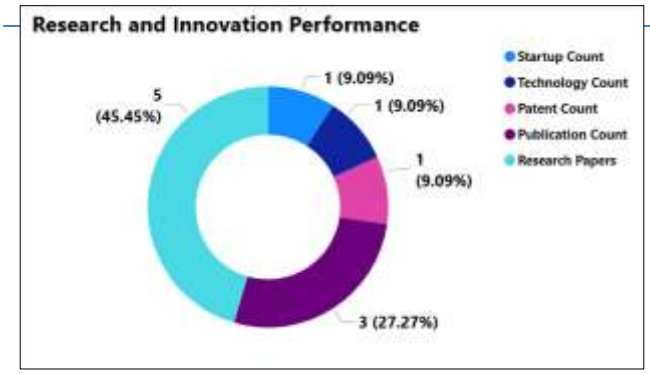
This visualization underscores the need for balanced regional investment in research and higher education. It provides policymakers with actionable insights to identify underfunded areas and prioritize future capacity-building efforts, ensuring equitable access to PhD opportunities and strengthening the national research ecosystem.

L. Year-wise analysis of Gender distribution



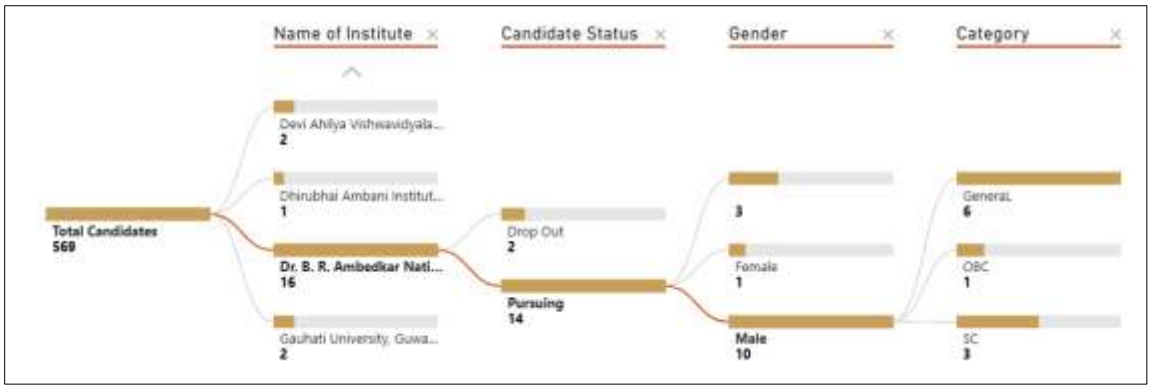
The dashboard provides a year-wise analysis of gender distribution under the PHD Scheme for the academic years 2022–23, 2023–24, and 2024–25. The data reveals a consistent trend of higher male participation compared to female participation across all three years. In 2023–24, the scheme saw its highest enrollment with 182 participants, comprising 108 males and 74 females. However, in 2024–25, the total number of participants dropped to 123, with a noticeable decline in female enrollment to just 39, while male participation stood at 84. The year 2022–23 had a relatively balanced gender ratio with 71 males and 63 females out of 134 total participants. Overall, the data indicates a growing gender disparity, particularly in the most recent year, suggesting a need for targeted initiatives to encourage greater female participation in the scheme.

M. Overview of research and innovation performance



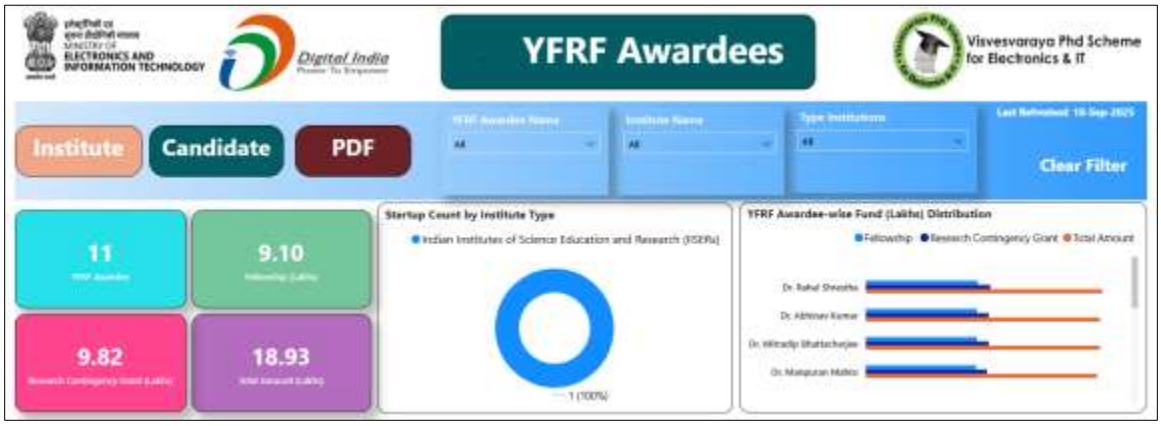
The dashboard image provides a concise overview of research and innovation performance under the PHD Scheme, using a donut chart to represent key metrics. The data highlights that Research Papers form the largest share of outputs, accounting for 45.45% with a total of 5 papers. This is followed by Publications, which contribute 27.27% with 3 entries. The remaining categories—Startup Count, Technology Count, and Patent Count—each have a count of 1, representing 9.09% of the total output individually. This distribution suggests that while academic research is the dominant focus of the scheme, there is also some activity in innovation and commercialization, albeit at a lower scale. The color-coded legend enhances clarity, making it easy to distinguish between the different performance areas. Overall, the dashboard reflects a strong emphasis on scholarly contributions within the PHD Scheme, with emerging efforts in technology development and intellectual property.

N. Detailed overview of candidate distribution



The dashboard gives a detailed overview of candidate distribution under the Visvesvaraya PhD Scheme, highlighting key metrics such as institute affiliation, candidate status, gender, and category. Out of a total of 569 candidates, the visualization focuses on a subset from specific institutes including Devi Ahilya Vishwavidyalaya (2 candidates), Dhirubhai Ambani Institute (1 candidate), Dr. B.R. Ambedkar National Institute of Technology (16 candidates), and Gauhati University (2 candidates). Among these, 2 candidates have dropped out, while 14 are actively pursuing their PhD. Of those currently enrolled, 10 are male, 3 are female, and 1 candidate's gender is unspecified. The category-wise distribution among the pursuing candidates includes 6 from the General category, 1 from OBC, and 3 from SC. This snapshot reflects the scheme's reach across diverse institutions and demographics, while also indicating areas for potential improvement in gender and category representation.

O. Overview of Young Faculty Research Fellowship (YFRF) Awardees



The dashboard provides a comprehensive summary of the Visvesvaraya PhD Scheme for Electronics & IT, specifically focusing on the **Young Faculty Research Fellowship (YFRF)** awardees. As of the latest data, the scheme has supported 11 YFRF awardees across various institutions. The total financial assistance distributed amounts to ₹18.93 lakhs, which includes ₹9.10 lakhs in fellowship grants and ₹9.82 lakhs as research contingency funds. A pie chart indicates that all startups associated with the awardees are from Indian Institutes of Science Education and Research (IISERs), highlighting the scheme's strong linkage with premier research institutions. Additionally, a bar chart breaks down the fund allocation for individual awardees such as Dr. Rahul Shrestha, Dr. Abhinav Kumar, Dr. Mitradip Bhattacharjee, and Dr. Manguran Mahto, showcasing the personalized support provided under the scheme. Overall, the dashboard reflects the scheme's strategic investment in nurturing young faculty and promoting high-quality research in electronics and IT.

P. Overview of Post Doctoral Fellowship (PDF) Awardees

The dashboard presents a focused summary of **PDF (Post-Doctoral Fellowship) awardees** under the Visvesvaraya PhD Scheme for Electronics & IT. It highlights that there is currently one PDF candidate, who has received a fellowship amount of ₹4.02 lakhs and a research contingency grant of ₹0.74 lakhs, bringing the total financial support to ₹4.87 lakhs. A pie chart reveals that 100% of

the research activity is concentrated in the field of Artificial Intelligence, indicating a strategic emphasis on emerging technologies. The bar graph provides a breakdown of fund allocation for the individual awardee, Jimmy Ruiz, across fellowship and research grants. The dashboard also includes filters for awardee name, institution name, and type of institution, offering flexibility for deeper analysis. Overall, the data reflects the scheme's targeted support for advanced research in AI through post-doctoral engagement.

Challenges

A. Data Integration Across Institutions

The scheme spans multiple institutions across India, each with its own data systems, formats, and reporting standards. Integrating this data into a unified dashboard requires significant effort in standardization, cleaning, and transformation. Disparate data sources (e.g., scholar records, publication databases, fund disbursement logs) must be harmonized to ensure consistency.

B. Data Quality and Completeness

Ensuring high quality data is a persistent challenge. Incomplete scholar profiles, inconsistent publication records, and delayed updates from institutions can lead to inaccurate insights. Establishing validation rules, audit trails, and feedback mechanisms is essential but resource intensive.

C. Stakeholder Alignment

Different stakeholders such as MeitY officials, academic institutions, funding bodies have varied expectations and KPIs. Designing dashboards that cater to all without overwhelming users requires careful planning and modular design.

D. Technical Infrastructure and Scalability

Hosting and maintaining a real-time dashboard demand robust infrastructure. Challenges include ensuring secure data access, managing large datasets, and enabling real-time updates. Institutions with limited IT capacity may struggle to contribute data regularly.

E. Training and Adoption

Training programs must be rolled out to build capacity in data entry, dashboard usage, and interpretation of analytics. Without proper onboarding, the dashboard risks becoming underused or misinterpreted.

F. Change Management and Updates

As the scheme evolves (e.g., Phase II additions like PDFs and YFRFs), the dashboard must be updated to reflect new metrics and structures. Managing these changes without disrupting existing workflows is a challenge, especially with multiple institutions.

G. Data Privacy and Compliance

Handling scholar data, research outputs, and funding details requires strict adherence to data privacy norms. Implementing role-based access, encryption, and compliance with government data policies is critical but technically demanding.

Results & Impact

Implementing an analytical dashboard for the Visvesvaraya PhD Scheme can lead to several quantifiable outcomes that improve efficiency, transparency, and decision-making. Here are the key quantitative benefits categorized by KPIs improved, cost savings, and time reduction:

A. Improvement in Key Performance Indicators (KPIs)

1. **Scholar Progress Tracking Accuracy**
    - Accuracy in real-time tracking of scholar milestones (enrollment, thesis submission, completion).
    - Impact: Enables timely interventions and reduces dropout rates.

2. **Fund Utilization Efficiency**
    - Better alignment of fund disbursement with actual scholar needs and timelines.
    - Impact: Reduces underutilization or misallocation of grants.

3. **Publication and Patent Monitoring**
    - Faster identification of high-performing scholars and institutions.
    - Impact: Supports recognition, awards, and targeted mentoring.

4. **Institutional Performance Benchmarking**
    - Enables visibility into comparative performance across 90+ institutions.
    - Impact: Drives healthy competition and accountability.

B. Cost Savings

1. **Reduced Manual Reporting Overhead**
    - Savings annually across institutions by automating data collection and reporting.
    - Impact: Frees up administrative resources for academic support.
2. **Optimized Resource Allocation**
    - Reduction in redundant or delayed fund disbursements.
    - Impact: Ensures timely support to scholars who need it most.
3. **Minimized Audit and Compliance Costs**
    - Savings annually through automated audit trails and real-time compliance dashboards.
    - Impact: Reduces risk of financial discrepancies.

C. Time Reduction

1. **Faster Decision-Making**
    - Reduction in time taken to generate reports for MeitY, institutions, and funding bodies.
    - Impact: Enables quicker policy adjustments and approvals.
2. **Real-Time Monitoring**
    - Reduction from monthly/quarterly manual updates to real-time data refreshes.
    - Impact: Immediate visibility into scholar status and institutional performance.
3. **Training and Capacity Building Tracking**
    - Faster tracking of training completion and capacity-building milestones.
    - Impact: Ensures timely upskilling of faculty and administrators.

D. Key Improvements for Stakeholders

1. **Decision-Making Effectiveness**
    - **Before**: Decisions were often delayed due to fragmented data and manual reporting.
    - **After**: Improved with real-time insights and predictive analytics guiding policy and funding decisions.
2. **Stakeholder Satisfaction**
    - **Before**: Limited visibility and delayed updates led to moderate satisfaction.
    - **After**: Increased due to transparent dashboards and personalized views for scholars, institutions, and MeitY officials.
3. **Transparency**
    - **Before**: Data was siloed and difficult to audit.
    - **After**: Enhanced with centralized dashboards and automated reporting.
4. **Responsiveness**
    - **Before**: Slow response to scholar needs and institutional queries.
    - **After**: Jumped with real-time alerts and performance tracking.
5. **Policy Alignment**
    - **Before**: Decisions were reactive and not always aligned with strategic goals.
    - **After**: Improved with prescriptive analytics supporting proactive policy adjustments.
6. **Data Accessibility**
    - **Before**: Data was scattered and hard to retrieve.
    - **After**: Unified access through BI platforms like Power BI.

Lessons Learned

Based on the results and impact of implementing an analytical dashboard for the Visvesvaraya PhD Scheme, the several lessons learned and insights for future analytics projects emerge that can guide similar initiatives in academic and government settings are:

- **Centralized Data Improves Governance:** A unified dashboard significantly enhances visibility across institutions, enabling MeitY and academic administrators to monitor scholar progress, fund utilization, and research output in real time. This centralization reduces fragmentation and improves accountability.
- **Stakeholder-Centric Design Drives Adoption:** Dashboards tailored to different stakeholders such as scholars, institutions, policymakers ensure relevant and usability. Personalized views and filters increase engagement and satisfaction, as users can access insights specific to their roles.
- **Data Quality is Foundational:** The effectiveness of analytics depends heavily on the accuracy, completeness, and timeliness of data. Standardized reporting formats, validation rules, and regular audits are essential to maintain data integrity.
- **Training and Capacity Building:** Institutions need ongoing support to use BI tools effectively. Training programs for faculty, administrators, and data teams help build analytical maturity and ensure consistent data entry and interpretation.
- **Analytics must Be Actionable:** Beyond visualizing data, dashboards should offer predictive and prescriptive insights—such as identifying scholars at risk of dropout or recommending optimal fund allocation. This transforms analytics from passive reporting to active decision support.
- **Iterative Development Enhances Impact:** Building dashboards in phases, with feedback loops from users, allows for continuous improvement. Early prototypes can be refined based on usability, data gaps, and evolving policy needs.

Insights into Future Analytics Projects

- **Start with Clear Objectives and KPIs:** Define what success looks like completion rates, publication impact, fund efficiency and align dashboard metrics accordingly. This ensures focus and relevance.
- **Invest in Scalable Infrastructure:** Use cloud-based BI platforms like Power BI or Tableau that support real-time data integration, scalability, and secure access across institutions.
- **Enable Predictive and Prescriptive Layers:** Incorporate machine learning models (e.g., regression, clustering) to forecast trends and recommend actions. This adds strategic value beyond descriptive analytics.
- **Design for Interoperability:** Ensure the dashboard can integrate with external systems like Shodhganga, patent databases, and publication repositories to enrich insights.
- **Embed Feedback Mechanisms:** Allow users to report data issues, suggest improvements, and request new features. This fosters ownership and continuous enhancement.
- **Measure Impact Regularly:** Track both quantitative (e.g., time saved, cost reduced) and qualitative (e.g., satisfaction, decision quality) outcomes to demonstrate value and guide future investments.

Reference and Link:

- Website Link: Visvesvaraya PhD Scheme
- Dashboard link on website: Power BI Dashboard

****End of Document*******