THE IMPACT OF DATA SCIENCE ON GOVERNANCE PRACTICES.docx

by BABAJIDE Obidare

Submission date: 16-Nov-2024 08:27PM (UTC+0000)
Submission ID: 242851210
File name: THE_IMPACT_OF_DATA_SCIENCE_ON_GOVERNANCE_PRACTICES.docx (1.19M)
Word count: 3071
Character count: 18593

THE IMPACT OF DATA SCIENCE ON GOVERNANCE PRACTICES

M.Sc. BUSINESS ANALYTICS 2024/2025

DATA SCIENCE IN PRACTICE(BSOM094-SUN-SI)

BABAJIDE OLADELE OBIDARE
STUDENT ID NUMBER 24826569
SUBMITTED ON 16TH NOV. 2024

Table of Contents

1.0 INTRODUCTION

This review examines the transformative impact of data science on governance practices by analysing a selection of recent journal articles and publications. As governments increasingly utilize data analytics to inform decision-making processes, the effectiveness of public service delivery, policy formulation, and citizen engagement has significantly improved (Schweizerischen et al., 2020; *Guirguis, 2020)*. The issue of ethics like algorithm bias, privacy of data and others are also germane. *(de Witte and Moesen, 2010; Doyle, 2017);*. This review not only highlights the benefits of data-driven governance but also raised emphasis on ethical standard and protocol to prevents potential risks associated with data usage around the public sector.

Data science is gradually emerging as a means of reshaping activities of government in most country of the world and giving it proper direction. Government plays variable roles in governance. Governance is all about steering the economy, the society and actualising the collective goals of the citizens (Katsamunska, 2016). With the rate technology increases and the huge availability of data, it has become necessary for government to take advantage of data science and gain insights to providing good governance. Data science allows you to turn raw material into understanding, insight, and knowledge (Wickham and Grolemund, 2017)*; (Provost and Fawcett, 2013)*. Therefore, the ability for government to take informed decisions to solve the serious citizens' demands around housing, good roads, health care, environmental degradation and lots more, based on empirical data becomes more necessary.

2.0 DISCUSSION AND ANALYSIS

The integration of data science into governance practices presents a multifaceted landscape of opportunities and challenges. As explored in the reviewed literature, the potential benefits of leveraging data science in governance are significant, transforming how governments interact with citizens, develop policies, and deliver services thus: -

*2.1.1 Optimizing Public Service Delivery***:** - Government takes timely, efficient and informed act of service delivery and proper distribution of public goods like healthcare, roads and other social amenities. Also, data can be used to measure performance and identify area of distortion in their program (Rogge *et al.*, 20(Fredriksson, 2018) *(Asatryan and De Witte, 2015)*(Witte *et al.*, n.d.) *(de Witte and Moesen, 2010)*(Cherchye *et al.*, 2010) (De Witte and López-Torres, 2017) This will increase citizen satisfaction in the performance index of the government.(Elgendy et al.,Bughin, J. et al. (2018)

2.1.2 Enhanced Decision-Making and Policy Formulation: **-** By using scientific tools to analyse large datasets, public institutions can identify public-goods needs of each locality and forecast the potential impacts of various policy options. (Mergel *et al.*, 2016) (Mergel *et al.*, 2019)

2.1.3 Transparency and Accountability: **-** Transparency initiatives, such as open data platforms and interactive dashboards, empower people with the required information to engage meaningfully with their governments (Bertot *et al.*, 2010) (Janssen et al., 2017.).

2.1.4 Citizen Engagement and Participation: **-** Policies are owned by the citizens when government engages citizens in the decision-making process. It does not only democratize governance but also ensures that policies are more reflective of community needs and priorities *(Boulton et al., 2022)*. (Olimid, 2014; Thuermer *et al.*, n.d.; Ju *et al.*, n.d.; Mellouli *et al.*, n.d.; Cortés-Cediel *et al.*, n.d.; review and 2015, n.d.)

2.2.0 METHODOLOGY

This review employs a systematic literature review by categorising and summarising existing literatures on a particular topic (Fisch and Block, 2018). Some of the websites searched for material journals were Scopus, Web of Science, The Social Science Journal, including Google Scholar and Sage. The search utilized keywords such as "data science," "governance," "public policy," "citizen engagement," and "data analytics. The review highlights the various data analytics tools used in the journals.

2.3.0 REVIEW FINDINGS AND INTERPRETATIONS

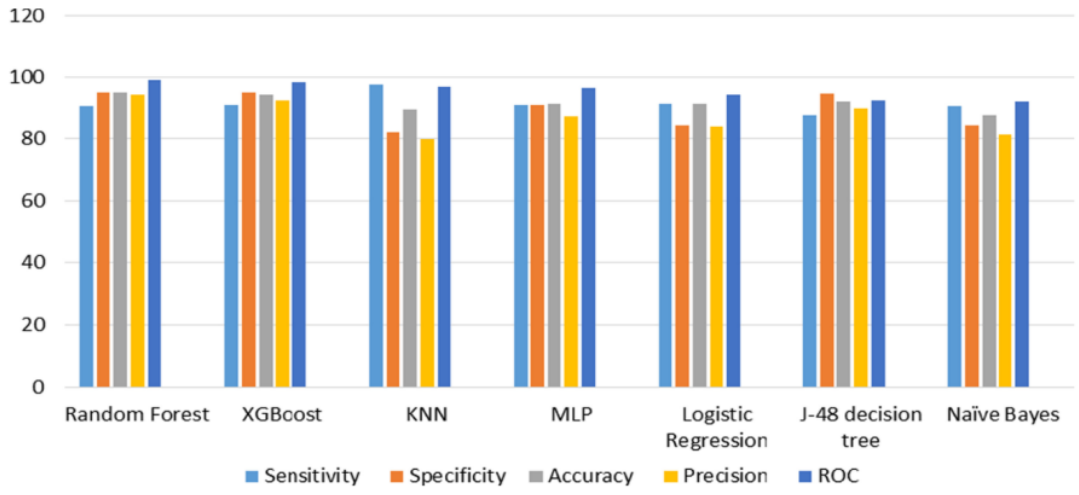
The findings of this review reveal significant insights into how data science and various data analytics tools enhance governance practices. By examining specific applications of these tools, several key themes emerge:

2.3.1 Enhanced Decision-Making through Predictive Analytics

According to Kim *et al.*, 2014, data science can enhance the ability every government institution to take informed decision by using relevant analytical tools.

Machine learning algorithms were used to analyse historical data and predict trends of mortality during COVID-19 (Moulaei *et al.*, 2022). Chart 1

CHART 1 by Moulaei et al., 2022



2.3.2 Optimizing Public Service Delivery with Data Visualization: -

In 2011, Syracuse government and IBM, launched a Smarter City project using data analytics to help predict and prevent vacant residential properties. (Kim *et al.*, 2014). *According to* Nam and Pardo, 2011 smart cities uses information and communications technology (ICT) and data for increased efficiency and improved services for citizens Using Power Bi, for visualisation of the forty-six (46) various department in the United States of America, to assess their performances, it was revealed that the department of commerce performed best. Chart 2 (Batarseh *et al.*, 2018).

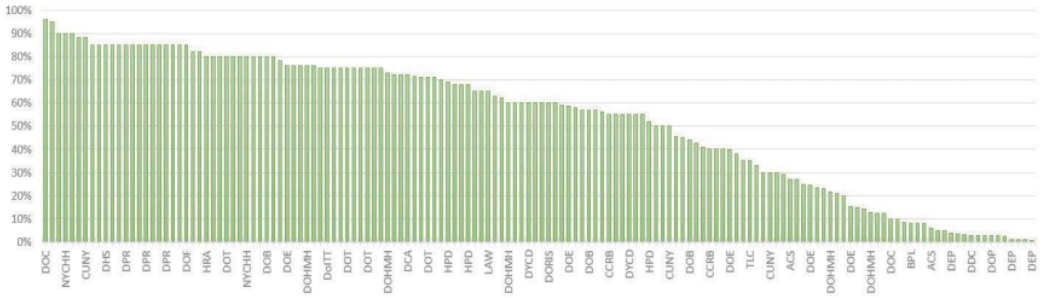


CHART 2 *by Batarsehet al., 2018*

2.3.4 Geospatial Analysis for Urban Planning: **-**

In a comprehensive urban planning initiative, a city utilized Geographical Information Systems (GIS) to identify neighbourhoods lacking adequate public transportation. As a result, new transit routes were introduced, leading to an increase in public transport usage. (Sampaio *et al.*, 2008; Zannat *et al.*, n.d.)

By the application of Spearman rank correlation method in Wuhan City, China showed urban landscape looked more fragmented when clustered in the center of the city due to the negative correlation as shown in Chart 3. (Yin *et al.*, 2018). This revelation allows the government to decongest the urban area by reallocating resources.

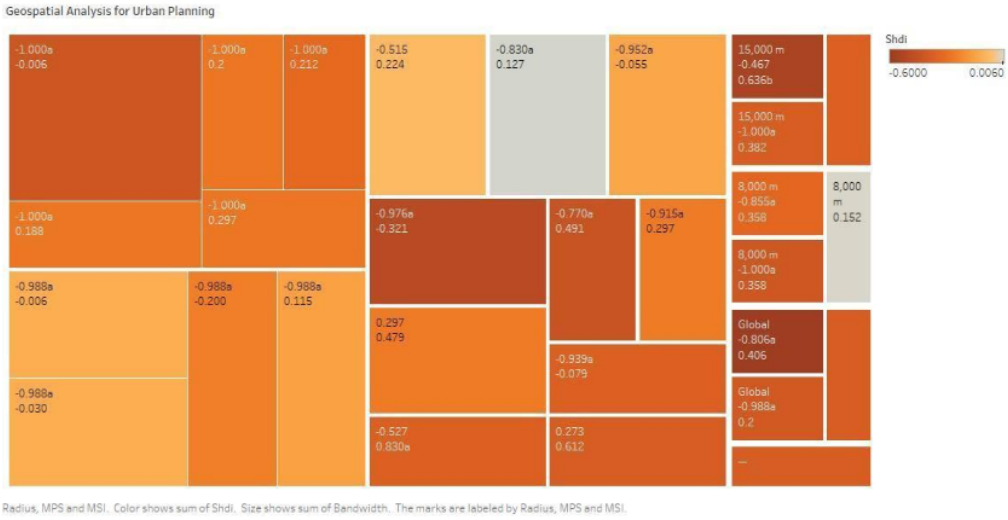


CHART 3 Geospatial Analysis of Urban Planning Using Tableau. Produced by the Author

2.3.5 Improving Citizen Engagement through Sentiment Analysis:

Engagement is defined as the inclusion of the citizens in some areas of community development or regulation of policy or technology. The resolution of air quality issues in part requires the cooperation of citizens, for instance, by reducing private vehicle journeys and using clean fuel sources. (Thuermer et al., n.d.), Rowe & Frewer, 2005

Partial Least Square Structural Equation Modelling (PLS- SEM) was used to analyse the datasets which show a significant link between citizens' engagement initiatives and resource management. Table 3 and Chart 4 (β = 0.579, p-value = 0.000). This means that when communities become more involved and active, it leads to better management of resources. In simple terms, for every 1% increase in citizen engagement, we can expect to see a remarkable 57.9% improvement in how resources are managed (Lawan, n.d.)

DCM= Decision Making; CEI= Citizen Engagement Initiative; RCM= Resource Management; POL= Policy Outcome; SOS= Social Sustainability

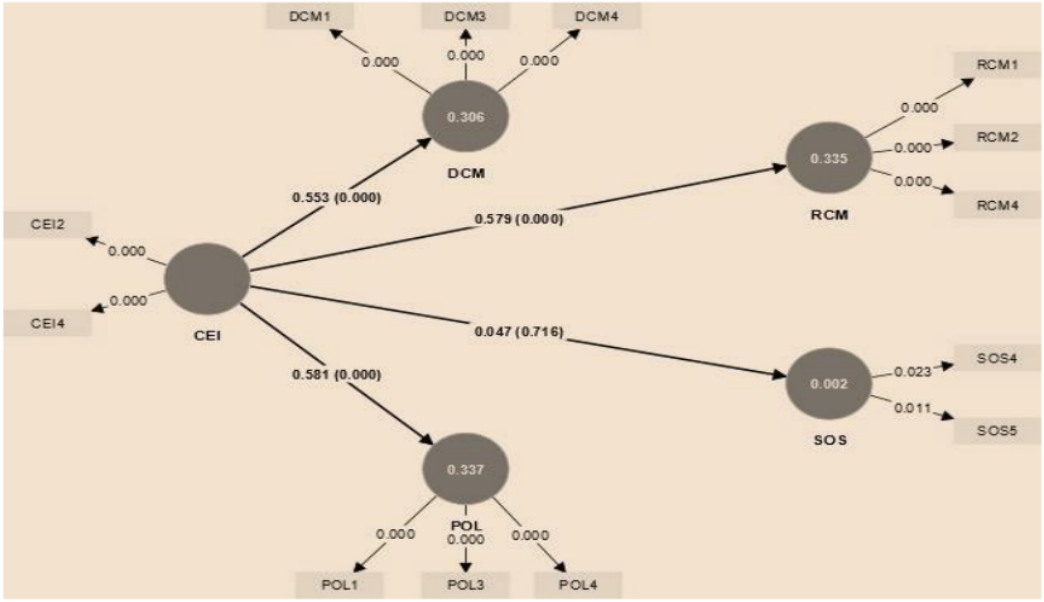


CHART 4 From Journal by Lawan, B. (2024)

	Coeff	Std Error	T-stat	P values
CEI -> DCM	0.553	0.113	4.912	0.000
CEI -> POL	0.581	0.107	5.405	0.000
CEI -> RCM	0.579	0.105	5.52	0.000
CEI -> SOS	0.047	0.129	0.364	0.716

Table 1 Data set from the Journal by Lawan B., (2024)

2.3.6 Data-Driven Crime Prevention Strategy: -

According to *The Economist*, *2013* reported that, to reduce crime, a crime-prediction software was produced by an American company called PredPol. It uses better data to predict crime. At the trial of this software in Los Angeles in 2008, the machine scored 6% compared with human analysts' 3%. (De Witte and López-Torres, 2017; Cherchye *et al.*, 2010; de Witte and Moesen, 2010; Cotton *et al.*, n.d.)

Also, within six months of introducing predictive techniques in the Foothill area of Los Angeles, in late 2011, property crimes had fallen 12% compared with the previous year (chart 5)

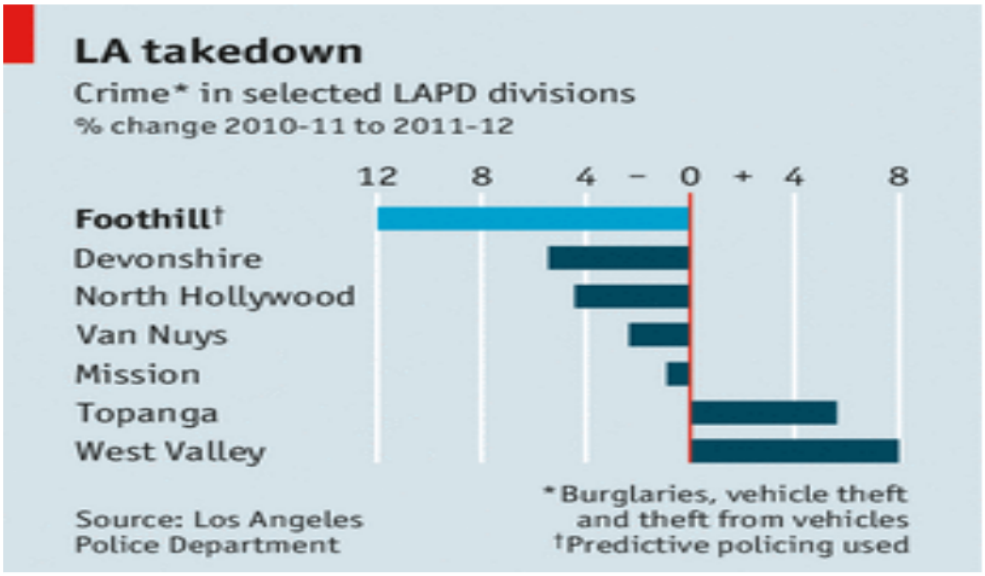


CHART 5 From Los Angeles Police Department

Predpol was also deployed in Kent, UK. It modestly improved crime prediction. Specifically, 8% of crime occurred in the predicted boxes, in comparison of 5% of police analyst predictions. Also, a study by (Anon, 2018) determined that predictive policing could decrease fatalities from 2.9% to 5% and crime incidents from 9.7% to 11.1%, depending on the context of the city in relation with the level of criminality, concentration of crime and efficiency of emergency response. (Shah *et al.*, 2021)(Aguirre *et al.*, 2019)

Utilizing algorithms that analyze historical crime data, governments can identify patterns and predict where crimes are likely to occur. This data-driven approach enables law enforcement agencies to allocate resources more effectively. A metropolitan police department implemented predictive policing software to analyze crime hotspots. By combining datasets from previous incidents, demographic information, and time-series analyses, they were able to reduce crime rates in targeted areas by approximately 20% over six months, improving safety and fostering a collaborative relationship between the police and the community. (Doyle, 2017)

2.4.0 FURTHER INSIGHT

To further this discussion, data was sought from an online data site, called Kaggle. This data is referred to as "2019 Crimes Data". The dataset contains information about reported crimes in various regions in the United State of America through the year 2000-2019. The dataset was collected from official crime statistics sources, police department records, and news articles from reputable sources. They were used in the analysis shown on frequency table in Table 4. Even when the Legislative House at that time was against allocating more funds for the building of prisons, the dataset and the ANOVA chart 6 shows that the growth in population affects increase in crimes and the criminals should be kept away. This allowed for more funds allocation to build more prisons.

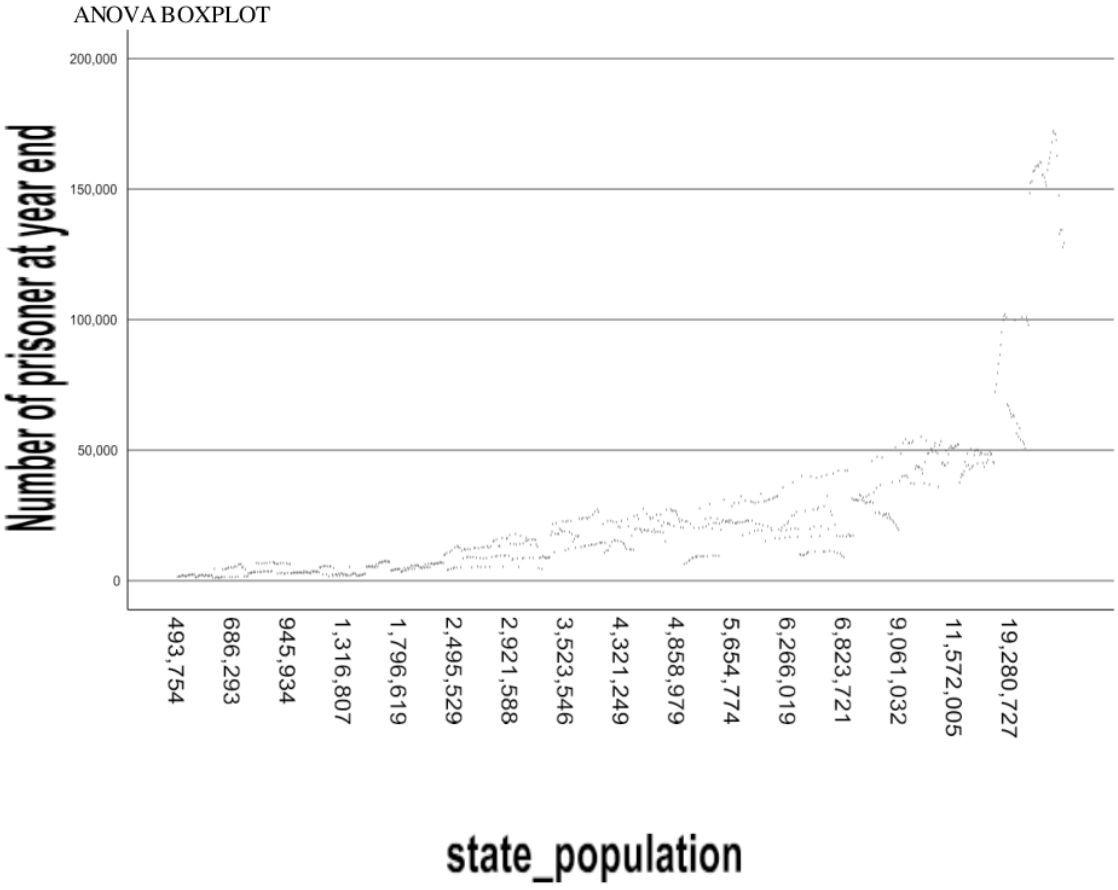


CHART 6 Created by the Author

FREQUENCY TABLE FROM 2019 CRIME DATASET			
		Number of Prisoner at Year End	State Population
N	Valid	802	799
	Missing	0	3
Mean		25,830.49	6,072,322.18
Median		16,371.50	4,314,113.00
Std. Dev		33,359.79	6,725,499.80
Range		176,512	38,802,722
Sum		20,716,052	4,851,785,422

Table 2 DATASET FROM KAGGLE ON CRIMES IN 2019 FROM USA.

Also, in another dataset from Kaggle about Female Employment vs Socioeconomic Factors on population in Bangladesh, Table 3 and Chart 7 shows that the employee female performs better than employer female in the area of vale and fertility. This may likely show that the government was taken good care of the women worker. Also, it could suggest a difficult terrain for female entrepreneur.

Chart 8 gives more insight from the datasets by showing that12.890 women from the population opened personal account in 2009 and increased to 16.70 in 2019. Also, lesser women became less vulnerable from 2006 to 2019.

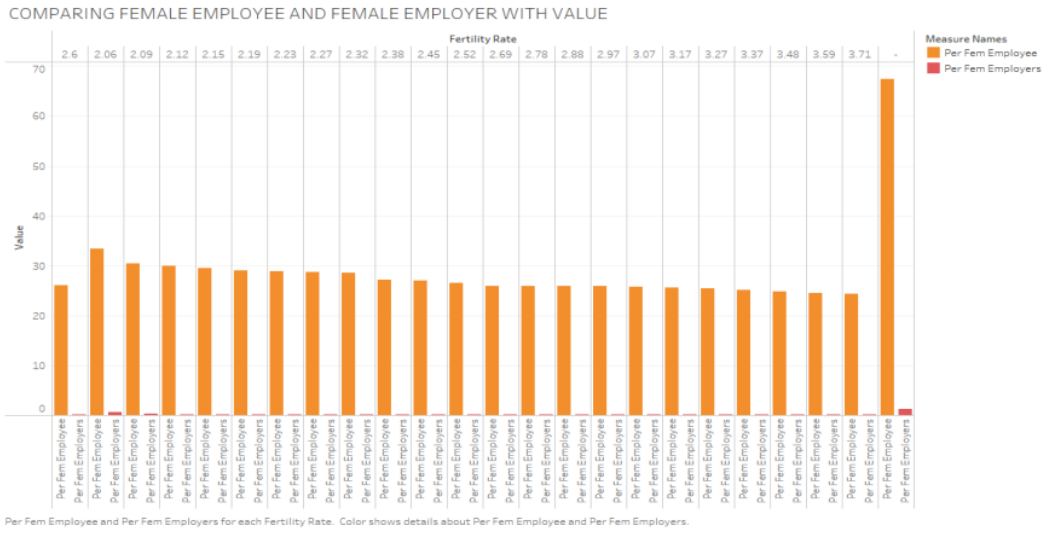


CHART 7 BY THE AUTHOUR

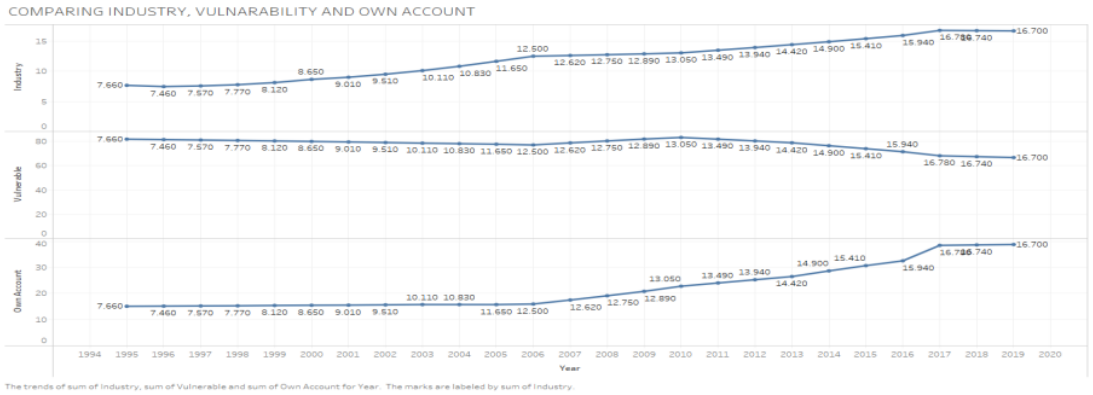


CHART 8 BY THE AUTHOUR

3 CONCLUSIONS

Leveraging data analytics in public organisations, holds incredible promise for making a real difference in people's lives. By using analytics effectively, these organisations can cut costs, enhance the services they provide, foster greater transparency, and support more informed decision-making. With the application of data analytics in their daily operations, public institutions can build trust, improve collaboration from the citizens and other relevant organisation and ultimately create a better and more responsive and engaged public sector that truly works for everyone.

With all the inherent and obvious advantages of using data science in public institutions, ethical challenges must be considered. Data should be used carefully because of the inherent risk. Also, there is serious need for capacity building, both human and technology for the data science to be effective and efficient.

4 REFERENCES

1. Aguirre, K., Badran, E., Muggah, R. (2019) *Igarape Institute Report Part Title: Limitations of crime prediction Report Title: FUTURE CRIME: Report Subtitle: Assessing twenty first century crime prediction*.

2. Anon (2018) *SMART CITIES: DIGITAL SOLUTIONS FOR A MORE LIVABLE FUTURE*.

Asatryan, Z., De Witte, K. (2015) Direct democracy and local government efficiency. *European Journal of Political Economy*. **39**, 58–66.

3. Batarseh, F., Gendron, J., Laufer, R., Madhavaram, M., Kumar, A. (2018) A Context-Driven Data Visualization Engine for Improved Citizen Service and Government Performance. *Modélisation et utilisation du contexte*. **2**(1).

4. Bertot, J.C., Jaeger, P.T., Grimes, J.M. (2010) Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly*. **27**(3), 264–271.

5. Cherchye, L., De Witte, K., Ooghe, E., Nicaise, I. (2010) Efficiency and equity in private and public

education: A nonparametric comparison. *European Journal of Operational Research*. **202**(2), 563–573.

6. Cortés-Cediel, M., … I.C.-S.S., 2021, undefined Analysing citizen participation and engagement in European smart cities. *journals.sagepub.com*.

7. Cotton, H., on, T.K.-2021 international conference, 2021, undefined Using data analytics to forecast violent crime. *ieeexplore.ieee.org*.

8. Doyle, T. (2017) Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy:, by Cathy O'Neil. New York, NY: Crown Publishers, 2016. 272 pp.

9. Elgendy, N., and A.E.-A. in D.Mining.A., 2014, undefined Big data analytics: a literature review paper. *Springer*.

10. Fisch, C., Block, J. (2018) Six tips for your (systematic) literature review in business and management research. *Management Review Quarterly*. **68**(2), 103–106.

11. Fredriksson, C. (2018) Big data creating new knowledge as support in decision-making: practical examples of big data use and consequences of using big data as decision support. *Journal of Decision Systems*. **27**(1), 1–18.

12. Guirguis, K. (2020) From Big Data to Big Performance – Exploring the Potential of Big Data for Enhancing Public Organizations' Performance. A Systematic Literature Review. *Yearbook of Swiss Administrative Sciences*. **11**(1), 55.

13. Janssen, M., Voort, H. Van Der, research, A.W.-J. of business, 2017, undefined Factors influencing big data decision-making quality. *ElsevierM Janssen, H Van Der Voort, A WahyudiJournal of business research, 2017•Elsevier*.

14. Ju, J., Liu, L., Policy, Y.F.-T., 2018, undefined Citizen-centered big data analysis-driven governance intelligence framework for smart cities. *Elsevier*.

15. Katsamunska, P. (2016) The Concept of Governance and Public Governance Theories. *Economic Alternatives*.

16. Kim, G.H., Trimi, S., Chung, J.H. (2014) Big-data applications in the government sector. *Communications of the ACM*. **57**(3), 78–85.

17. Lawan, B. *Assessing the Effectiveness of Citizens Engagement Initiative in Local Government Decission Making Process in Bursari Local Government Area, Yobe State, Nigeria*.

18. Mellouli, S., Luna-Reyes, L., Polity, J.Z.-Inf., 2014, undefined Smart government, citizen participation and open data. *academia.edu*.

19. Mergel, I., Edelmann, N., Haug, N. (2019) Defining digital transformation: Results from expert interviews. *Government Information Quarterly*. **36**(4).

20. Mergel, I., Rethemeyer, R.K., Isett, K. (2016) Big Data in Public Affairs. *Public Administration Review*. **76**(6), 928–937.

21. Moulaei, K., Shanbehzadeh, M., Mohammadi-Taghiabad, Z., Kazemi-Arpanahi, H. (2022)

Comparing machine learning algorithms for predicting COVID-19 mortality. *BMC Medical Informatics and Decision Making*. **22**(1).

22. Nam, T., Pardo, T.A. (2011) Conceptualizing smart city with dimensions of technology, people, and institutions. *ACM International Conference Proceeding Series*, 282–291.

23. Olimid, A.P. (2014) Civic Engagement and Citizen Participation in Local Governance: Innovations in Civil Society Research. *Revista de Ştiinţe Politice. Revue des Sciences Politiques*. (44), 73–84.

24. Provost, F., Fawcett, T. (2013) Data Science and its Relationship to Big Data and Data- Driven Decision Making. *Big data*. **1**(1), 51–59.

25. review, A.F.-P. administration, 2015, undefined Putting the public back into governance: The challenges of citizen participation and its future. *Wiley Online Library*.

26. Rogge, N., Agasisti, T., De Witte, K. (2017) Big data and the measurement of public organizations' performance and efficiency: The state-of-the-art. *https://doi.org/10.1177/0952076716687355*. **32**(4), 263–281.

27. Sampaio, B.R., Neto, O.L., Sampaio, Y. (2008) Efficiency analysis of public transport systems: Lessons for institutional planning. *Transportation Research Part A: Policy and Practice*. **42**(3), 445–454.

28. Schweizerischen, K.G.-J. der, 2020, undefined From big data to big performance– exploring the potential of big data for enhancing public organizations' performance: a systematic literature review. *digitalcollection.zhaw.ch*.

29. Shah, N., Bhagat, N., Shah, M. (2021) Crime forecasting: a machine learning and computer vision approach to crime prediction and prevention. *Visual Computing for Industry, Biomedicine, and Art*. **4**(1).

30. Thuermer, G., Walker, J., Simperl, E., Policy, L.C.-D.&, 2024, undefined When data meets citizens: an investigation of citizen engagement in data-driven innovation programmes. *cambridge.orgG Thuermer, J Walker, E Simperl, L CarrData & Policy, 2024•cambridge.org*.

31. Wickham, Hadley., Grolemund, Garrett. (2017) R for data science: import, tidy, transform, visualize, and model data. , 492.

32. Witte, K. De, economics, B.G.-J. of urban, 2011, undefined Evaluating efficient public good provision: Theory and evidence from a generalised conditional efficiency model for public libraries. *Elsevier*.

33. De Witte, K., López-Torres, L. (2017) Efficiency in education: A review of literature and a way forward. *Journal of the Operational Research Society*. **68**(4), 339–363.

34. de Witte, K., Moesen, W. (2010) Sizing the government. *Public Choice*. **145**(1), 39–55.

35. Yin, C., Liu, Y., Wei, X., Chen, W. (2018) Road Centrality and Urban Landscape Patterns in Wuhan City, China. *Journal of Urban Planning and Development*. **144**(2).

36. Zannat, K., Science, C.C.-J. of the I.I. of, 2019, undefined Emerging big data sources for public

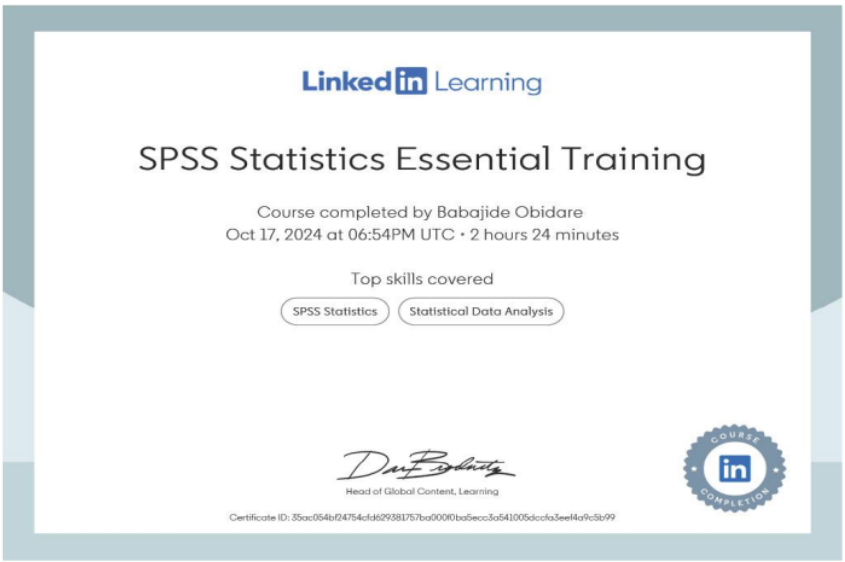
transport planning: A systematic review on current state of art and future research directions. *Springer*.

5.0 APPENDICES: -

Year	PerFemEmployee	FertilityRate	Ratio_MaletoFemale	PerFemEmployers	Industry	OwnAccount	Vulnerable
1995	24.3	3.71	28.33	0.1	7.66	15.07	81.87
1996	24.57	3.59	28.72	0.1	7.46	15.14	81.52
1997	24.82	3.48	29.18	0.1	7.57	15.21	81.16
1998	25.11	3.37	29.67	0.1	7.77	15.26	80.79
1999	25.38	3.27	30.17	0.1	8.12	15.39	80.4
2000	25.63	3.17	30.66	0.1	8.65	15.47	80
2001	25.78	3.07	31.02	0.1	9.01	15.52	79.58
2002	25.89	2.97	31.4	0.11	9.51	15.63	79.09
2003	25.96	2.88	31.77	0.11	10.11	15.74	78.58
2004	25.89	2.78	32.13	0.11	10.83	15.74	78.16
2005	25.83	2.69	32.5	0.11	11.65	15.73	77.71
2006	26.11	2.6	32.74	0.12	12.5	15.94	77.11
2007	26.56	2.52	33.5	0.13	12.62	17.48	78.8
2008	27	2.45	34.29	0.14	12.75	19.11	80.4
2009	27.22	2.38	35.1	0.16	12.89	20.79	81.96
2010	28.56	2.32	35.94	0.17	13.05	22.77	83.27
2011	28.72	2.27	36.77	0.15	13.49	24.01	81.88
2012	28.87	2.23	37.62	0.12	13.94	25.25	80.41
2013	28.99	2.19	38.49	0.09	14.42	26.47	78.88
2014	29.49	2.15	39.38	0.15	14.9	28.63	76.47
2015	29.96	2.12	40.29	0.23	15.41	30.65	74.03
2016	30.47	2.09	41.21	0.37	15.94	32.49	71.54
2017	33.44	2.06	44.04	0.63	16.78	38.41	68.2
2018	33.65	-	44.27	0.65	16.74	38.58	67.47
2019	33.82	-	44.5	0.66	16.7	38.74	66.73

TABLE 3 FROM KAGGLE ON THE FEMALE EMPLOYMENT vs SOCIOECONOMIC FACTORS FROM 1995 TO 2019 IN BANGLADES

5.0 APPENDICES: - **CERTIFICATES OF TRAINING**



LinkedIn Learning

Tableau Essential Training

Course completed by Babajide Obidare
Oct 23, 2024 at 11:47AM UTC • 4 hours 42 minutes

Top skills covered

Tableau

Head of Global Content, Learning

Certificate ID: 348345357cef30cc4c6eafa21a8e5b31a2e6d2503a354242882a52610901b5af

COURSE COMPLETION

THE IMPACT OF DATA SCIENCE ON GOVERNANCE PRACTICES.docx

ORIGINALITY REPORT

15%	12%	6%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www-economist-com.libproxy.ncl.ac.uk Internet Source	2%
2	Submitted to University of Wisconsin System Student Paper	2%
3	core-cms.prod.aop.cambridge.org Internet Source	2%
4	igarape.org.br Internet Source	1%
5	Submitted to University of Reading Student Paper	1%
6	econpapers.repec.org Internet Source	1%
7	Submitted to Crafton Hills College Turnitin Canvas LTI 1.3 Student Paper	1%
8	Submitted to University of Sydney Student Paper	1%
	www.coursehero.com	

9	Internet Source	1 %
10	apcz.umk.pl Internet Source	1 %
11	ascelibrary.org Internet Source	<1 %
12	journals.sagepub.com Internet Source	<1 %
13	lirias.kuleuven.be Internet Source	<1 %
14	Submitted to University of Witwatersrand Student Paper	<1 %
15	Mickey Lauria, Carissa Schively Slotterback. "Learning from Arnstein's Ladder - From Citizen Participation to Public Engagement", Routledge, 2020 Publication	<1 %
16	africadailynews.net Internet Source	<1 %
17	repo.unhi.ac.id Internet Source	<1 %
18	Smarter as the New Urban Agenda, 2016. Publication	<1 %

Exclude quotes	Off	Exclude matches	< 5 words
Exclude bibliography	On		