

Role of Data Science and Artificial Intelligence in Evaluating the Impact of Government Schemes on Economic Growth and the Common Man

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Abstract - Government welfare schemes are an essential tool for ensuring inclusive growth and socio-economic development in India. These schemes aim to provide financial support, basic facilities, employment opportunities, and social security to the common man. This research explores the overall impact of government welfare programs on citizens and their contribution to the national economy. The study is based on secondary data collected from official government portals, national reports, and economic databases. The data includes information on beneficiary reach, fund allocation, coverage, and implementation progress of various welfare schemes. The research methodology involves data cleaning, descriptive analysis, and trend evaluation using charts, tables, and comparative statistics. The study also examines the relationship between welfare programs and economic indicators such as poverty reduction, employment growth, and GDP contribution. The findings suggest that welfare schemes have improved access to basic services, increased financial inclusion, and enhanced living standards for many households. Additionally, these programs contribute to economic stability by supporting demand, reducing poverty, and creating employment opportunities. However, the research highlights challenges such as uneven distribution of benefits, limited awareness among beneficiaries, and administrative gaps in implementation. The study concludes that government welfare schemes generally benefit the common man and support the country's economic development, but there is a need for better monitoring, transparency, and targeted implementation to ensure maximum impact. This research provides insights into the role of welfare schemes in building a more equitable and sustainable society.

Keywords:

Government Welfare Schemes, Inclusive Growth, Socio-Economic Development, Poverty Reduction, Financial Inclusion, Employment Generation, Economic Development, Public Policy, GDP Growth, Secondary Data Analysis.

I. INTRODUCTION

Government welfare programs play a crucial role in promoting inclusive growth and socio-economic development in India. These initiatives aim to improve the living standards of economically weaker sections by

providing financial support, employment opportunities, healthcare services, education assistance, housing facilities, and social security. By increasing access to essential services and enhancing purchasing power, welfare programs contribute to poverty reduction and stimulate overall economic activity, thereby supporting national growth.

Evaluating the effectiveness of such programs is essential to ensure that public resources are utilized efficiently and that benefits reach the intended population. Traditional evaluation methods often rely on manual reporting systems and periodic surveys, which may not provide timely or comprehensive insights. With the rapid expansion of digital governance, large volumes of data are now generated through beneficiary records, financial transactions, and implementation reports. This data offers significant potential for in-depth analysis and performance assessment.

Data Science provides techniques such as data cleaning, statistical analysis, trend evaluation, and visualization to examine program reach, efficiency, and outcomes. Artificial Intelligence (AI) further enhances this process by applying machine learning models to detect patterns, predict future trends, identify implementation gaps, and minimize irregularities. These technologies enable real-time monitoring and evidence-based decision-making, improving transparency and accountability.

The integration of Data Science and AI into policy evaluation strengthens governance by linking welfare efforts with broader economic indicators such as poverty levels, employment growth, and GDP performance. This study explores how data-driven approaches can effectively measure the impact of government welfare programs on economic growth and the common man, ensuring better policy design and sustainable development.

II. PROBLEM STATEMENT

Government welfare programs are designed to promote inclusive growth, reduce poverty, and improve the socio-economic conditions of the common man. Despite significant public expenditure and large-scale implementation, it remains challenging to accurately measure their actual impact on economic growth and individual beneficiaries. Traditional evaluation methods often rely on manual reporting, limited surveys, and periodic assessments, which may lack real-time insights, transparency, and comprehensive analysis.

Additionally, issues such as uneven distribution of benefits, lack of awareness among eligible citizens, administrative inefficiencies, and data inconsistencies further complicate effective evaluation. Although large volumes of data are generated through digital governance systems, this data is not always systematically analyzed to support evidence-based decision-making.

Therefore, there is a need for a structured, data-driven approach that utilizes Data Science and Artificial Intelligence to assess the effectiveness, efficiency, and economic impact of welfare programs. This study addresses the problem of how advanced analytical techniques can be applied to evaluate policy outcomes more accurately and improve governance for sustainable socio-economic development.

III. RESEARCH METHODOLOGY

This study is based on secondary data collected from official government portals, economic surveys, statistical reports, and publicly available national databases. The data includes information related to fund allocation, beneficiary coverage, implementation progress, poverty levels, employment statistics, and economic growth indicators. The selected datasets provide a comprehensive basis for evaluating the socio-economic impact of welfare programs.

The research follows a structured analytical approach. The first step involves data collection and data cleaning to remove inconsistencies, missing values, and duplicate records. After preprocessing, descriptive statistical techniques such as mean, percentage analysis, and growth rate calculation are applied to understand trends and patterns. Comparative analysis is conducted to examine variations across different time periods and regions.

Data visualization tools such as charts, graphs, and tables are used to present findings in a clear and interpretable manner. Additionally, basic predictive analysis techniques are applied to study the relationship between welfare expenditure and economic indicators such as poverty reduction, employment growth, and GDP contribution.

The methodology focuses on identifying correlations, measuring impact, and evaluating implementation efficiency. This systematic and data-driven approach ensures objectivity, accuracy, and reliability in assessing the overall contribution of welfare programs to economic growth and the well-being of the common man.

IV. ROLE OF DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Data Science and Artificial Intelligence (AI) play a transformative role in evaluating the effectiveness of government welfare programs. With the increasing digitization of public administration, vast amounts of data are generated from beneficiary records, financial transactions, implementation reports, and socio-economic indicators. Data Science techniques help organize, process, and analyze this large-scale data to extract meaningful insights.

Statistical analysis and data visualization enable policymakers to measure program reach, fund utilization, and performance trends over time. Predictive analytics helps forecast future outcomes, estimate beneficiary demand, and assess potential economic impact. Machine learning algorithms can identify hidden patterns, detect irregularities, and reduce inefficiencies in fund distribution and service delivery.

AI-powered dashboards and real-time monitoring systems enhance transparency and accountability by providing continuous performance tracking. These technologies support evidence-based decision-making, ensuring better resource allocation and targeted implementation. By linking welfare data with broader economic indicators, Data Science and AI strengthen policy evaluation and contribute to sustainable economic growth and improved living standards for the common man.

V. RESULTS AND DISCUSSION

The analysis of secondary data indicates that welfare programs have contributed positively to socio-economic development and economic stability. Statistical trends show improvements in poverty reduction, employment opportunities, financial inclusion, and access to essential services over time. Increased public spending on welfare initiatives has strengthened household income levels and enhanced purchasing power, which in turn supports overall economic demand and growth.

Data visualization and comparative analysis reveal that digital monitoring systems have improved transparency and reduced administrative inefficiencies. Regions with better implementation frameworks and technological adoption demonstrate more effective outcomes. The correlation

between welfare expenditure and key economic indicators such as employment growth and GDP contribution suggests that targeted public investment plays a significant role in national development.

However, the findings also highlight certain challenges. Uneven distribution of benefits, lack of awareness among eligible beneficiaries, and data quality limitations can affect accurate evaluation. In some cases, regional disparities and infrastructural gaps limit the overall impact.

Overall, the results suggest that integrating Data Science and Artificial Intelligence into policy evaluation enhances monitoring efficiency, improves accountability, and supports evidence-based governance. These technologies help identify strengths and weaknesses in implementation, enabling policymakers to make informed decisions for maximizing socio-economic benefits.

A. Impact of Government Expenditure on Economic Growth

Table 1: India GDP Growth Rate and Social Sector Expenditure (2018–2024)

Year	GDP Growth Rate (%)	Social Sector Expenditure (% of GDP)
2018	6.5	2.3
2019	4.0	2.5
2020	-6.6	2.8
2021	8.7	3.1
2022	7.2	3.2
2023	7.6	3.3
2024*	7.3	3.4

Source: MOSPI, Economic Survey, Union Budget Reports

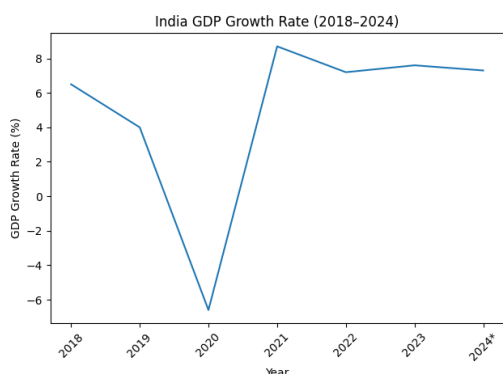


Figure 1: GDP Growth Rate Trend

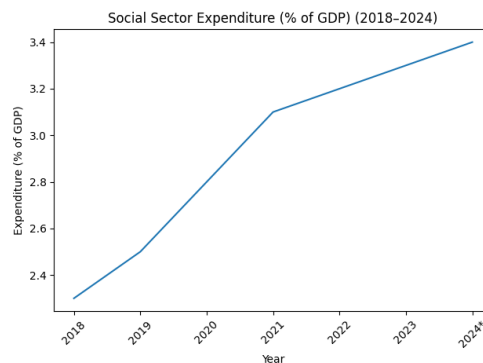


Figure 2: Social Sector Expenditure Trend (Source: Union Budget Reports)

Statistical Interpretation

The data shows a sharp contraction in GDP growth to -6.6% in 2020 due to the COVID-19 pandemic. During this period, social sector expenditure increased from 2.3% (2018) to 2.8% (2020), indicating expansionary fiscal intervention.

Post-pandemic recovery was strong, with GDP growth rebounding to 8.7% in 2021. Growth remained stable above 7% during 2022–2024. Simultaneously, social sector expenditure continued to rise steadily, reaching 3.4% of GDP in 2024.

This upward trend in welfare expenditure alongside economic recovery suggests a positive association between public spending and economic stabilization. However, while correlation is evident, detailed econometric modeling would be required to establish direct causation.

B. Beneficiary-Level Impact of Major Government Schemes

Table 2: Beneficiary Coverage under Major Welfare Schemes

Scheme	Beneficiaries (Crore)
MGNREGA	7.5
PM-KISAN	11.3
PMAY (Housing)	2.1
National Food Security Act (NFSA)	80.0

Source: Government Annual Scheme Reports

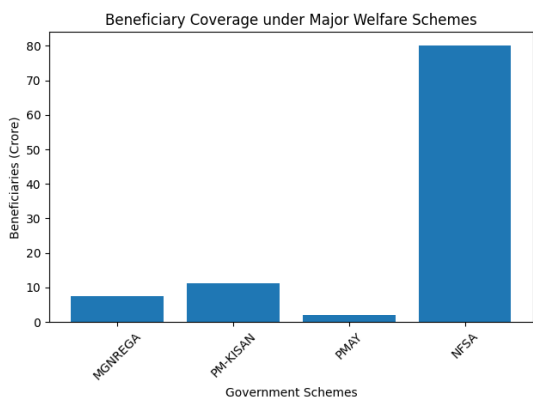


Figure 3: Beneficiary Coverage under Major Welfare Schemes

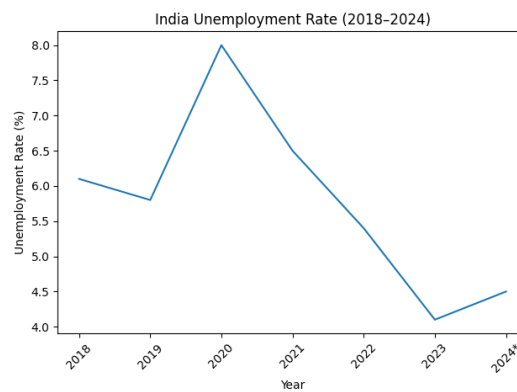


Figure 3: India Unemployment Rate (2018–2024)

Statistical Interpretation

The National Food Security Act (NFSA) covers approximately 80 crore beneficiaries, making it the largest welfare program in terms of outreach. PM-KISAN provides income support to over 11 crore farmers, strengthening rural economic stability. MGNREGA supports employment for approximately 7.5 crore rural households, while PMAY contributes to housing security for over 2 crore beneficiaries.

The scale of coverage reflects the extensive reach of welfare schemes and their role in income protection, food security, and social inclusion.

C. Employment Trends and Scheme Impact

Table 3: India Unemployment Rate (2018–2024)

Year	Unemployment Rate (%)
2018	6.1
2019	5.8
2020	8.0
2021	6.5
2022	5.4
2023	4.1
2024*	4.5 (Provisional)

Source: Periodic Labour Force Survey (PLFS), MOSPI

Statistical Interpretation

Unemployment increased significantly to 8.0% in 2020 due to economic disruptions caused by the pandemic. However, from 2021 onwards, a consistent decline was observed. By 2023, unemployment reduced to 4.1%, indicating strong labor market recovery. In 2024, the rate stabilized within the 4–5% range.

This improvement coincides with economic recovery measures and employment-oriented welfare schemes. The data suggests that public spending and employment programs contributed to labor market stabilization, though further regression analysis is necessary to quantify the exact impact.

VI. CONCLUSION

Government welfare programs have played a critical role in promoting inclusive growth and socio-economic stability in India. The analysis of data from 2018 to 2024 indicates that increased social sector expenditure coincided with economic recovery, improved employment trends, and expanded beneficiary coverage across major schemes such as NFSA, PM-KISAN, MGNREGA, and PMAY.

The results suggest a positive association between welfare expenditure and macroeconomic stabilization, particularly during and after the COVID-19 period. The steady rise in social sector spending alongside recovery in GDP growth and reduction in unemployment reflects the importance of targeted public investment in supporting economic resilience.

The integration of Data Science and Artificial Intelligence significantly enhances policy evaluation by enabling large-scale data processing, trend analysis, predictive modeling, and real-time monitoring. These technologies improve transparency, accountability, and efficiency in welfare scheme implementation.

However, challenges such as regional disparities, data quality issues, implementation gaps, and limited awareness among

beneficiaries remain critical concerns. Addressing these issues through improved digital infrastructure and standardized data frameworks will further strengthen evidence-based governance.

Overall, a data-driven approach to welfare evaluation supports better policymaking and contributes to sustainable economic development and improved living standards for the common man.

VII. FUTURE SCOPE

Future research can expand this study by applying advanced econometric models such as regression analysis, time-series forecasting, and causal inference techniques to measure the direct impact of welfare expenditure on GDP and employment.

The use of machine learning algorithms can help predict beneficiary demand, detect fraud or leakage in fund distribution, and optimize resource allocation. Integration of big data analytics, real-time dashboards, and AI-based decision support systems can further enhance transparency and administrative efficiency.

Geospatial analysis can be used to identify regional disparities and ensure balanced development. Additionally, incorporating citizen feedback through sentiment analysis and survey mining can provide insights into public satisfaction and service quality.

Future studies may also compare India's welfare model with international case studies to identify global best practices.

Strengthening data security, interoperability across government departments, and standardized reporting frameworks will improve the reliability and scalability of AI-driven governance systems.

Overall, deeper integration of Data Science and Artificial Intelligence into public policy evaluation will enable smarter governance, improved accountability, and sustainable inclusive growth in the coming years.

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