

Project Cost Management Analysis: The DIA Automated Baggage Handling System

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INFO 6245: Planning and Managing Information Systems Development

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October 17, 2025

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The Automated Baggage Handling System at Denver International Airport (DIA) was initiated in the early 1990s, with the goal of innovative world-class, full automation of bag delivery to and from the aircraft. The City of Denver was looking to reduce lost luggage, decrease turnaround times, and enhance passenger experience. Conversely, the project turned into one of the most expensive technology failures in airline history in the United States. Cost estimates rose from \$193 million to nearly \$400 million, and the opening of the airport was delayed by 16 months (Montealegre & Keil, 2000). To achieve full automation, the City of Denver hired BAE Automated Systems, Inc., a global material handling company, to design a system consisting of an airport-wide network with 5,000 optical sensors and 56 barcode scanners. The major stakeholders were the City of Denver, Mayor Wellington Webb, BAE, United Airlines, and several federal agencies. Originally planned for a single concourse, the scope of the project quickly expanded to cover all three concourses without any changes to cost or schedule baselines, violating PMBOK principles of cost management and compressing the schedule, creating conditions for later cost overruns (Montealegre & Keil, 2000). Public and media scrutiny increased after a failed test of the entire system in April 1994, when bags became misrouted, jammed, and destroyed on the conveyor systems, all of which publicly embarrassed City officials and raised alerts from investors (Flynn, 1994).

Evaluation of Cost Management Practices

1. Budget Estimation and Planning Errors

Errors in cost management occurred during the Estimate Costs and Determine Budget processes. City leaders disregarded consultants' comments on the automation technology being immature for DIA's scale. No contingency reserves were added into the \$193 million estimation, and other

elements necessary to implement the technology, such as integration with existing software, training of staff and vendors, and test/reviews of system performance, were excluded from the cost plan. As a result, any design change led to unplanned costs that quickly absorbed any budget margin.

2. Weak Cost Control Mechanisms

DIA did not have a formal Control Costs system. There was no Earned Value Management (EVM) to evaluate Cost Performance Index (CPI) or Schedule Performance Index (SPI). Project reports were based on anecdotal progress rather than variance data, hiding growing costs until it was required by the external audit (Montealegre & Keil, 2000).

3. Governance and Accountability Failures

Without a Change Control Board (CCB), the changes made were uncontrolled. BAE changed design parameters multiple times to meet new United Airlines requirements, without any change in the budget. Political pressure to meet an election deadline added to the escalation of budgetary figures creating a cycle where sunk costs warranted additional expenditures.

Table 1

Major Cost Management Issues in the DIA Baggage System Project

Issue	Summary
Unrealistic Budget	Initial estimate was significantly lower than the final cost, and it did not have any contingency.
Scope Expansion	More concourses were added but budget timeline and cost estimates were not adjusted.
Weak Cost Controls	No EVM or variance technique was evident to track any cost overruns.
Risk Oversight	Technical risks were underestimated and budgeted contingency.
Political Pressure	Deadlines took precedence over accurate costing and governance.

Note: Adapted from Montealegre and Keil (2000) and Flynn (1994).

As depicted in Table 1, ineffective budgeting, a lack of scope control, and political pressure resulted in increased costs and delays to the project launch.

Figure 1

Cost Management Analysis



This figure sums up the challenges and outcomes of cost management in the project, pointing out how poor budgeting, failures in governance, and inadequate oversight influenced strained financial performance, and required an even more pressing response.

Implications of Cost Overruns

The cost overruns created a chain or ripple effect, which extended into other financial or political ramifications. The total cost incurred to develop the airport was \$5.2 billion, which in turn, forced downgrades on a number of bonds and triggered investigations to be launched by the SEC, FAA, and GAO (Montealegre & Keil, 2000). On top of that, since the continuing costs of the project showed $CPI < 1.0$ (indicating an exceptionally high level of inefficiencies), levels of public trust in the project were reduced, and the media started to highlight taxpayers' losses. All

of these problems lead management to scale down, and to agree to some reopening of the airport to save it from completely failing, with one semi-automated concourse opened, which was an example of de-escalating which led to a partial recovery.

Alternative Cost Management Strategies

Using PMBOK principles, a variety of approaches could be employed to help to decrease escalation:

- 1) Progressive Elaboration and Phased Funding - Approving budgets by concourse phase and using real performance to inform estimates thereafter.
- 2) Formal EVM Reporting - Tracking variances monthly (CPI/SPI) to identify deviations sooner.
- 3) Change Control Board of Review - Require that any changes to scope, design, or engineering that exceed a 10% change to baseline be reviewed.
- 4) Contingency & Management reserves - Hold 15-20 percent as contingency reserves for technological risks.
- 5) Transparency with Stakeholders - Develop a public dashboard of reports to engage stakeholders (investors and taxpayers) and re-establish their trust.

Lessons Learned and Recommendations

The DIA case exemplifies how new technology cannot substitute for poor cost control processes.

Future megaprojects should:

- 1) Bring together risk and cost control processes so that there is a means to quantify financial exposure.
- 2) Use EVM and rolling-wave planning to correlate progress with budget authority.
- 3) Establish de-escalation triggers (e.g., $CPI < 0.9$) to stimulate executive discussions.
- 4) Balance ambition with proven feasibility through pilot projects prior to full deployment.

Conclusion

The DIA Automated Baggage System serves as a case study of optimism bias, political intervention, and weak cost-control discipline can compromise an otherwise positive outcome. Future projects can increase the likelihood of avoiding the same more by aligning budgeting, risk management, and transparency of reporting within a PMBOK Cost Management perspective. In doing so, the financial sustainability of a project will be preserved along with public confidence.

References

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