The Impact of Data Quality on Budget Development and Reporting in Mining Operations

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Introduction

- Effective budget management and reporting are vital
- They also serve as key performance evaluation tools
- Despite advances in budgeting methodologies budget reliability is still undermined by poor data quality
- Common issues include:
  - Faulty or missing meter data
  - Outdated readings
  - Delayed data submissions
- These data weaknesses lead to inaccurate budgets

Existing Gap:

- Existing studies overlook the quality of input data that determines their effectiveness.

Aim:

- This research shifts focus from the budgeting method to data quality, proposing a practical framework “the Data Quality Toolbox” to diagnose and address these issues.

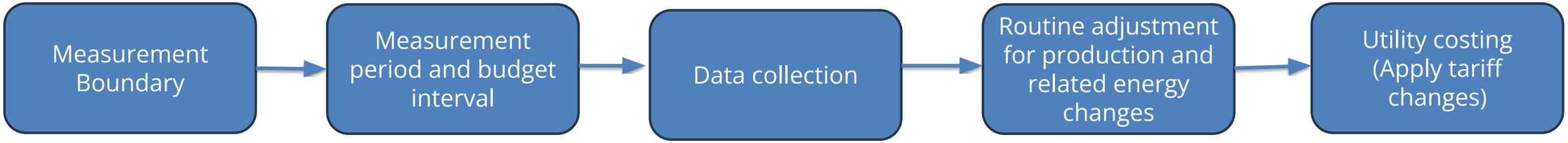
Budget development and it’s limitations in practice

Budget Development in Mining

- Various methods used, depending on operational preference and strategic objectives.
- Incremental budgeting is most common:
  - Uses historical data with an estimated increment/decrement.
  - Simple to apply but assumes operations remain similar to the base year.
  - Can fail to reflect current operational changes accurately.

Budget development and it’s limitations in practice

Survey of 63 mining shafts revealed common steps:



Improving Budget Accuracy

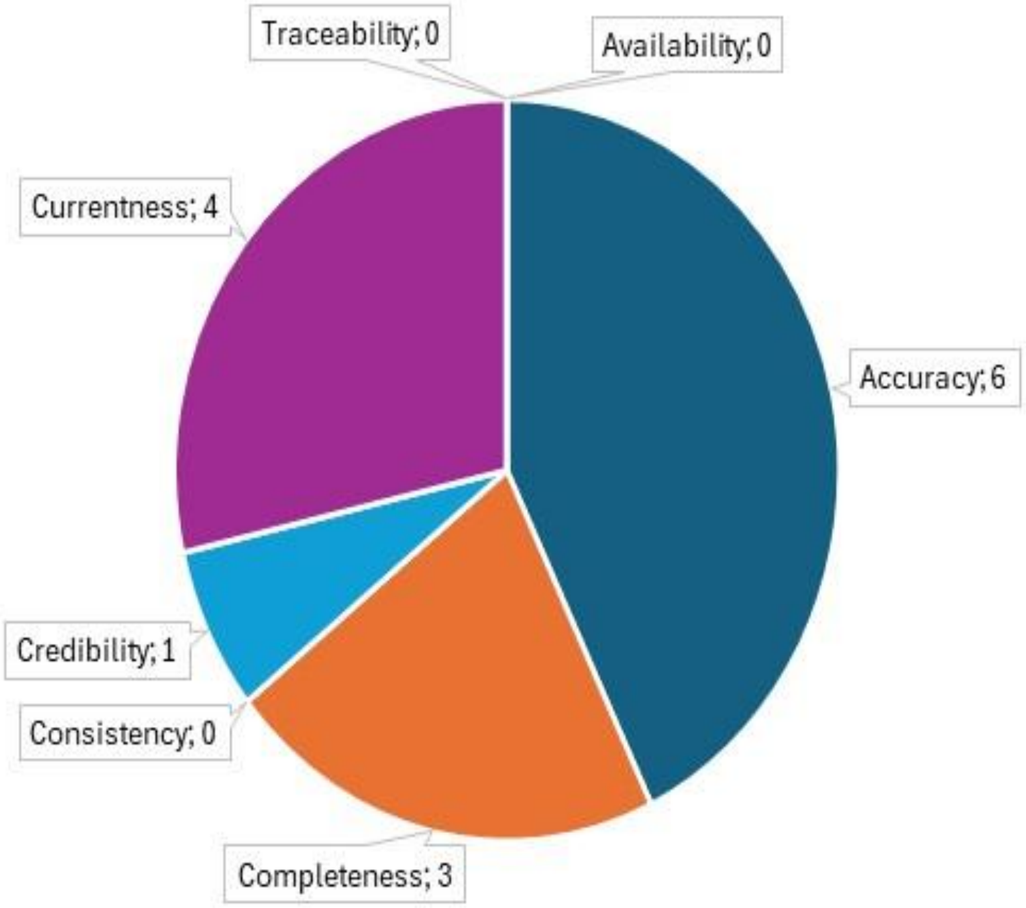
- Studies incorporate measurement and verification principles:
  - Accuracy checks
  - Consistency reviews
  - Reliability assessments
- These practices are not widely implemented and often lack formal auditing.
- Insights from these practices guided the development of the proposed framework.

Data quality assessment and audit

Accuracy	Completeness	Consistency	Credibility	Currentness	Traceability	Availability
❑ Errors ❑ Misinformation ❑ Record comparison	❑ Data gaps ❑ Period gaps ❑ Necessary inputs	❑ Standardised measurements ❑ No contradictory figures	❑ Verifiable ❑ Reliable ❑ Transparent adjustments	❑ Current ❑ Up to date	❑ Clear lineage ❑ Trackable	❑ System access ❑ Accessible data

Data Quality Assessment Results

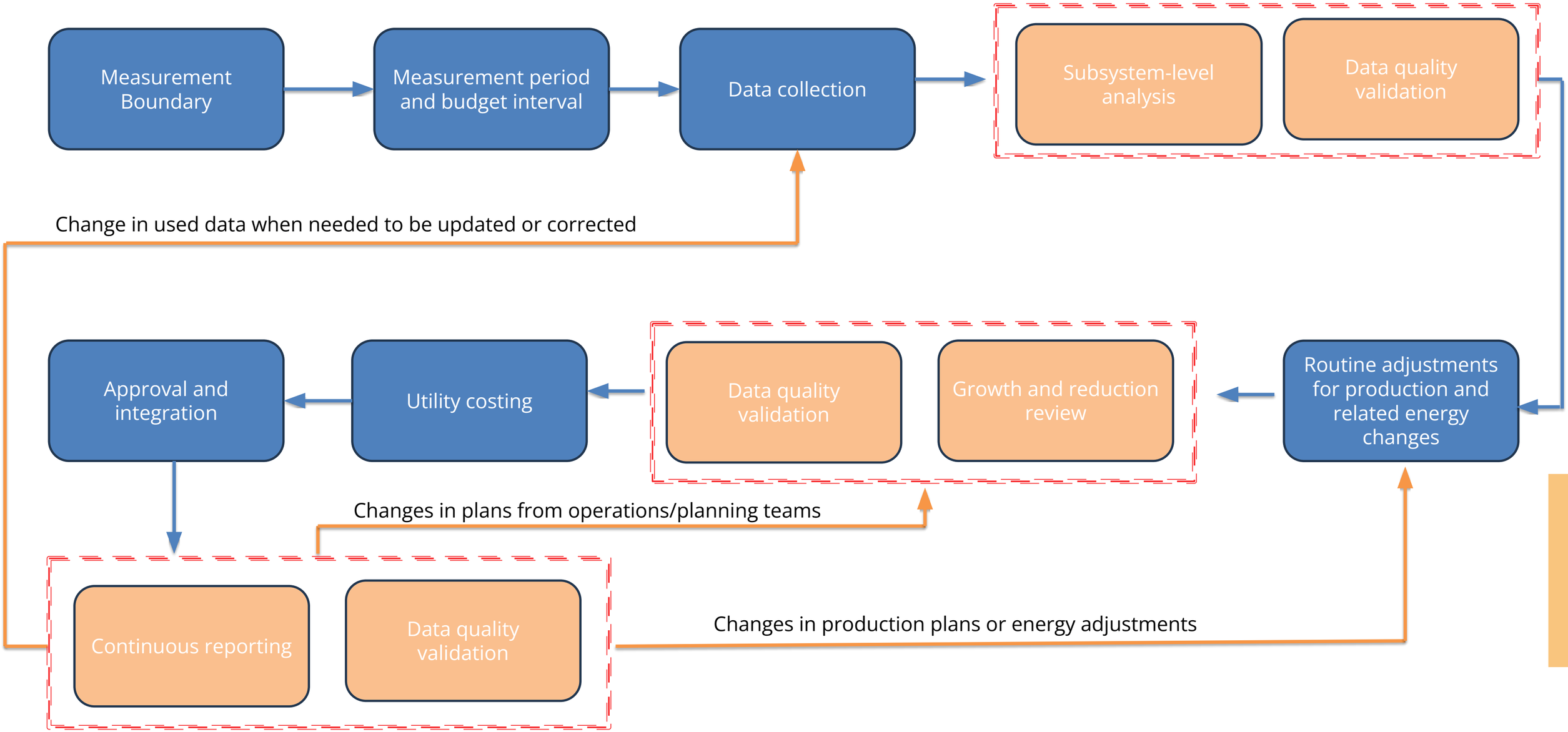
- Combined qualitative questionnaires with technical audits for deeper insight.
- 10 operations, Jan-July 2025
- Key weaknesses: Accuracy, Completeness, Currentness
- No major issues: Consistency, Traceability, Credibility, Availability
- Highlights that many data issues would remain hidden using only numerical data or reports.
- Revealed systemic weaknesses in:
  - Data generation
  - Tracking
  - Reporting processes



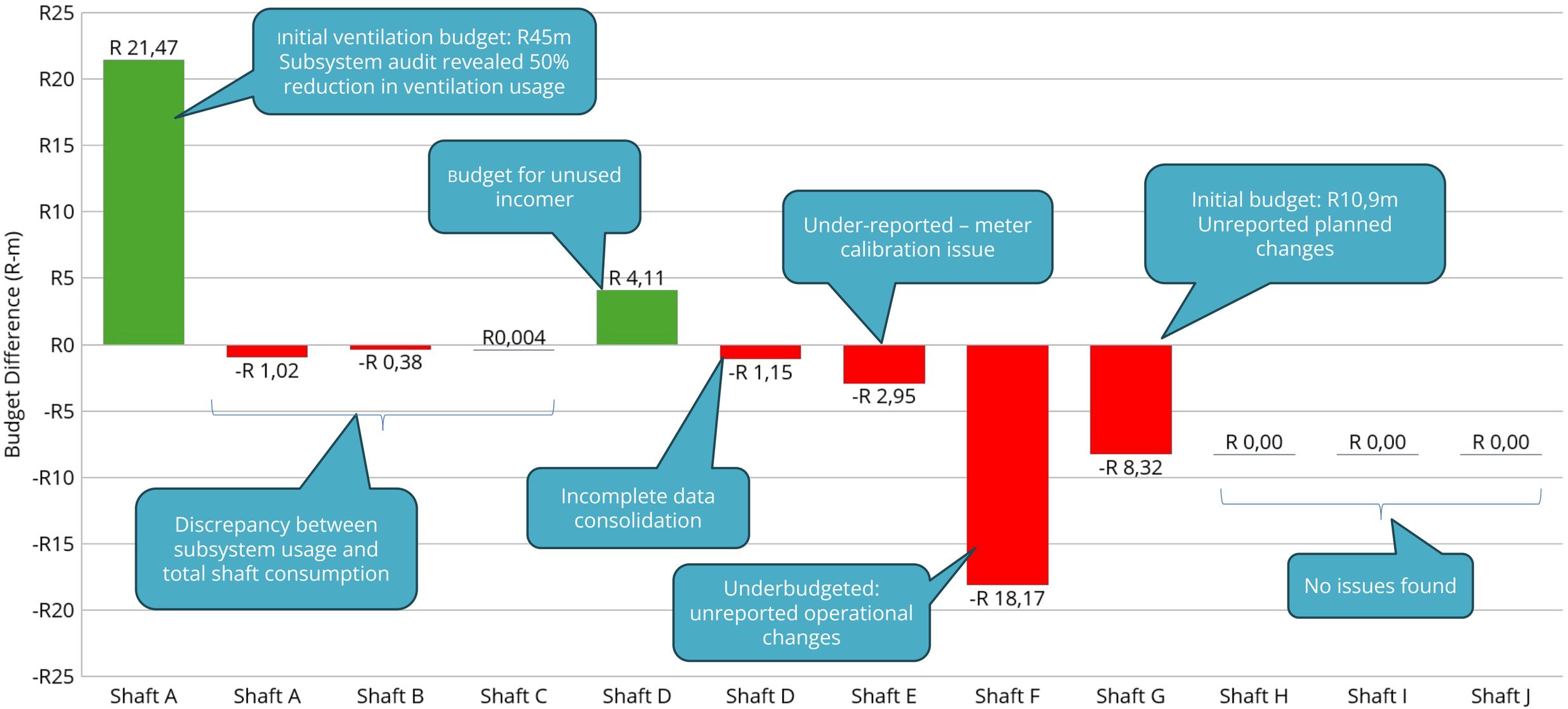
Data Quality Assessment Results

- Examples:
  - Unbudgeted savings masking poor performance elsewhere.
  - Offsetting mistakes creating *false accuracy*.
  - Operational changes (e.g., equipment delays, section consolidations) not communicated to reporting teams.
- Result: Discrepancies between planned and actual budgets.
- Budget variance alone doesn’t reflect true performance.
- Must interpret results through a data quality lens.
- Findings use to form the foundation for the Data Quality Toolbox

Proposed data quality toolbox



Key findings



Comparison of budget before and after proposed toolbox application

Conclusion

- The paper focused on energy and cost budgeting
- The proposed solution is adaptable to other utilities and operational needs.
- Data quality ensures accuracy and reliability
- These are systemic issues, caused by:
  - Insufficient data segmentation
  - Outdated operational inputs
  - Weak communication between operations and budgeting teams
- Overreliance on aggregated shaft-level data masks subsystem variances, leading to misleading forecasts.
- Granular subsystem-level analysis enhances precision and enables targeted operational interventions.
- Adapting to Change and Ensuring Accuracy
- Budgets must integrate planned operational changes
- Real-time reporting fosters trust and credibility between financial and operational teams.
- The proposed approach offers a pathway to:
  - Mitigate financial risk
  - Enhance operational efficiency
  - Strengthen organizational alignment

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