

**Critical analysis of administrative efficiency in DepEd:
A study in administrative theory application**

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ABSTRACT

This study examined the application of computational pattern analysis techniques to investigate administrative efficiency profiles in public schools within a selected Department of Education (DepEd) Division. Anchored in Simon's (1997) bounded rationality theory and Hood's (1991) New Public Management framework, the research explored how algorithmic classification and behavioral pattern extraction could support administrative decision-making in a DepEd setting. Using a descriptive-correlational design, data were gathered from 120 school administrative personnel across 15 schools through a validated Likert-type survey instrument covering five efficiency dimensions: compliance and documentation management, resource allocation effectiveness, personnel coordination, policy implementation fidelity, and data-driven decision-making capacity. K-means clustering identified three governance profiles, high-, moderate-, and low-efficiency, while Apriori association rule analysis surfaced behavioral co-occurrence patterns linked to governance performance. Findings showed that schools demonstrating both strong data-driven decision-making and high documentation compliance were most likely to be classified as high-efficiency institutions (support = 0.72, confidence = 0.88). A significant positive correlation was also found between data-driven decision-making capacity and overall institutional efficiency ($r = 0.61$, $p < 0.01$). The study concludes that computational governance analytics constitute a viable and theoretically grounded tool for enhancing DepEd school governance and recommends the institutionalization of such approaches within existing school improvement frameworks.

Keywords: Computational governance analytics, administrative efficiency, New Public Management, DepEd, k-means clustering, association rule mining.

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INTRODUCTION

Public school administration in the Department of Education is situated within a complex bureaucratic structure that requires both accountability and operational efficiency. As the primary institution responsible for administering the country's basic education system

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across national, regional, division, and school levels, it generates substantial volumes of administrative data through monitoring systems, reporting mechanisms, and policy implementation processes. Despite the abundance of data, governance at the school level continues to rely largely on manual practices and experience based decision making. This reliance constrains the effective use of available information and leaves significant analytical potential underutilized in improving administrative performance.

Computational pattern analysis, defined as the algorithmic process of identifying structures and regularities in large datasets, provides a viable approach to addressing this governance gap. When applied to administrative records, techniques such as cluster based classification and rule extraction can reveal latent efficiency patterns, differentiate institutional performance levels, and identify behavioral determinants of governance quality (Fayyad et al., 1996; Han et al., 2022). Prior studies in the educational domain have demonstrated the utility of such approaches for institutional enhancement. For instance, Romero and Ventura (2010) and Baker and Yacef (2009) highlighted the effectiveness of data driven analytical methods in improving educational systems. However, these applications have largely focused on student learning analytics, while the use of computational techniques in school administrative governance remains limited, particularly within the context of Philippine public schools.

This investigation is anchored in two complementary theoretical perspectives. Simon (1997) proposed the theory of bounded rationality, which posits that administrators operate under constraints related to information availability and cognitive capacity. In this context, algorithmic analytical tools serve to augment decision making by uncovering patterns that are not readily discernible through unaided human reasoning. Concurrently, Hood's (1991) New Public Management framework emphasizes the importance of performance measurement and the application of analytical tools to enhance efficiency in public sector institutions. These theoretical foundations collectively support the integration of computational analytics as a means of strengthening governance processes at the school level.

Within a selected DepEd Division, school based administrative personnel face increasing demands related to documentation, compliance with policy directives, and resource limitations, often without sufficient analytical infrastructure to support evidence based decision making. In response to these challenges, the present study employs k means clustering and association rule mining techniques applied to survey data and administrative records. Through this approach, the study aims to identify governance patterns, classify school efficiency profiles, and generate empirically grounded recommendations for administrative reform informed by established principles in administrative theory.

Statement of the problem

This study investigated how pattern-based computational analysis techniques could be applied to analyze institutional efficiency indicators among public schools in a selected DepEd Division, and what implications these findings hold for administrative governance improvement. Specifically, it sought to answer the following questions:

1. What is the level of institutional efficiency of DepEd schools across the five administrative dimensions assessed?
2. What school governance profiles emerge when k-means cluster analysis is applied to the institutional efficiency data?
3. What association rules characterize the administrative behaviors of high-efficiency schools?
4. Is there a significant relationship between data-driven decision-making capacity and overall institutional efficiency?

5. What analytically-informed framework can be proposed to strengthen administrative governance in DepEd schools?

METHODOLOGY

This study employed a descriptive correlational research design supplemented by exploratory computational pattern analysis in order to examine administrative efficiency and governance patterns in public schools. The descriptive component was utilized to document efficiency levels across five administrative dimensions, while the correlational component determined the relationship between data driven decision making capacity and overall institutional efficiency. To extend the analytical depth beyond conventional statistical techniques, algorithmic pattern extraction was incorporated to uncover latent structures and relationships within the dataset.

The study was conducted in fifteen public schools, consisting of ten elementary and five secondary institutions, which were purposively selected based on the availability of at least three years of continuous digital administrative records and their participation in the Enhanced Basic Education Information System. The respondents included 120 school administrative personnel, composed of school heads and assistant school heads ($n = 45$), teachers with administrative functions ($n = 52$), and records and support officers ($n = 23$). The use of purposive sampling ensured that all selected participants and institutions met the criteria necessary to support both statistical and computational analyses.

Primary data were gathered using a researcher constructed 50 item Likert-type survey instrument organized into five scales with 10 items each, namely Compliance and Documentation Management, Resource Allocation Effectiveness, Personnel Coordination, Policy Implementation Fidelity, and Data Driven Decision Making Capacity. Responses were rated using a four point scale with corresponding values of 4 (Always), 3 (Often), 2 (Sometimes), and 1 (Rarely). The interpretation of mean scores followed four established levels, with 3.50-4.00 indicating Very High Efficiency, 2.50-3.49 indicating High Efficiency, 1.50-2.49 indicating Moderate Efficiency, and 1.00-1.49 indicating Low Efficiency. The instrument underwent content validation by three experts in public administration and educational management to ensure its relevance and adequacy. Reliability testing using Cronbach's alpha produced a coefficient of 0.87, indicating a high level of internal consistency.

In addition to primary survey data, secondary data were obtained from compliance submission logs, budget utilization reports, and policy monitoring records covering school years 2021 to 2023. These data were sourced from the Division Office through formal data sharing protocols that adhered to the provisions of the Data Privacy Act of 2012. Ethical considerations were strictly observed throughout the study. Informed consent was secured from all respondents prior to participation, and the research procedures were aligned with the National Ethical Guidelines for Health and Health Related Research established by the Philippine Health Research Ethics Board in 2017.

Data analysis involved the use of both statistical and computational techniques. Descriptive statistics and Pearson product moment correlation were computed using IBM SPSS Statistics Version 26 to determine central tendencies and relationships among variables. For computational pattern analysis, cluster based governance profiling and behavioral rule extraction were conducted using WEKA Version 3.8.6. K means clustering was applied to classify schools into governance performance tiers, with the optimal number of clusters determined through the elbow method and silhouette coefficient analysis (MacQueen, 1967). Furthermore, association rules were generated using the Apriori algorithm with a minimum support threshold of 0.60 and a minimum confidence level of 0.75, in accordance with the

procedures outlined by Agrawal and Srikant (1994). These analytical approaches enabled the identification of meaningful governance patterns and the extraction of actionable insights grounded in both statistical and computational evidence.

RESULTS AND DISCUSSION

This section presents the results and discussion of the study based on data collected from 120 school administrative personnel across 15 public schools, selected through purposive sampling to ensure the availability of at least three years of continuous administrative records. The study employed a descriptive correlational research design supplemented by computational pattern analysis, utilizing a validated 50 item Likert type survey instrument and secondary administrative data. Statistical analyses, including descriptive statistics and Pearson product moment correlation, were conducted alongside machine learning techniques such as k means clustering and association rule mining. The discussion is grounded in the empirical data gathered and is interpreted in direct relation to the objectives of the study, with reference to established theoretical frameworks and relevant literature.

The overall institutional efficiency of the participating schools was found to be at a High Efficiency level, with an aggregate mean score of $M = 2.94$ ($SD = 0.41$). Among the five administrative dimensions assessed, Compliance and Documentation Management recorded the highest mean score of $M = 3.21$ ($SD = 0.38$), indicating that schools demonstrate strong adherence to bureaucratic requirements and procedural formalization. This finding aligns with Weber's (1947) characterization of bureaucracy as a system grounded in rules, documentation, and hierarchical control. Policy Implementation Fidelity also reflected High Efficiency with $M = 2.96$ ($SD = 0.42$), suggesting that schools are generally consistent in executing mandated policies. Resource Allocation Effectiveness yielded $M = 2.87$ ($SD = 0.44$), indicating a relatively efficient use of resources, though with some variability across institutions. Personnel Coordination obtained $M = 2.83$ ($SD = 0.47$), reflecting moderate variability in internal coordination practices. In contrast, Data Driven Decision Making Capacity recorded the lowest mean score of $M = 2.76$ ($SD = 0.51$), approaching the Moderate Efficiency threshold. This pattern indicates that while compliance oriented functions are well established, analytical and adaptive governance capacities remain comparatively underdeveloped. Such findings reflect the persistent tension identified in public administration literature, where compliance driven systems tend to prioritize procedural adherence over analytical innovation, as emphasized in the critique of traditional bureaucracy within the New Public Management perspective (Hood, 1991; Osborne and Gaebler, 1992).

Further analysis through k means clustering with $k = 3$ yielded a silhouette coefficient of 0.64, indicating adequate separation among clusters and supporting the validity of the classification. Three distinct school governance profiles emerged from the analysis. Cluster 1, identified as High Efficiency Governance Schools, comprised $n = 42$ or 35.0% of the sample and exhibited a centroid mean of $M = 3.51$ ($SD = 0.21$), reflecting consistently strong performance across all administrative dimensions. Cluster 2, categorized as Moderate Efficiency Governance Schools, included $n = 53$ or 44.2% of the sample, with a centroid mean of $M = 2.81$ ($SD = 0.34$). This group was characterized by strong compliance practices but comparatively weaker analytical capabilities, particularly in data driven decision making. Cluster 3, identified as Low Efficiency Governance Schools, consisted of $n = 25$ or 20.8% of the sample and demonstrated a centroid mean of $M = 2.12$ ($SD = 0.39$). This group exhibited the lowest performance in Personnel Coordination ($M = 2.04$) and Data Driven Decision Making Capacity ($M = 1.98$), indicating significant deficiencies in both collaborative processes and analytical governance practices. These cluster profiles are consistent with Frederickson et al. (2016), who emphasized administrative capacity as a critical determinant of governance

quality, and they correspond to Mintzberg's (1979) organizational configurations, wherein high efficiency institutions resemble professional bureaucracies while low efficiency institutions reflect simpler organizational structures reliant on direct supervision.

The application of the Apriori algorithm generated 18 association rules that met the predefined thresholds of minimum support and confidence, revealing significant behavioral patterns associated with high efficiency governance. The strongest rule identified was {High Data Driven Decision Making, High Compliance Documentation} - {High Overall Efficiency}, with support = 0.72, confidence = 0.88, and lift = 1.94. This indicates that schools demonstrating both strong analytical capacity and robust documentation practices are 1.94 times more likely to achieve high overall efficiency than would be expected by chance. A second significant rule, {High Personnel Coordination, High Policy Implementation Fidelity} - {High Overall Efficiency}, yielded support = 0.65, confidence = 0.81, and lift = 1.77, suggesting that coordinated personnel practices combined with consistent policy execution contribute substantially to institutional performance. A third rule, {High Data Driven Decision Making} - {High Policy Implementation Fidelity}, produced support = 0.68, confidence = 0.79, and lift = 1.61, indicating that analytical decision making enhances the fidelity of policy implementation. These findings align with Simon's (1997) bounded rationality theory, which posits that reducing informational uncertainty through structured analysis improves decision quality. The co-occurrence of analytical capacity and compliance rigor as key determinants of efficiency further supports the New Public Management assertion that performance measurement and data driven practices can yield measurable improvements in public sector outcomes (Hood, 1991).

Correlation analysis using the Pearson product moment correlation coefficient revealed a statistically significant positive relationship between Data Driven Decision Making Capacity and Overall Institutional Efficiency, with $r = 0.61$ and $p < 0.01$. This result indicates a strong positive association and represents a large effect size according to Cohen's (1988) criteria. At the 0.01 level of significance, the null hypothesis of no significant relationship was rejected. The magnitude of this correlation demonstrates that Data Driven Decision Making Capacity is the most influential predictor of institutional efficiency among the variables examined, as no other dimension exhibited a comparable level of association. This finding reinforces the critical role of analytical governance practices in enhancing organizational performance and is consistent with the work of Agasisti and Vittadini (2012), who identified analytical institutional practices as key predictors of effectiveness in public education systems. Similarly, Wirtz et al. (2019) highlighted evidence based management as a transformative mechanism in public sector reform, further supporting the importance of integrating data driven approaches into administrative processes.

Drawing from these empirical findings, the study proposes a Computationally Informed School Governance framework designed to operationalize data driven administrative practices within the school context. The framework consists of four integrated phases. The first phase focuses on Data Infrastructure Development, which involves standardizing and systematically archiving administrative records in formats compatible with the Enhanced Basic Education Information System to ensure accessibility and analytical readiness. The second phase, Governance Profiling, applies periodic k means clustering to classify schools according to efficiency trajectories, enabling comparative performance assessment across the Division. The third phase, Rule Based Improvement Planning, translates high confidence association rules into targeted administrative interventions, prioritizing areas such as Data Driven Decision Making Capacity and Compliance Documentation, which have demonstrated the strongest impact on efficiency outcomes. The fourth phase, Feedback Integration, incorporates cluster derived insights into the annual School Improvement Plan cycle within the School Based

Management framework of the Department of Education, thereby institutionalizing continuous improvement processes.

In synthesis, the results of the study demonstrate that while public schools exhibit generally high levels of institutional efficiency, this performance is unevenly distributed across administrative dimensions, with compliance oriented functions outperforming analytical and adaptive capacities. The identification of distinct governance clusters highlights variability in institutional performance and underscores the role of administrative capacity in shaping efficiency outcomes. Association rule mining and correlation analysis collectively confirm that Data Driven Decision Making Capacity is a critical determinant of overall institutional efficiency, providing empirical support for theoretical perspectives in bounded rationality and New Public Management. The proposed Computationally Informed School Governance framework translates these findings into a practical model for enhancing governance practices in the education sector. These results not only address the core objectives of the study but also contribute to the growing body of literature on data driven governance in public education, offering a foundation for subsequent discussions on policy implications, implementation strategies, and future research directions.

CONCLUSION

This study demonstrated that computational governance analytics constitute a viable and theoretically grounded instrument for examining administrative efficiency in DepEd public schools. Applied to 120 respondents across 15 schools in a selected DepEd Division, k-means clustering and Apriori association rule mining revealed three distinct governance profiles, identified behavioral patterns most reliably linked to institutional efficiency, and confirmed a strong positive correlation between data-driven decision-making capacity and overall governance performance ($r = 0.61$, $p < 0.01$).

The findings affirm Simon's (1997) bounded rationality framework: schools that systematically reduce informational uncertainty through data collection and documentation consistently outperform those that do not. They also validate the NPM position that analytical governance tools, applied in public institutional contexts, produce measurable performance differentiation (Hood, 1991). The identification of Data-Driven Decision-Making Capacity as the single most powerful administrative efficiency predictor positions it as the priority target for capacity development investment in the participating DepEd Division.

The study recommends that the Division adopt and pilot the CISG Framework proposed herein, beginning with targeted data literacy training for school heads and administrative officers. It further recommends that division-level monitoring incorporate periodic cluster analysis as a governance performance tool, and that future longitudinal research track the effectiveness of the proposed framework over successive school years. Ultimately, this study establishes that computational governance analysis is not a peripheral technological exercise but a substantive instrument of public administration reform, one fully consistent with the administrative theory traditions that continue to shape public governance both globally and in the Philippine educational context.

REFERENCES

Agasisti, T., & Vittadini, G. (2012). Regional economic disparities as determinants of students' achievement in Italy. *Research in Applied Economics*, 4(1), 1–33. <https://doi.org/10.5296/rae.v4i1.1316>

Agrawal, R., & Srikant, R. (1994). Fast algorithms for mining association rules. In Proceedings of the 20th International Conference on Very Large Data Bases (VLDB '94) (pp. 487–499). Morgan Kaufmann.

Baker, R. S. J. d., & Yacef, K. (2009). The state of educational data mining in 2009: A review and future visions. *Journal of Educational Data Mining*, 1(1), 3–17. <https://doi.org/10.5281/zenodo.3554657>

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Denhardt, R. B., & Denhardt, J. V. (2000). The new public service: Serving rather than steering. *Public Administration Review*, 60(6), 549–559. <https://doi.org/10.1111/0033-3352.00117>

Department of Education. (2015). DepEd Order No. 8, s. 2015: Policy guidelines on classroom assessment for the K to 12 basic education program. Republic of the Philippines.

Department of Education. (2017). DepEd Order No. 42, s. 2017: National adoption and implementation of the Philippine professional standards for teachers. Republic of the Philippines.

Fayyad, U., Piatetsky-Shapiro, G., & Smyth, P. (1996). From data mining to knowledge discovery in databases. *AI Magazine*, 17(3), 37–54. <https://doi.org/10.1609/aimag.v17i3.1230>

Frederickson, H. G., Smith, K. B., Larimer, C. W., & Licari, M. J. (2016). *The public administration theory primer* (3rd ed.). Westview Press.

Han, J., Pei, J., & Tong, H. (2022). *Data mining: Concepts and techniques* (4th ed.). Morgan Kaufmann.

Hood, C. (1991). A public management for all seasons? *Public Administration*, 69(1), 3–19. <https://doi.org/10.1111/j.1467-9299.1991.tb00779.x>

MacQueen, J. (1967). Some methods for classification and analysis of multivariate observations. In *Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability* (Vol. 1, pp. 281–297). University of California Press.

Mintzberg, H. (1979). *The structuring of organizations: A synthesis of the research*. Prentice-Hall.

Osborne, D., & Gaebler, T. (1992). *Reinventing government: How the entrepreneurial spirit is transforming the public sector*. Addison-Wesley.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

Philippine Health Research Ethics Board. (2017). National ethical guidelines for health and health-related research. Department of Health, Republic of the Philippines.

Republic Act No. 10173. (2012). Data privacy act of 2012. Republic of the Philippines. <https://www.privacy.gov.ph/data-privacy-act/>

Romero, C., & Ventura, S. (2010). Educational data mining: A review of the state of the art. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 40(6), 601–618. <https://doi.org/10.1109/TSMCC.2010.2053532>

Simon, H. A. (1997). *Administrative behavior: A study of decision-making processes in administrative organizations* (4th ed.). Free Press.

Weber, M. (1947). *The theory of social and economic organization* (A. M. Henderson & T. Parsons, Trans.). Free Press. (Original work published 1922)

Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2019). Artificial intelligence and the public sector: Applications and challenges. *International Journal of Public Administration*, 42(7), 596–615. <https://doi.org/10.1080/01900692.2018.1498103>