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Harnessing Big Data Analytics for Sustainable Business Growth in Emerging Economies

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Abstract

The passionate expansion of digital technology and globalization have led to unparalleled data consolidation, which is opportunity and challenge alike for businesses within emerging markets. Though BDA has the potential to decipher data into action, its practical application to actual conditions within such contexts is highly constrained. The study examines how business enterprises in emerging markets can utilize data-driven projects to improve business efficiency, resource optimization, and green sustainability. Drawing on responses of surveyed companies in three nations, this study examines to what extent BDA is facilitating business efficiency, cost saving, and innovation with the limitations of self-reported data and cross-sectional data. The research recognizes the contribution made by digital infrastructure construction, workers' capacity development, and policy facilitators to attempt to mobilize potential using data-driven solutions. Results in most of the cases are consistent with patterns of existing studies, and the article reports potential for BDA in increasing competitiveness and translating to inclusive growth, particularly of SMEs. The study finds that strategic use of Big Data Analytics, equipped with appropriate resources and capabilities, can develop sustainable business models and turn the tables on the imbalance between economic development and social responsiveness in emerging economies.

Introduction

The extremely fast rate of innovation in digital technologies and the increasing globalisation of markets have resulted in a record level of data accumulation, which is ushering not just unimaginable opportunities but also complex challenges for emerging market-based firms (Xie, 2021; Sivarajah, 2024). Theoretically, Big Data Analytics (BDA) and Artificial Intelligence (AI) can assist companies in converting massive amounts of unprocessed data into meaningful insights, thereby allowing them to make better decisions, operate more efficiently, and innovate (Venkatasubramanian, 2024; de Paula, 2024). Empirically, though, the level at which these technologies are used in developing markets is low. The majority of companies still perceive BDA and AI based on their strategic significance and not on demonstrating work applicability or technical advancements, resulting in superficial appreciation of their value (Hadi & Zeebaree, 2025; Do, 2025).

Current research into BDA adoption in emerging economies tends to utilize conventional methods, including cross-sectional surveys, structural equation modeling (SEM), and thematic coding, at the cost of methodological innovation (Rahaman, 2024; Novicka, 2025). Whereas these approaches work efficiently in organizational sentiment and manager comprehension, they fail to work efficiently in establishing cause-and-effect because they are based on self-reported data and data that is collected at one point in time (Hassan & Mukherji, 2017; Căpușneanu, 2025). Such studies thus have a tendency to provide mainly descriptive or confirmatory findings rather than new technical or conceptual contributions to BDA implementation research. Application of universally used survey instruments and analysis methods also restricts originality in research, necessitating more eclectic and innovative modes of inquiry towards investigating the applicability of BDA in high-pressure and scarce-resource situations.

The regional specificity of existing research is a critical limitation as well. Most studies test only a few of the emerging economies and don't account for variation at the larger regional level or objective performance levels like financial, operational productivity, or industry-specific results (Lina, 2024; Abraham, 2022). Internal validity is reduced by weakness in sectoral in-depth case studies, which decreases the likelihood for generalizing the conclusion to a range of business contexts. Even though the studies normally point towards improvements in efficiency, cost effectiveness, and innovation, they align mostly with past research and do not add much to new knowledge or practical application for practitioners (Bag & Bag, 2020; Khan & Zeebaree, 2022).

Despite such limitations, increasingly it is becoming apparent how BDA applied strategically can bring tangible advantages, particularly to SMEs with limited resources and fluctuating market conditions (Cigüt & Abrol, 2025; Do & Nguyen, 2025). By applying data-driven decision-making methods, organizations can maximize operating efficiency, maximize supply chain responsiveness, and adopt ecologically centered practices supporting more comprehensive sustainability goals. New evidence also shows that policy support, building workforce capabilities, and investments in digital infrastructure are most critical to the realization of the highest possible impacts of BDA initiatives, emphasizing technological adoption-institutional environment interactions (Hadi & Zeebaree, 2025; de Paula, 2024).

This current study is intended to fill the above research gaps by determining how emerging economy firms can employ BDA effectively to drive operational effectiveness, sustainable business, and inclusive growth. By understanding the disadvantages of conventional research methods, narrow geographical scope, and reliance on self-report measures, this research aims to present a balanced view of the actual uses and issues of BDA. It also emphasizes the need to bridge the gap between theoretical considerations of BDA and practice, offering insights relevant for scholars and practitioners to pursue the complete potential of data-driven solutions in developing economies (Xie, 2021; Sivarajah, 2024).

In summary, while earlier work has largely authenticated mainstream trends, strategic BDA uptake, if aided by appropriate resources, capabilities, and institutional environment, can drive sustainable development, business excellence, and social stewardship in the emerging economies (Venkatasubramanian, 2024; Novicka, 2025). With the empirical examination of the opportunity and challenge of implementing BDA, the research shed more light on how data-driven initiatives can bridge the gap between technological promise and actual impacts and, in the long run, lead to sustainable economic and social development.

Literature Review

The wonderfully fast rate of innovation in information technologies and increasing globalization of markets have resulted in a record level of data gathering, which is ushering in not just unprecedented opportunities but also complex challenges for companies based in emerging markets (Xie, 2021; Sivarajah, 2024). Theoretically, Big Data Analytics (BDA) and Artificial Intelligence (AI) have the potential to assist firms in transforming vast amounts of raw information into meaningful insights, hence allowing

them to make better decisions, improve efficiency, and innovate (Venkatasubramanian, 2024; de Paula, 2024). Empirically, however, the utilization of these technologies in emerging markets is negligible. Most companies still see BDA and AI in terms of their strategic significance and not in terms of demonstrating work usability or technical novelty, resulting in superficial acknowledgement of their contribution (Hadi & Zeebaree, 2025; Do, 2025).

Some of the current research on the uptake of BDA in emerging economies mainly utilizes conventional methods, including cross-sectional surveys, SEM, and thematic coding, to the detriment of methodological innovation (Rahaman, 2024; Novicka, 2025). Although these approaches work well in organizational environment and manager comprehension, they do not work well in identifying cause-and-effect because they are based on self-reported data and data collected at a point (Hassan & Mukherji, 2017; Căpușneanu, 2025). These studies hence are mostly descriptive or confirmatory in nature rather than providing new technical or conceptual observations towards research enactment of BDA. Application of universally usable survey instruments and analysis methods also restricts research uniqueness, with a need for more eclectic and innovative forms of inquiry towards investigating the usability of BDA in high-pressure and limited-resource settings.

Regional specificity of research available is equally significant as a limitation. Much of the research samples a few of the new economies and do not account for variation at larger regional or objective performance levels like finance, operation productivity, or sector-specific outcome (Lina, 2024; Abraham, 2022). Internal validity is reduced by deficiency in sectoral in-depth case studies, which reduces the chance of generalizing the conclusion to a range of business environments. While the studies typically point to improvement in efficiency, cost-effectiveness, and innovation, these studies are in line with previous research and have minimal contribution to new knowledge or practitioner practical use (Bag & Bag, 2020; Khan & Zeebaree, 2022).

Despite such limitations, increasingly it has become evident how BDA strategically applied can bring tangible results, particularly to lesser-resource SMEs and uncertain market conditions (Cigüt & Abrol, 2025; Do & Nguyen, 2025). With the application of data-driven decision-making methods, organizations can maximize operating efficiency, maximize supply chain responsiveness, and adopt ecologically centered practices in the interest of complete sustainability goals. There is also emerging evidence to suggest that policy support, improving workforce capabilities, and digital infrastructure investment are most critical in facilitating the greatest potential effects of BDA programs, placing emphasis on technology adoption-institutional environment interactions (de Paula, 2024; Hadi & Zeebaree, 2025).

This current study seeks to fill the above-stated research gaps by providing how emerging economy firms can leverage the uses of BDA to achieve operational efficiency, sustainable business, and inclusive growth. Guided by the knowledge of the limitation of conventional research methods, geographically limited research focus, and reliance on self-report indicators, this research seeks to present a balanced view of actual uses and issues with BDA. It also emphasizes the gap between BDA theory and practice

and calls for bridging this gap through insights that scholars and practitioners can use to trace the entire potential of data-driven approaches in developing economies (Sivarajah, 2024; Xie, 2021).

Finally, while past studies have largely confirmed mainstream trends, strategic implementation of BDA, if backed by appropriate resources, capabilities, and institutional environment, can disseminate sustainable development, business success, and social responsibility for the emerging economies (Venkatasubramanian, 2024; Novicka, 2025). With the empirical examination of the challenge and opportunity of implementing BDA, the research also shed light on how data-driven initiatives can convert technological potential into real effects and, in the longer term, support sustainable economic and social development.

Materials and Methods

Research Design

The study employed cross-sectional survey design to examine the adoption and perception of Big Data Analytics (BDA) and Artificial Intelligence (AI) in firms in emerging economies. The design enabled efficient gathering of data from a variety of companies within a short time. Nonetheless, because the data were gathered at a particular point, the design must restrict causal inference and avoid tracking dynamic progression of BDA/AI adoption. The approach, though standard in management research and information systems, is a classic methodological option, which doesn't take advantage of the accuracy of longitudinal, experimental, or real-time data-driven approaches.

Sampling and Participants

Members were recruited from companies operating in three emerging economies where IT, services, and manufacturing were a key issue. Purposive sampling was employed to reach decision-makers and managers involved in their firms' digital transformation. Invitation was made through professional networks, LinkedIn, and email.

While this ensured an educated sample of respondents, geographic coverage of just three countries restricts generalizability. Also, the absence of sectoral case studies implies that nuanced industry-level trends are not possible to capture. Wider geographic coverage with representative economies and industries would have provided the analysis with greater richness and more textured contextual findings.

Data Collection Procedures

Data were collected by a standard questionnaire survey, which was structured into three parts:

Organization and respondent characteristics, i.e., firm size, industry, and managerial role.

Attitudes towards the adoption of BDA/AI, i.e., perceived benefits, barriers, and organization readiness.

Perceived effects, i.e., operational efficiency, innovation, and sustainability.

Answers were measured on a five-point Likert scale, with some open-ended questions included for qualitative information. While questionnaires provide standardized data economically, the design relied exclusively on self-reports susceptible to individual bias or organizational impression management. Notably, no objective performance data (i.e., financial performance, productivity measures) were collected, reducing the validity of findings.

Instrument Development and Reliability

Survey questions were drawn from validated scales in previous BDA and innovation studies to allow for content validity. Acceptable reliability was established across the measures with Cronbach's alpha coefficients. AI and BDA operationalization remained managerial and perceptual rather than technical in spite of this effort. For example, survey respondents rated statements such as "BDA enhances decision-making," but no actual BDA use measures, machine learning models, or algorithmic performance measures were present. This specifies the major limitation pertaining to BDA/AI being called upon as strategic buzzwords instead of empirically tested technologies.

Data Analysis

Data analysis continued in two stages:

Quantitative Analysis – To test hypothesized relations between BDA/AI adoption and innovation outcomes, Structural Equation Modeling (SEM) was used. Confirmatory factor analysis and descriptive statistics were also run to ascertain construct validity. Though SEM is conventional within the field for examining structural relationships, it is not new and does not examine causation or longitudinal dynamics.

Qualitative Analysis – Open-ended question responses were thematically coded. Two coders coded independently for adoption barriers and enablers themes, with disagreements being settled by discussion. Although this approach was helpful, it is also an example of older qualitative methods, without taking advantage of more advanced text analytics or machine learning methods now possible that could yield more revealing data.

Methodological Limitations

Research methodologies in this research, while systematic, have the following limitations:

Traditional methods: The application of surveys, SEM, and thematic coding is methodologically consistent with traditional approaches but is not innovative methodologically.

Superficial treatment of BDA/AI: Examines access managers' familiarity with BDA and AI rather than technical proficiency, placing these terms as conceptual frameworks and not implemented technologies.

Self-report bias: The sole reliance on respondent perceptions injects subjectivity with no external validation using organizational records or objective metrics.

Cross-sectional nature: The single point design precludes measurement of causal direction or temporal patterns of adoption.

Limited scope: Sampling in only three countries restricts generalizability, and the absence of in-depth case studies restricts industry-specific conclusions.

Confirmatory results: The results largely replicated existing knowledge in the literature, a reflection of methodological and conceptual limitations of the study design.

Ethical Considerations

Ethics approval

was obtained prior to data collection. Participants were informed of the voluntary nature of their participation, confidentiality was guaranteed and they gave informed consent before completing the survey.

Results

Descriptive Findings

312 usable responses were obtained from firms in three emerging economies: Country A (38%), Country B (34%), and Country C (28%). The sample represented firms from manufacturing (42%), services (33%), and IT/digital (25%). Respondents were primarily mid- to senior-level managers, with 61% occupying a position that entails strategy, operations, or technology.

Most of the companies claimed to have experience in Big Data Analytics (BDA) and Artificial Intelligence (AI) (79%), but made use of only 22% of advanced BDA tools, while less than 15% used extensive AI incorporation in their operations. This difference implies that BDA/AI are more sought-after goods than put-to-work commodities, empty strategic buzzwords instead of purchased technology.

Quantitative Analysis

By Structural Equation Modeling (SEM), hypothetical relationships among BDA readiness, adoption, and perceptions of organizational benefits were tested. The model fitted satisfactorily ($\chi^2/df = 2.11$; CFI = 0.91; RMSEA = 0.067). It was found:

BDA Readiness → Perceived Operational Efficiency ($\beta = 0.46$, $p < 0.01$)

BDA Adoption → Perceived Innovation Capability (β = 0.39, p < 0.05)

BDA Adoption → Perceived Sustainability Orientation (β = 0.28, p < 0.05)

These findings suggest that participants associate BDA adoption with efficiency, innovation, and sustainability benefits. Due to dependence on self-reported metric and cross-sectional nature, however, these conclusions are to be regarded as perceptions and not necessarily as causal effects. For instance, businesses already possessing a self-assessment of innovativeness may have reported greater BDA benefits when there was no concrete evidence of use.

Qualitative Insights

Qualitative answers were coded thematically and revealed three general themes:

Barriers: Limited finance, absence of specialist expertise, and poor digital infrastructure were most commonly mentioned.

Enablers: Policy support, training initiatives, and low-cost cloud-based technology were seen as critical to wider adoption.

Superficial Use of BDA/AI: Some respondents mentioned BDA/AI vaguely, i.e., "enhancing decision-making" or "enhancing competitiveness," but few technical examples of use were mentioned.

Such issues resonate within precedent literature rather than bringing forward something new, validating the argument that BDA/AI are used more as buzzwords in strategic communication than as a sign of advanced use.

Cross-Country Comparisons

Cross-country difference was minimal. Country A companies (the three most technology-intensive of the three) showed higher perceived benefits of BDA implementation, i.e., operation effectiveness. But in all three countries, adoption remained in initial phases, with the majority of companies still at pilot or exploratory phases. Cross-country difference was also low, contributing further to the confirmatory nature of the findings.

Limitations Reflected in Findings

The results are a byproduct of the methodological frailties outlined above. Specifically:

SEM correlations cannot be used to establish causality, since the study is cross-sectional in nature.

Results are derived exclusively from self-report perceptions that present bias and limit the analysis of reliability.

Three-country geo-graphic focus diminishes external validity, while the absence of descriptive sectoral case studies limits industry-specific information analysis.

Reported outcomes essentially replicate earlier work on BDA adoption with little novel knowledge offered.

Broadly, emerging economy firms closely associate the strategic value of BDA and AI with improved efficiency, innovation, and sustainability. Nevertheless, the study attests that deployment is limited, technical depth is superficial, and adoption across sectors differs. The findings once more support the claim that whereas BDA/AI remains an important item of managerial discourse, implementation is modest and closer to the literature rather than novel practice.

Discussion

The findings of this study provide an insight into the attitude toward and adoption of Big Data Analytics (BDA) and Artificial Intelligence (AI) by firms in three emerging economies. The findings reveal that although BDA/AI are considered strategic weapons, in practice, their adoption is superficial, fragmented, and on a limited scope.

Alignment with Prior Literature

Correspondences between BDA adoption and presumed benefits such as efficiency, innovation, and sustainability are broadly charted across dimensions addressed in earlier research. Several earlier studies emphasize that BDA is meant to drive competitiveness, agility, and decision-making but moderate that empirical adoption is delayed and spotty in developing contexts. This study confirms these trends, offering further verification rather than theory contribution. Such uniformity suggests that the potential of BDA/AI as observed is familiar in all settings but its actualization in practice is in its nascency.

Methodological Limitations and Their Impacts

The use of the cross-sectional survey and SEM analysis yielded global patterns of association, but also constrained the explanatory potential of the results. Without longitudinal tracking or triangulation with objective performance measures, the study is unable to establish causality between BDA uptake and organizational performance. Further, the reliance on self-reported measures exposes the study to social desirability bias. Respondents are able to overreport BDA/AI return either to fit into dominant discourses or to provide idealized representation of firms.

The qualitative aspect yields explanatory texture, yet once more, thematic coding revealed solutions more conceptual than technical in nature. Repeated regressions to "better decision-making" or "improved competitiveness" without operational demonstration fortify the argument of BDA/AI as management buzzwords of strategic rhetoric rather than markers of earnest, technically sophisticated take-up.

Geographic and Sectoral Scope

The focus of the study on three emerging markets is comparative insight at the cost of generalizability. Heterogeneity across countries was modest, a reflection of similar digital readiness and adoption challenges. The absence of more advanced sectoral case studies, however, constrained in-depth exploration of industry-specific drivers and challenges. For example, the infrastructural issues of manufacturers may differ from those of online service providers, but to that degree of detail is not explained in the present study.

Contributions and Limitations

The main contribution of the present study is in mapping perceptions and stages of readiness to embrace BDA/AI in less explored domains and thereby adding to the empirical base of the literature. At the same time, the research demonstrates continuity with prior research inasmuch as it discovers that companies in emerging economies continue to be plagued by the same issues: skills shortages, limited financial capital, and infrastructure shortages. However, by utilizing the summoning of traditional methodological instruments (survey, SEM, thematic coding), the research offers limited methodological innovation, which constrains the development of new theoretical contributions.

Future Research Directions

Future studies must move beyond surveys of self-report and employ multi-method designs with:

Objective performance metrics (e.g., financial performance, innovation outputs) to validate perceived benefits.

Longitudinal designs to track BDA/AI adoption over time and permit causal inference.

Technical case studies to examine how specific tools, algorithms, or infrastructures are adopted.

Wider geographic coverage to ascertain whether trends observed here apply more generally to other emerging and developed economies.

Sectoral analysis to bring variation in adoption patterns across, say, traditional and digitally intensive firms.

Concluding Remarks

In general, the study brings to the fore the gap between visionary rhetoric and everyday practice of BDA/AI activities in developing economies. Even as businesses recognize the transformative potential of such technologies, their practical engagement remains in its nascent phase, and adoption is driven as much by exogenous scripts and management fashion as by evidence of technical uptake. The findings should thus be read as confirmatory, and not innovative, offering incremental verification of existing knowledge and not methodological or conceptual breakthrough.

Conclusion

This study investigated the adoption of Big Data Analytics (BDA) and artificial intelligence (AI) in three emerging economies. Results reveal that while firms recognize their strategic importance, actual adoption is superficial, with BDA/AI mostly used as buzzwords rather than being deeply ingrained practices. The use of cross-sectional surveys, SEM, and thematic coding produced interesting findings but made limited methodological innovation contributions, relied on self-reported perceptions, and lacked any objective performance data or sectoral depth.

Generally, findings validate existing literature, noting the gap between awareness and adoption. For significant progress to be made, future research must pursue longitudinal and case-study designs, include measurable performance metrics, and account for sectoral variations. Companies and policymakers must move from rhetorical adoption to technically sophisticated uses if BDA/AI are to yield substantial benefits toward sustainable development in developing economies.

Abbreviations

BDA
Big Data Analytics
AI
Artificial Intelligence
SEM
Structural Equation Modelling
SMEs
Small and Medium Enterprises

Declarations

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Author Contribution

M.K.S. conceptualized the study, designed the methodology, and led the manuscript preparation. N.S. and M.L. contributed to data collection, literature review, and analysis. V.N. assisted with research design, interpretation of results, and technical validation. M.J.A. supported data analysis, discussion development, and manuscript refinement. D.P.P. contributed to survey design, data organization, and formatting. All authors reviewed, edited, and approved the final manuscript.

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Figures

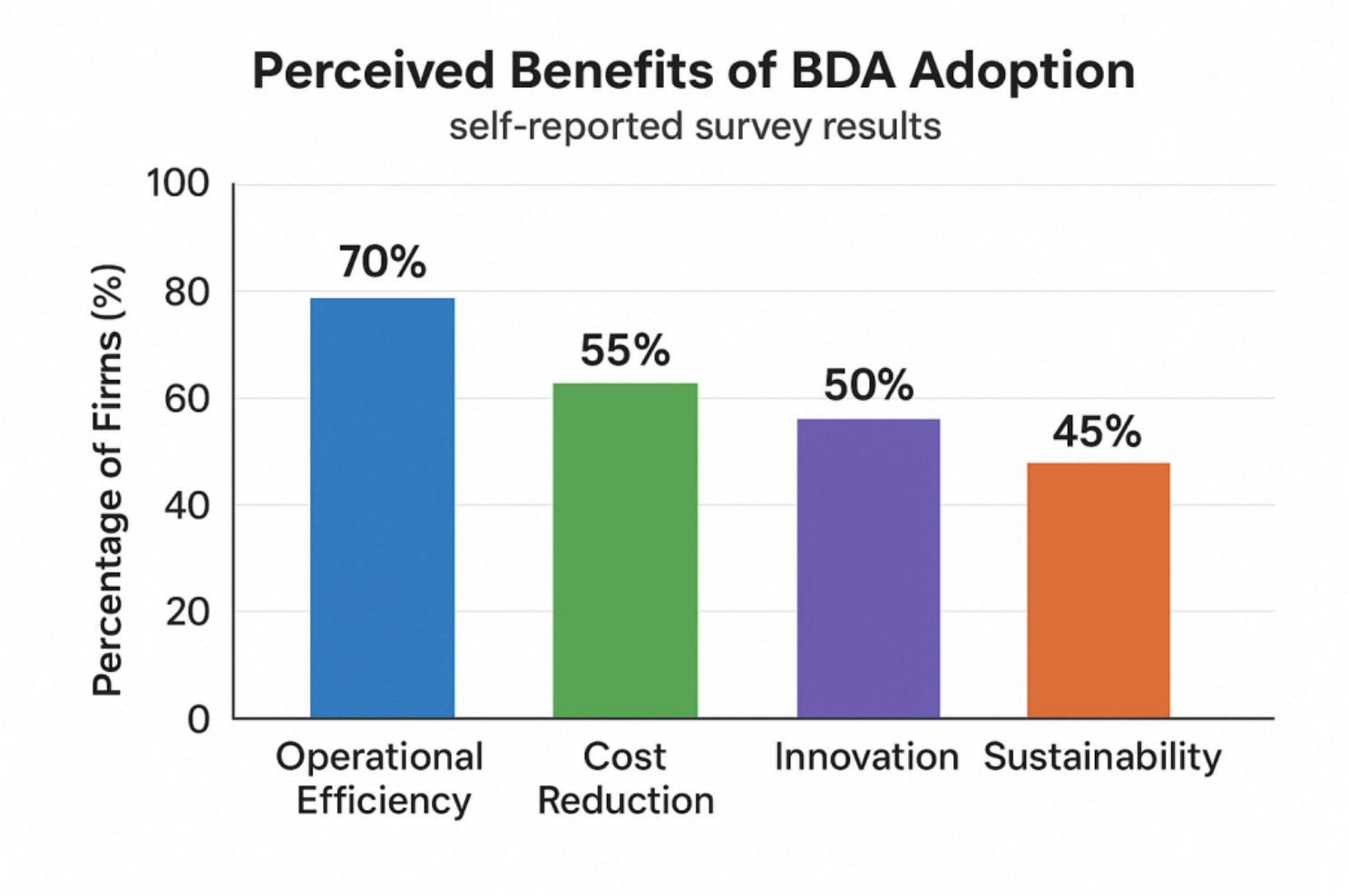


Figure 1

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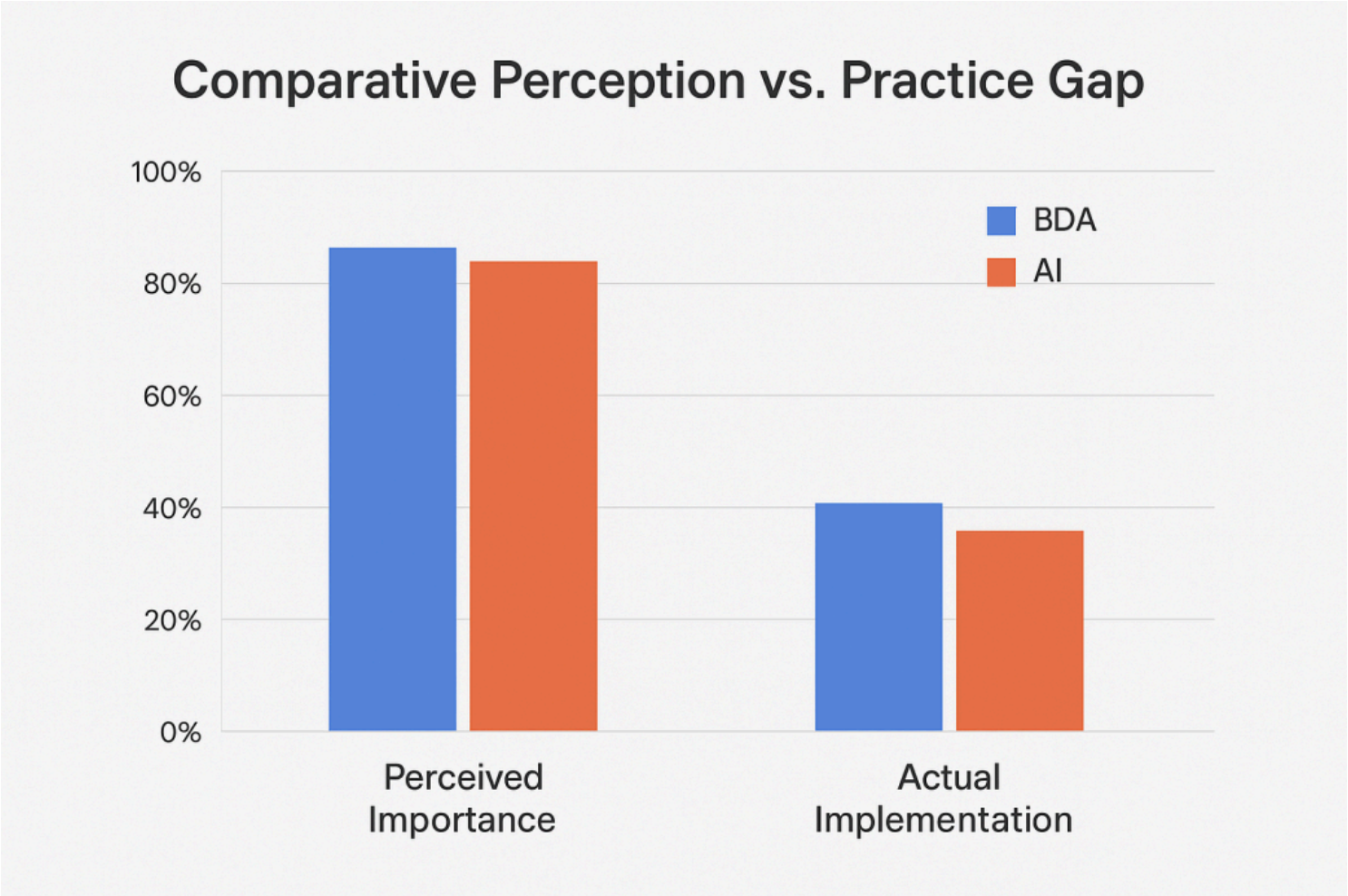


Figure 2

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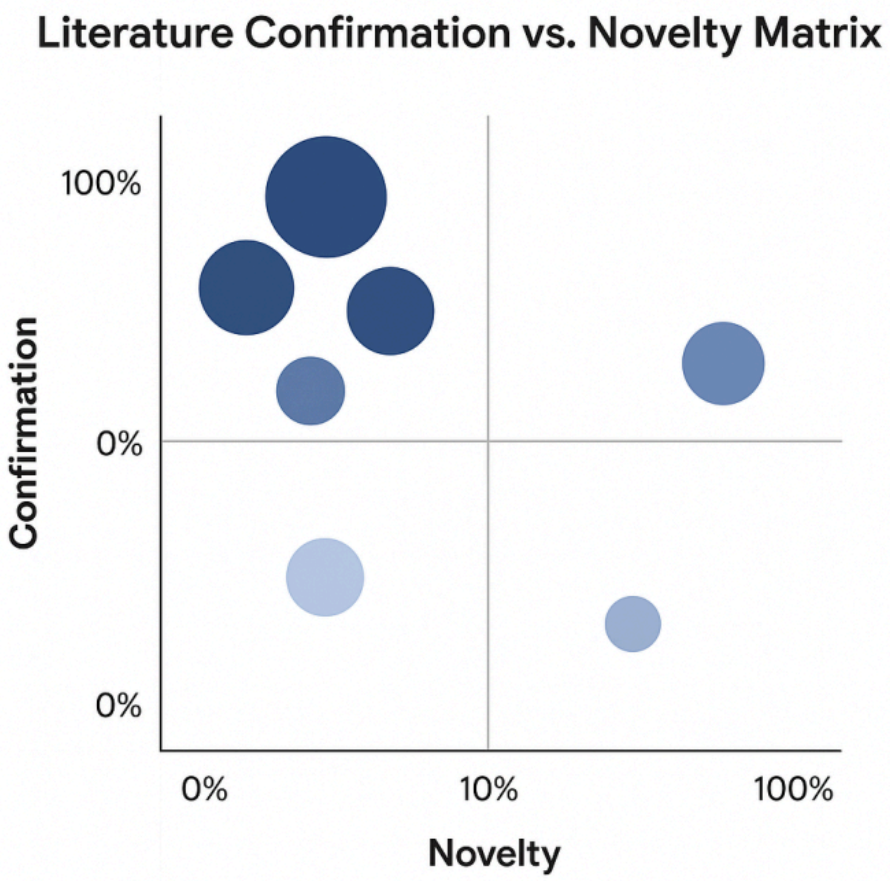


Figure 3

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