



NIGERIAN INSTITUTE OF QUANTITY SURVEYORS
The professional construction cost managers.

NEW AND INNOVATIVE DATA-DRIVEN COST ESTIMATION AND BUDGETING TECHNIQUES

PRESENTED BY

QS PROF. (MRS.) GRACE KEHINDE OJO
DEPT OF QUANTITY SURVEYING
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

NIQS ZONAL WORKSHOP
INTERNATIONAL CONFERENCE CENTRE,
UNIVERSITY OF IBADAN, IBADAN, OYO STATE

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INTRODUCTION

- Cost estimation and budgeting - integral components of financial management.
- Traditional approaches to cost estimation often rely on historical data and heuristic methods - prone to biases and inaccuracies.
- The advent of data-driven techniques has opened up new avenues for improving the precision and reliability of cost estimation and budgeting processes



This paper explores the latest advancements in data-driven methodologies and their implications for cost management related decision-making.



IMPORTANCE OF COST ESTIMATION AND BUDGETING TECHNIQUES

To plan, monitor, and control the project activities and deliverables.

To communicate effectively with the stakeholders and sponsors.

To evaluate the feasibility, profitability, and risks of the project.

To make informed decisions about the scope, quality, and schedule of the project.



METHODS OF COST ESTIMATION AND BUDGETING

TRADITIONAL METHODS

01. Top-down
estimation

TRADITIONAL METHODS

01. Top-down
Estimation

02. Bottom-up
Estimation

TRADITIONAL METHODS

01. Top-down
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02. Bottom-up
Estimation

03. Parametric
Estimation

TRADITIONAL METHODS

01. Top-down
Estimation

02. Bottom-up
Estimation

03. Parametric
Estimation

04. Three-point
Estimation

TRADITIONAL METHODS

01. Top-down
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03. Parametric
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04. Three-point
Estimation

05. Expert
Judgement -
based Estimation

TRADITIONAL METHODS

01. Top-down
Estimation

02. Bottom-up
Estimation

03. Parametric
Estimation

04. Three-point
Estimation

05. Expert
Judgement -
based Estimation

06. Analogy based
Estimation



CHALLENGES OF TRADITIONAL METHODS

CHALLENGES

- Data availability and quality

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- Data availability and quality
- Subjectivity and Bias

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- Complexity and Uncertainty

CHALLENGES

- Data availability and quality

- Subjectivity and Bias

- Complexity and Uncertainty

- Scalability and Adaptability



DATA-DRIVEN COST ESTIMATION TECHNIQUES

DATA-DRIVEN COST ESTIMATION TECHNIQUES

Data-driven cost estimation techniques are methods that use historical data, statistical analysis, machine learning, and other tools to improve the accuracy and reliability of cost estimates.

These techniques can help reduce the uncertainty and bias in cost estimation, as well as provide valuable insights for decision making and risk management. They produce a cost estimate that is based on verifiable data.

SIGNIFICANCE OF DATA-DRIVEN COST ESTIMATION APPROACHES

- Inform decision-making processes

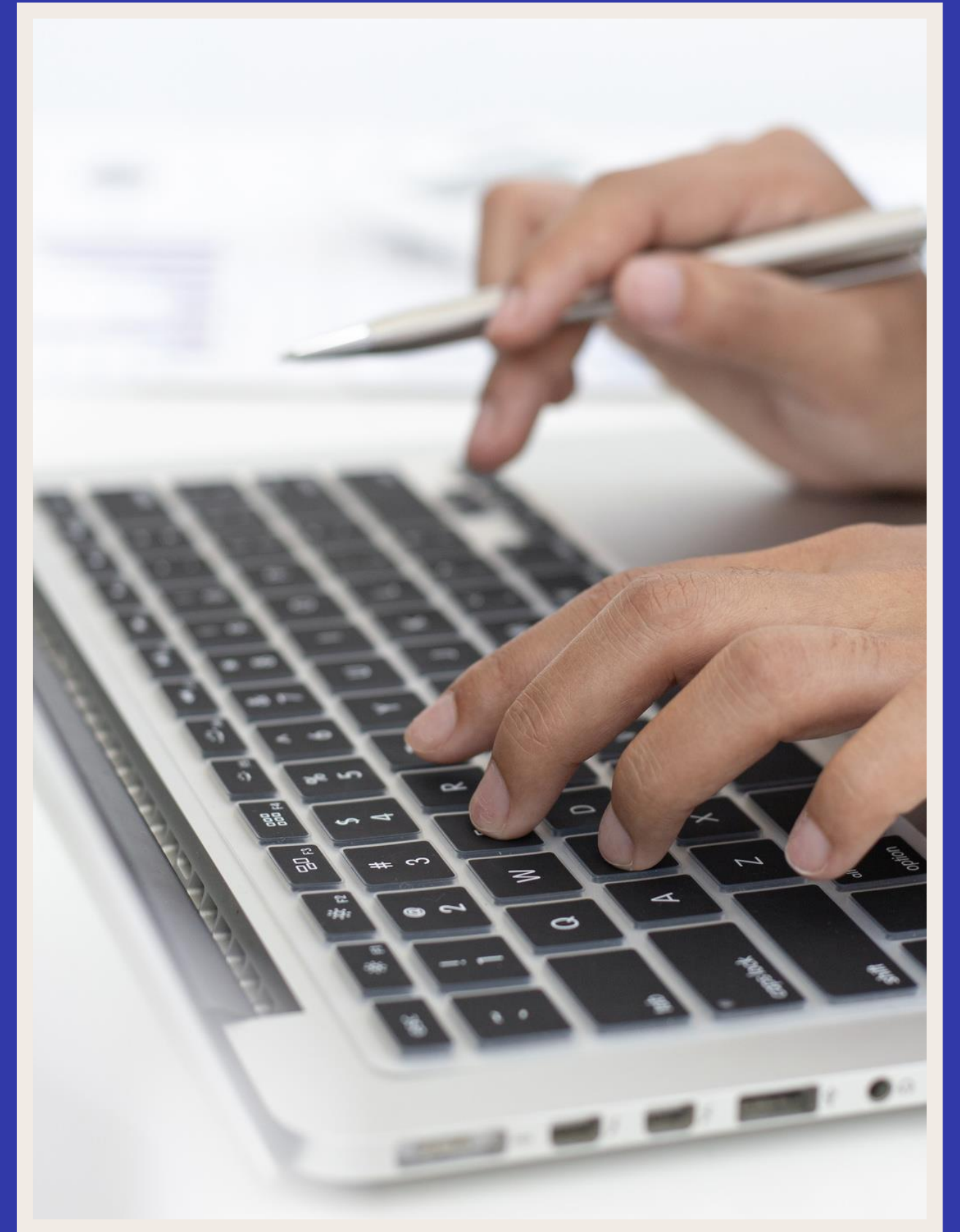
- Develop more accurate forecasts.

- Enable real-time monitoring and adaptive planning

- Allows organizations to respond swiftly to changing market

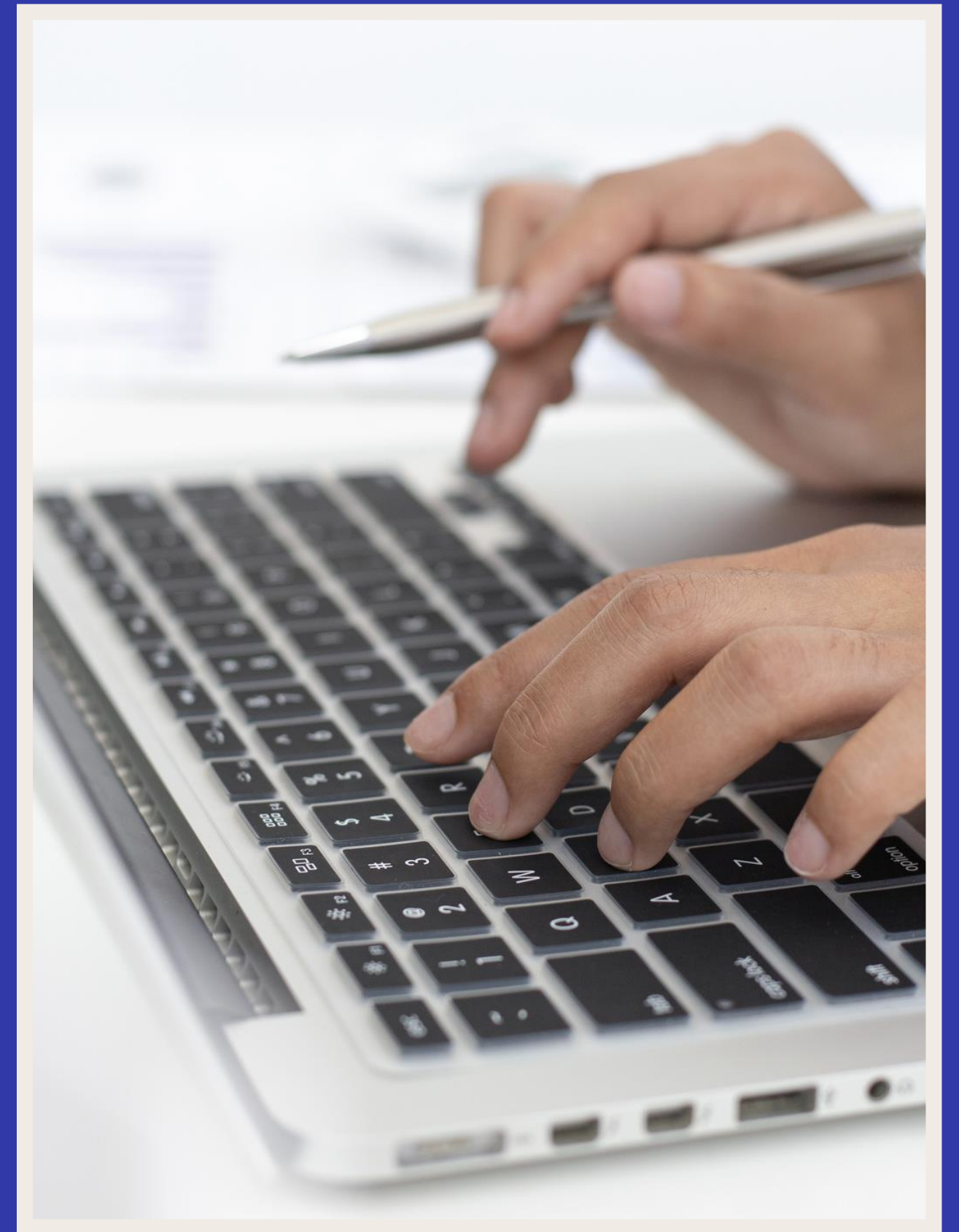
STEPS INVOLVE IN DATA-DRIVEN COST ESTIMATION AND BUDGETING PROCESS

1. Data Collection from various sources including information on past projects expenditures, resource utilization, project specifications, market conditions among others.
2. Data Analysis to identify patterns, trends, and correlations that can inform cost estimation.



STEPS INVOLVE IN DATA-DRIVEN COST ESTIMATION AND BUDGETING PROCESS

3. Modeling and Forecasting mathematical models and algorithms to predict future costs
4. Validation and Sensitivity Analysis for accuracy and reliability of cost estimates
5. Documentation and Reporting



LEARNING FROM CASE STUDIES

For instance, a firm wants to estimate the cost of a proposed project

Using a traditional method, such as analogous, the firm might base its estimate on the cost of a previous similar project that took 6 months to complete and cost \$100,000. However, this estimate might not account for the differences in the scope, complexity, quality, or technology of the new project, changes in the market, customer, or competitors.

Using a data-driven method, such as machine learning, the firm might use historical data from hundreds of similar or comparable projects to create a predictive model that can estimate the cost of the new project based on its characteristics, such as the project location, project function, project scope, users, etc. The model might also provide a range of possible costs, such as #800m to #1,200m with a confidence level of 95%, to reflect the uncertainty and variability of the project parameters.

LEARNING FROM CASE STUDIES

Case Study 1: Cost Estimation in a Large-scale Commercial Construction Project

In a large-scale commercial construction project, the project team utilized technology-driven cost estimation tools and BIM technology. By integrating these tools, they were able to generate accurate cost estimates faster and identify potential clashes or conflicts early on. This proactive approach significantly reduced rework, improved cost control, and resulted in the successful completion of the project within the allocated budget.

Case Study 2: Cost Estimation in a Residential Housing Development

In a residential housing development, data analytics and machine learning were incorporated into the cost estimation process. By analyzing historical cost data and utilizing predictive models, the project team was able to identify cost-saving opportunities and make informed decisions. As a result, the project was completed under budget, exceeding the expectations of the stakeholders.

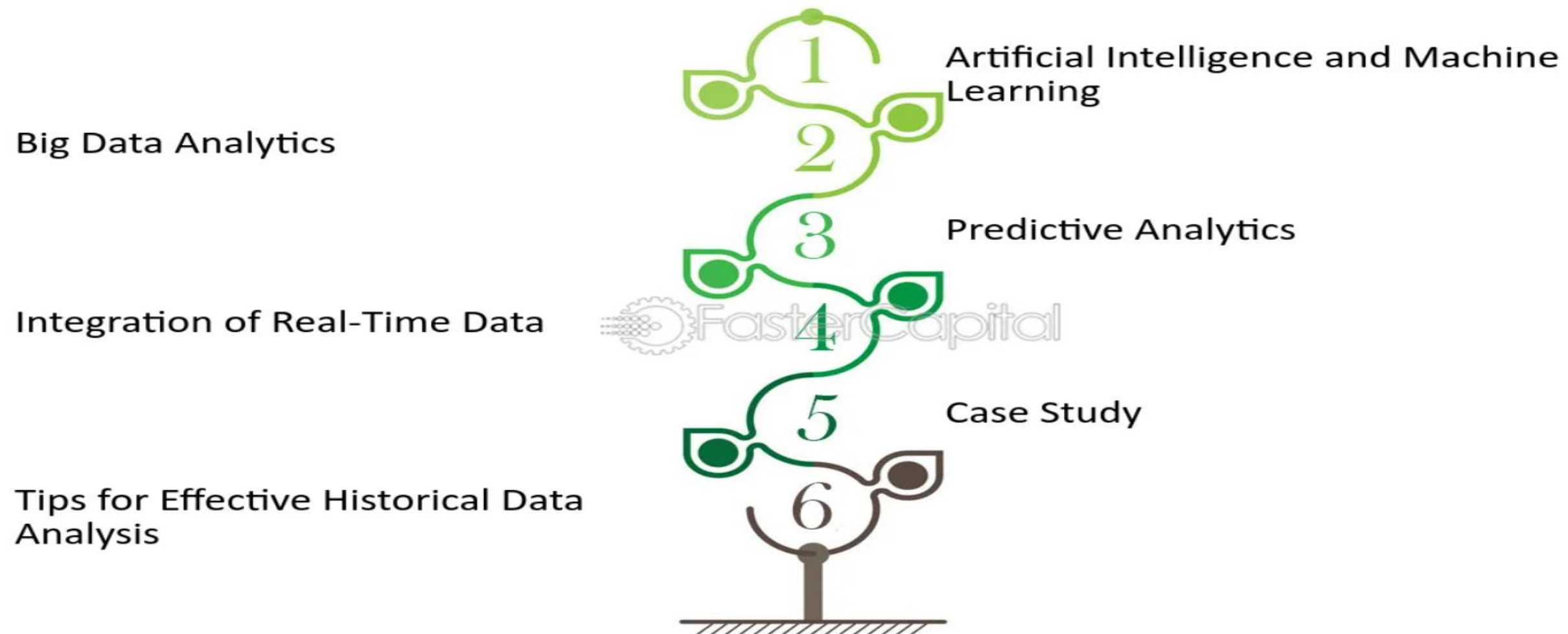


ADVANTAGES OF DATA-DRIVEN COST ESTIMATION AND BUDGETING

- Increased Accuracy
- Better Decision Making
- Improved Transparency
- Flexibility
- Consistency
- Efficiency

INNOVATIVE COST ESTIMATION AND BUDGETING TECHNIQUES

Future Trends and Innovations in Historical Data Analysis for Cost Estimation



INNOVATIVE COST ESTIMATION AND BUDGETING TECHNIQUES

01.

Building
Information
Modeling (BIM)

INNOVATIVE COST ESTIMATION AND BUDGETING TECHNIQUES

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02.

Parametric
Cost
Estimation

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Integrated
Project Delivery
(IPD):

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Integrated
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05.

Data Analytics
and Predictive
Modeling:

INNOVATIVE COST ESTIMATION AND BUDGETING TECHNIQUES

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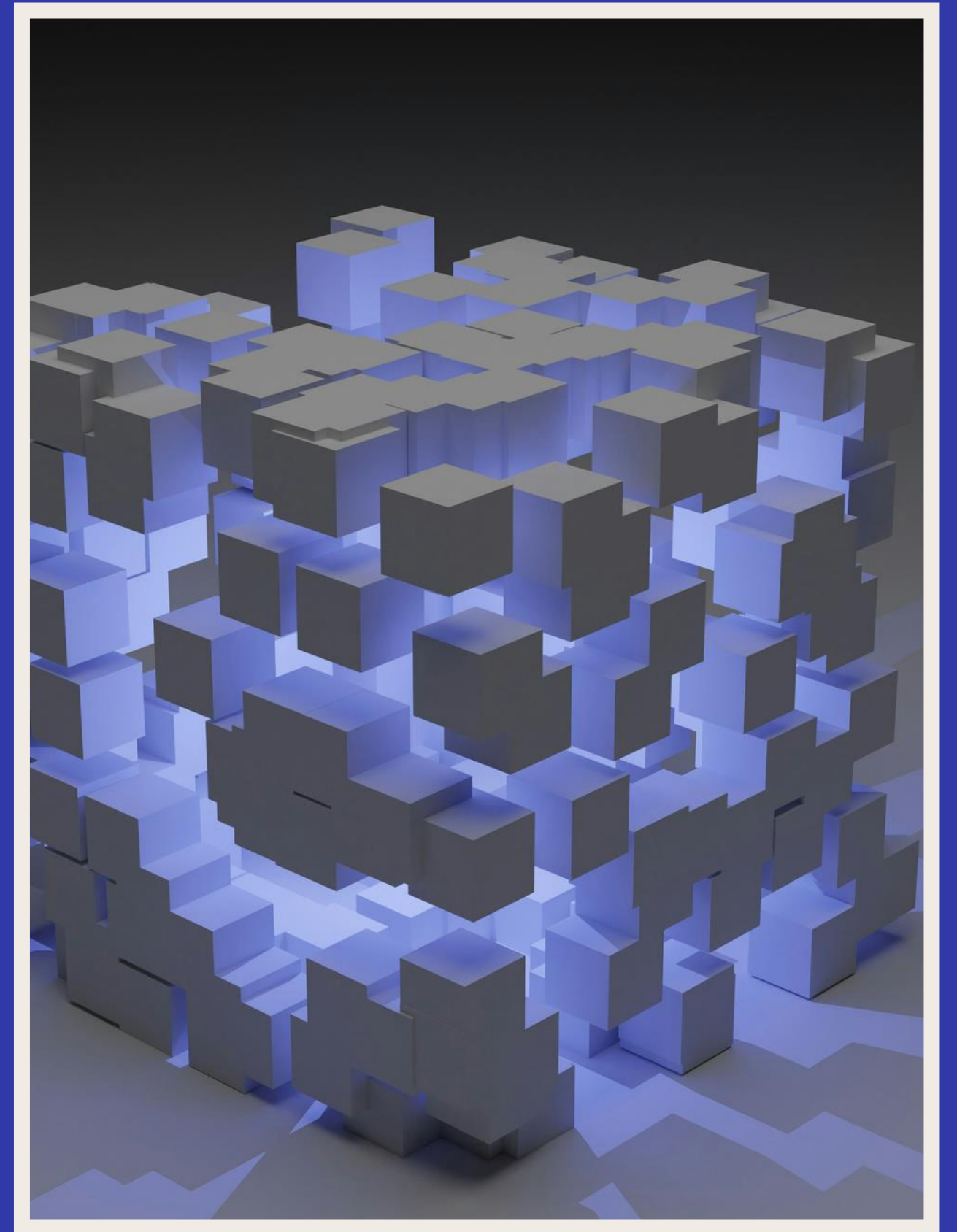
Data Analytics
and Predictive
Modeling:

06.

Real-Time Cost
Monitoring and
Control

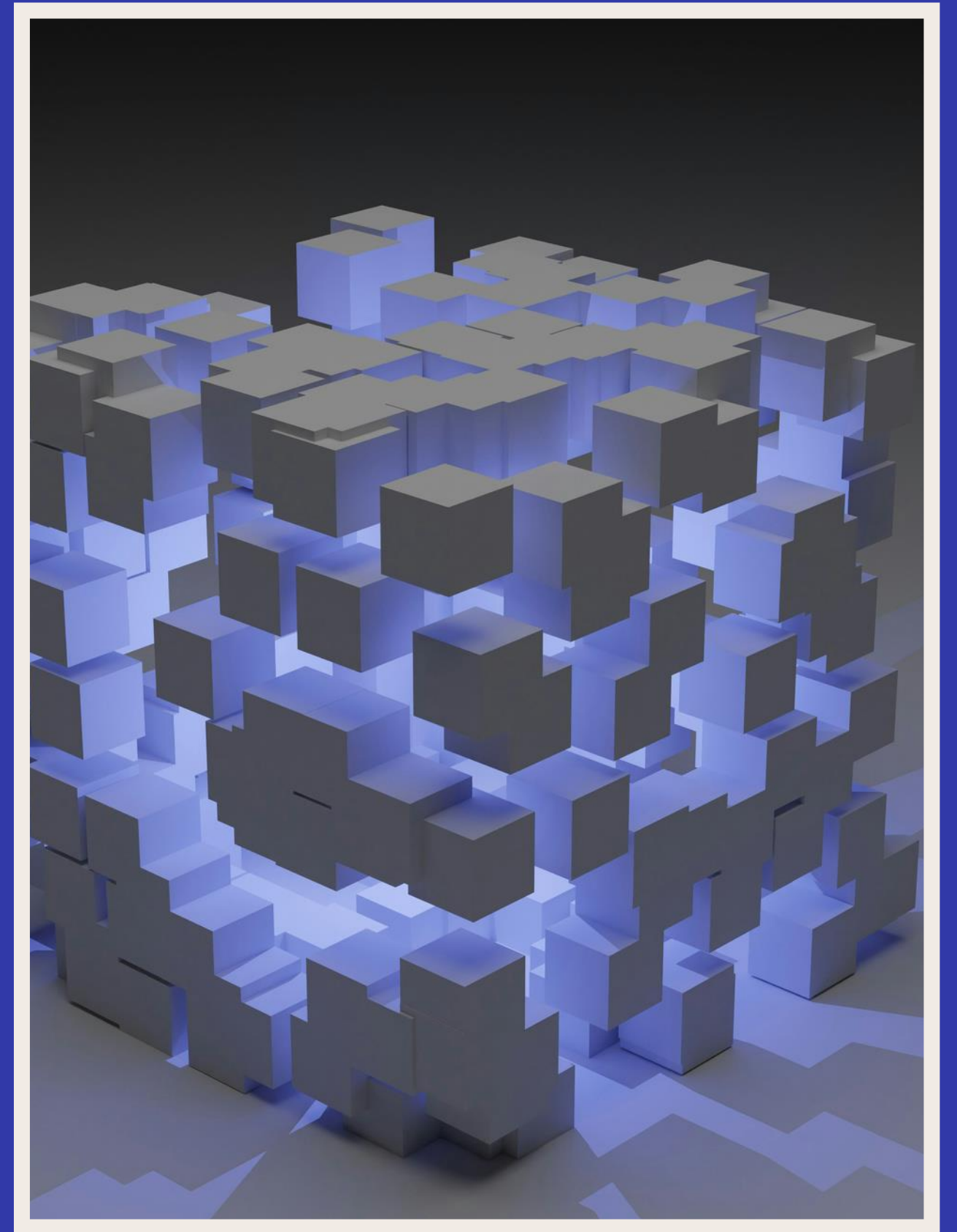
EMERGING TRENDS AND METHODOLOGIES

1. Predictive Analytics: Leveraging machine learning algorithms and predictive modeling techniques to forecast future costs based on historical data and relevant variables.



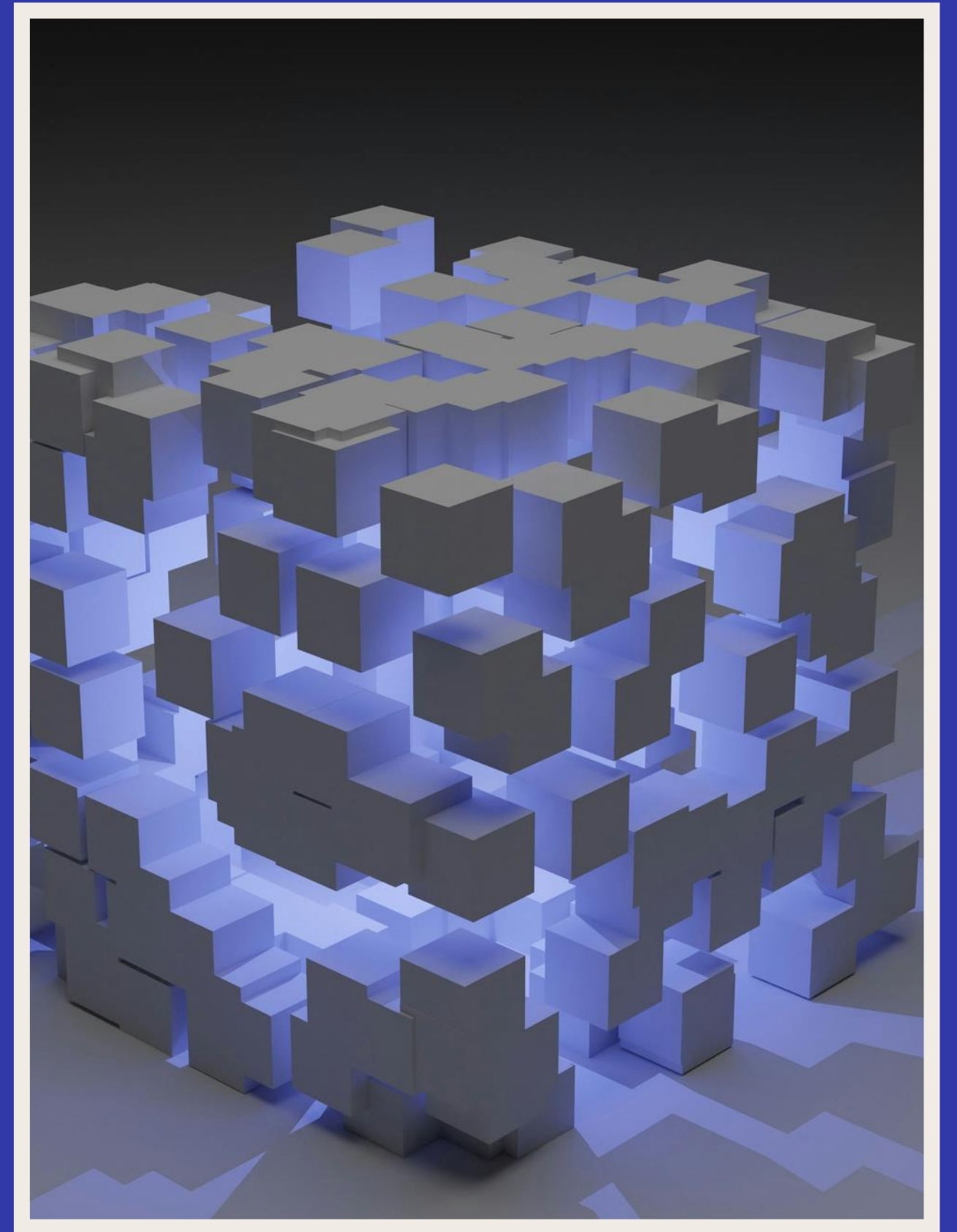
EMERGING TRENDS AND METHODOLOGIES

2. Activity-Based Costing (ABC): Allocating costs to specific activities or processes based on their consumption of resources, providing a more accurate view of cost structures.



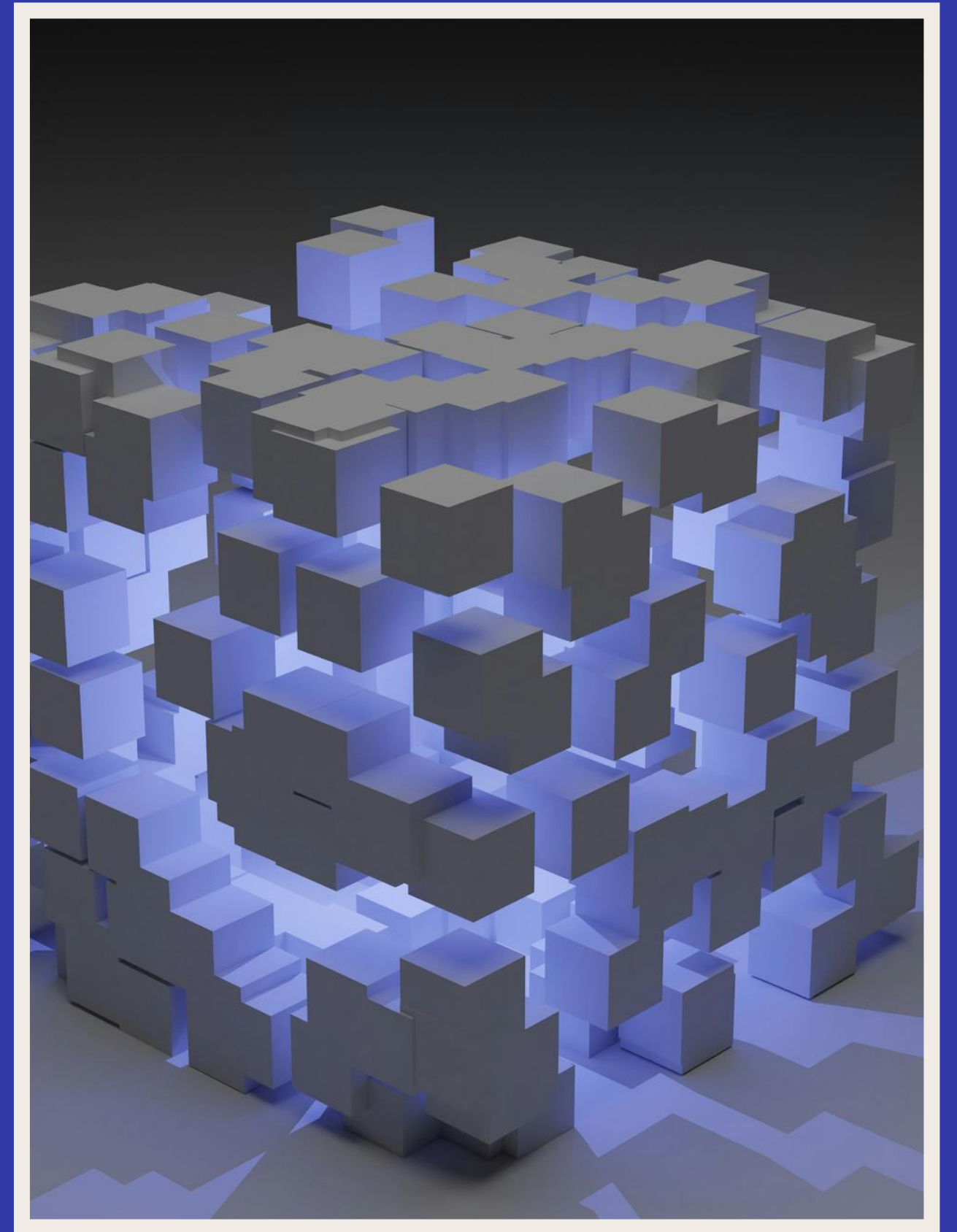
EMERGING TRENDS AND METHODOLOGIES

3. Real-Time Data Integration: Integrating real-time data streams from multiple sources to enhance the timeliness and accuracy of cost estimation and budgeting.



EMERGING TRENDS AND METHODOLOGIES

4. Risk-Based Budgeting: Incorporating risk analysis techniques to assess the potential impact of uncertainties and develop risk-adjusted budgets.



CHALLENGES OF INNOVATIVE COST ESTIMATION AND BUDGETING TECHNIQUES

- Data Quality and Availability
- Complexity and Technical Expertise
- Integration with Existing Systems
- Cost and Resource Constraints
- Risk and Uncertainty: introduce new sources of risk and uncertainty into the estimation process.
- .Organizational Culture and Resistance to Change
- Regulatory and Compliance Requirements



OVERCOMING THE CHALLENGES OF COST ESTIMATION AND BUDGETING TECHNIQUES

1. Data Quality Improvement
2. Data Integration and Centralization
3. Invest in Training and Skill Development
4. Collaboration and Cross-Functional Teams
5. Pilot Projects and Proof of Concepts



OVERCOMING THE CHALLENGES OF COST ESTIMATION AND BUDGETING TECHNIQUES

6. Customization and Acclimatizing

7. Change Management and Stakeholder Engagement

8. Continuous Improvement and Feedback Loop

9. Compliance and Risk Management



FUTURE DIRECTIONS AND IMPLICATIONS

The future of data-driven cost estimation and budgeting is shaped by advancements in artificial intelligence, machine learning, and big data analytics.



CONCLUSION

In conclusion, embracing new and innovative data-driven techniques holds immense potential for transforming cost estimation and budgeting practices in organizations within construction industry.

