

# **BRIDGING THE GAPS IN THE ELEVATOR INDUSTRY: A FRESH PERSPECTIVE ON PROCESS ALIGNMENT AND PUBLIC AWARENESS**

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## **ABSTRACT:**

The elevator industry is a foundational pillar of urban infrastructure, enabling vertical mobility that directly influences spatial planning, accessibility, and city growth. Despite its relevance, the industry remains underrepresented in public discourse and often experiences process inefficiencies within its operational pipeline.

Drawing from ground-level experience as a Graduate Engineer Trainee in Layout Design, this paper explores the challenges arising from departmental misalignments—particularly between sales, design, and installation. One recurring issue is the reliance on preliminary site data collected with the intent of later revision. While seemingly benign, this practice introduces inefficiencies such as increased task redundancy, elongated design validation cycles, and mental fatigue within the layout team—especially during repetitive updates like floor legend modifications across multiple CAD sheets.

Further, the paper highlights the communication gap between client expectations and design feasibility. Sales-driven approaches may overlook structural implications, such as providing overhead clearances that complicate installation or maintenance access. These micro-level mismatches, often addressed through informal adjustments, contribute to project-level inefficiencies and potential safety oversights.

This paper advocates for structured interdepartmental workflows, the use of standardized site validation protocols, and proactive client education as means

to reduce feedback loops and optimize lead times. By reflecting on the emotional and technical aspects of early-career engineering work in vertical transportation, the discussion aims to reignite attention toward process empathy, technical rigor, and the silent yet critical role elevators play in shaping how we live and build.

## **1. INTRODUCTION**

The vertical transportation (VT) industry is rapidly evolving—not only in terms of technology but also in how engineering processes interface with on-site operations. As urban infrastructure grows more complex, elevator systems face increasing demands for efficiency, safety, and reliability. However, operational silos between sales, engineering, layout planning, and field execution often result in misalignments, rework, and reduced overall efficiency.

This paper draws on first-hand experience at a VT firm to examine how streamlining internal processes—particularly in layout design and interdepartmental coordination—can enhance productivity, shorten installation timelines, and improve outcomes for both clients and end-users. It also proposes scalable awareness initiatives to increase public appreciation for the technical rigor involved in elevator engineering, a domain often overlooked despite its critical role in shaping modern urban life.

## **2. PROBLEM STATEMENT**

During my tenure as a Graduate Engineer Trainee at a multinational elevator manufacturing company, I observed recurring challenges in translating engineering intent into seamless on-site execution. The key issues included:

1. Delays in layout design clarifications stemming from unclear standards and the absence of structured feedback loops.
2. Ambiguities encountered by field teams that were not identified and addressed during the design phase.
3. Communication gaps across departments, leading to coordination inefficiencies.
4. A general lack of public and cross-functional awareness about the complex technical groundwork involved in elevator installation.

These challenges are not isolated to a single organization but reflect systemic gaps within the vertical transportation (VT) industry. This paper explores how a combination of technological tools and human-centric process interventions can bridge these gaps—focusing on design clarity, lean coordination frameworks, and grassroots-level awareness initiatives.

### **3. LITERATURE REVIEW**

Vertical Transportation (VT) systems are essential to modern urban infrastructure, but much of the academic research in this domain has focused on product-level aspects such as traffic simulation, ride quality, energy efficiency, and safety mechanisms (Barney, 2003; Peters, 1998). While these studies have driven technological advancement, they offer limited insight into process-level challenges, such as layout coordination, design handovers, and interdisciplinary communication—factors that directly affect installation outcomes.

In broader construction and manufacturing contexts, several studies have linked project inefficiencies to breakdowns in early-stage coordination. Azhar et al. (2008) found that poor design handovers in BIM environments were a major cause of downstream rework. Similarly, Love et al. (2002) identified that even minor misinterpretations during early design phases can escalate into costly site-level disruptions.

To address such inefficiencies, Lean Construction principles—originally derived from manufacturing—have been adapted to improve workflows in VT installation projects. In a Brazilian case study, a structured application of Lean tools (including A3 reporting and value-stream mapping) led to measurable reductions in cycle time: from 21 to 17 days in one project phase, and from 7 to 6 days in another, marking a 14–19% improvement (Montenegro et al., 2012). These gains were attributed to early-stage alignment between engineering and field execution teams.

Another emerging framework is Design for Installation (DFI), adapted from Design for Manufacturing (DFM), which emphasizes minimizing on-site improvisation by incorporating field insights during the design phase. Pan and Sidwell (2011) showed that off-site modular construction projects that applied DFI principles achieved greater consistency in output and reduced change orders during installation.

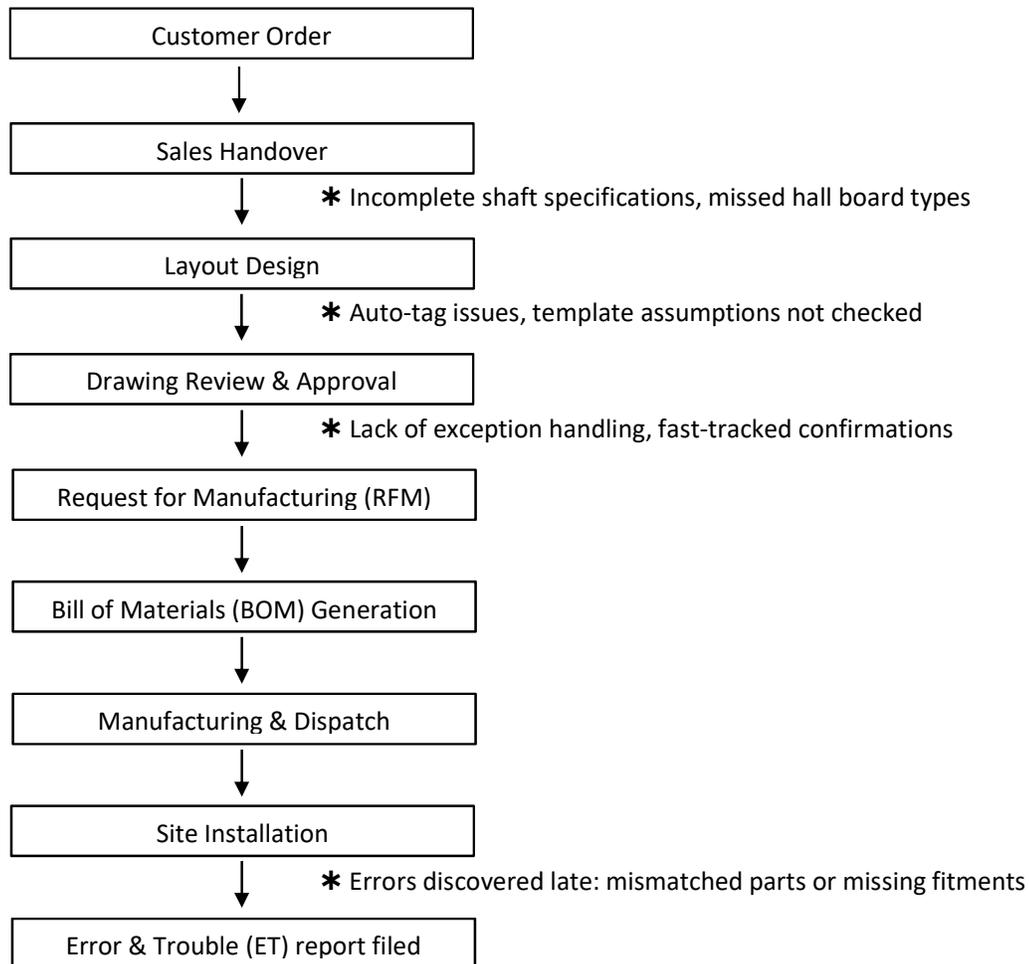
Additionally, digital collaboration platforms are increasingly recognized for their role in improving project coordination. The Construction Industry Institute (2019) reported that such platforms helped reduce Requests for Information (RFIs) by over 30% in complex, multi-disciplinary construction projects. This is highly relevant to VT projects, where layout drawings and shaft configurations often demand iterative clarification.

Despite these advancements, the elevator industry remains underexplored from a process and coordination perspective, particularly regarding the silent, process-level decisions that shape installation efficiency and client satisfaction. This paper aims to address that gap by drawing on first-hand observations and real project data to highlight how better process alignment—not just better products—can improve outcomes across the VT lifecycle.

### **4. METHODOLOGY**

This study is grounded in direct industry exposure gained during a Graduate Engineer Trainee (GET) role at a global elevator manufacturer, where I was assigned to the

Layout Design department. Over several months, I engaged in live projects involving high-rise commercial and residential elevator installations. The methodology employed to identify systemic inefficiencies and propose process improvements comprised four key components:



**Figure 1: Elevator project lifecycle, with critical failure points marked**

#### 4.1 Active Participation in Layout Design

I was directly involved in the preparation and revision of layout drawings, responding to evolving site conditions, consultant feedback, and internal review processes. This hands-on experience provided insight into recurring points of friction between the design office and field execution teams.

#### 4.2 Cross-Functional Coordination and Process Mapping

A significant aspect of my role required continuous coordination between the Business Support and Engineering teams. The Business Support team served as a conduit between Layout Design and regional Sales, while Engineering was responsible for generating mechanical and electrical component designs based on the Bill of Materials (BOM) and site-specific inputs.

This interdepartmental collaboration revealed several process inefficiencies. For instance, in one project involving a two-car elevator shaft, the sales handover omitted the capacity mapping for each car (8-pax and 15-pax), causing ambiguity in shaft

arrangement and subsequent delays. In another case, discrepancies in anchor bolt positioning arose due to a lack of standardized placement logic—especially in shafts with non-typical dimensions. Such incidents highlighted the absence of consistent guidelines and the reliance on informal assumptions across teams.

#### **4.3 Field-Level Feedback and Practitioner Insights**

To supplement internal observations, I engaged in informal discussions with experienced field technicians, including a senior installation expert with over 17 years of on-site experience. These practitioner insights illuminated several gaps between drawing specifications and practical feasibility, often overlooked in formal documentation.

#### **4.4 Review of Rework and Error Documentation**

An internal review of rework logs and error reports revealed that a significant proportion of issues originated from preventable lapses in coordination, absence of mandatory cross-checks, and inconsistencies in communication standards across teams. Documents such as elevator layout drawings, Request for Manufacturing (RFM) submissions, Bills of Materials (BOM), and Error & Trouble (ET) reports were reviewed to trace the origin of issues and assess systemic vulnerabilities.

## **5. FINDINGS AND RECOMMENDATIONS**

### **5.1 Pre-Layout Process Gaps**

#### **5.1.1 Incomplete Shaft Specifications in Multi-Car Projects**

**Problem:** Sales teams often submitted drawings without clearly mapping individual car specifications within shared shafts.

**Impact:** Resulted in delayed clarification requests and scheduling conflicts during the layout phase.

**Recommendation:** Introduce a Sales Handover Checklist with mandatory fields for shaft assignment, car differentiation, and pit/headroom references.

#### **5.1.2 Premature Site Data Submission and Floor Legend Issues**

**Problem:** Floor heights, legend details, and site measurements were often submitted just to raise the order—without confirmed or accurate data.

**Impact:** Created cascading changes across layout, engineering, and site coordination, leading to rework and timeline slippage.

**Recommendation:** Establish a Site Data Verification Protocol, requiring preliminary validation of floor legends and site measurements before order finalization.

### **5.2 Standardization Challenges**

#### **5.2.1 Inconsistent Component Fitment Understanding**

**Problem:** Discrepancies emerged across layout, engineering, and field teams regarding the placement of anchor bolts and brackets, with no shared fitment logic.

**Impact:** Risk of structural misalignment and unnecessary delays in installation.

**Recommendation:** Develop a Standard Component Fitment Guide, including tolerance zones, edge cases, and visual references for critical components.

### 5.2.2 Lack of Drawing Page Structure

**Problem:** The number and arrangement of drawing pages varied by individual, with no fixed sequence or content logic.

**Impact:** Confusion in revisions, inefficient approvals, and inconsistent clarity for downstream teams.

**Recommendation:** Enforce a Drawing Page Norm Policy specifying that a 1-car project should contain 5 pages, while a 2-car project should include 7–8 pages. Each set of drawings should consistently include sections for layout, fitment details, legend, section views, and technical notes.

**Table 1: Recommended layout drawing page structure**

Project Type	No. of Pages	Page Breakdown
1-Car Project	5 Pages	Plan, Elevation, Rail Arrangement, Entrance, CSW (Customer Scope of Work)
2-Car (Same Specification)	7 Pages	Plan 1, Plan 2, Elevation, Rail Arrangement, Entrance 1, Entrance 2, CSW
2-Car (Different Specification)	8 Pages	Plan 1, Plan 2, Elevation, Rail Arrangement, Entrance 1, Entrance 2, CSW 1, CSW 2
Special / Custom Configurations	9+ Pages	Add Cabin Drawings, Machine Room Drawing, Alternate Shaft Layouts, etc., as needed

### 5.3 Communication and Feedback Loops

#### 5.3.1 Slow Inter-Team Clarification Loops

**Problem:** Layout engineers often waited over 24 hours for replies to clarification emails or messages.

**Impact:** Disrupted workflow and delayed project handovers.

**Recommendation:** Deploy a Clarification Dashboard that includes the following elements: (1) escalation timers (e.g., 12-hour response expectation), (2) standardized clarification templates, and (3) a tagging system to assign responsibility to stakeholders.

**Table 2: Mock-up of proposed inter-team clarification dashboard**

Query ID	Raised By	Issue Summary	Assigned To	Time Left
#CL-023	Layout	Cut-out dimensions required for special case controller placement	Engineering	4 hrs
#CL-024	Field	Bracket mismatch	Layout	8 hrs
#CL-025	Layout	Floor height mismatch between order specification and architectural drawings	Sales	3 hrs

### 5.3.2 Field Learning Not Fed Back into Design

**Problem:** Feedback from field teams—such as recurring install issues or site adaptations—was not systematically captured or integrated into design updates.

**Impact:** Errors repeated across projects, with no institutional learning.

**Recommendation:** Implement Quarterly Field Review Syncs to document learnings, review recurring problems, and update design protocols collaboratively.

**Table 3: Root cause analysis of key findings**

<b>Issue</b>	<b>Observed Problem</b>	<b>Root Cause(s)</b>	<b>Category (6M)</b>	<b>5 Whys Summary</b>
<b>1. Incomplete Shaft Specs in Multi-Car Projects</b>	Delays in layout due to unclear shaft/car assignments	No standard sales handover format with car-wise mapping	Method / Management	Sales shared only GA → No car-wise detail → No checklist → No enforced process
<b>2. Premature Site Data and Floor Legend Issues</b>	Rework due to incorrect floor heights and legends	Site data submitted prematurely to book orders	Management / Measurement	Data submitted early → Not validated → Order pressure → KPI-driven → No verification policy
<b>3. Anchor Bolt Fitment Conflicts</b>	Misalignment during installation	No shared logic or references between design and site teams	Method / Man	Teams assume different logics → No guide exists → Not documented → Assumed as tribal knowledge
<b>4. Drawing Page Structure Inconsistency</b>	Approval and review confusion	No standard page sequence across engineers	Method / Management	Each engineer follows own format → No policy → No audits → Low priority on standardization
<b>5. Delayed Clarification Loops</b>	Layout stuck waiting >24h for replies	No escalation timeline or assigned accountability	Management / Man	Queries via email → No dashboard → No timelines → No system enforcement
<b>6. Field Learnings Not Integrated into Design</b>	Repeat errors in multiple projects	No structured feedback loop from field to design teams	Management / Method	Field issues not documented → No quarterly reviews → No habit of institutional learning

## **6. CASE STUDIES**

The following anonymized case studies (*generalized from industry observations and anonymized for process-improvement discussion*) illustrate recurring process challenges encountered in vertical transportation projects.

### **6.1 Case Study: Hall Board Error in a Two-Car Elevator Project**

#### **6.1.1 Project Overview**

In a two-car elevator installation, a critical mismatch occurred between the dispatched product and the site cut-outs regarding the hall board configuration—the passenger interface used for calling the elevator at each landing.

The customer had requested a common hall board, centrally placed between the two elevators. However, the auto-generated layout drawing defaulted to individual hall boards for each car, leading to approval of the wrong configuration and subsequent site-level conflict.

#### **6.1.2 Sequence of Events**

##### **6.1.2.1 Order Specification and Auto-Generated Layout**

The Sales team documented the customer's requirement for a single, centrally located hall board. However, the layout software used for drawing generation defaults to individual hall boards in multi-car settings, as it lacks automated logic for common board placement.

##### **6.1.2.2 Layout Review and Drawing Forwarding**

Only minor changes were made to the drawing, and the Layout team overlooked the auto-tag referring to individual boards. Assuming no significant alteration, the drawing was forwarded for customer confirmation without manual intervention or exception handling.

##### **6.1.2.3 Sales Approval and Customer Confirmation**

The Sales team missed to detect the mismatch between the drawing and the original spec. As a result, the customer approved the layout, unaware that it contradicted their original requirement for a single hall board.

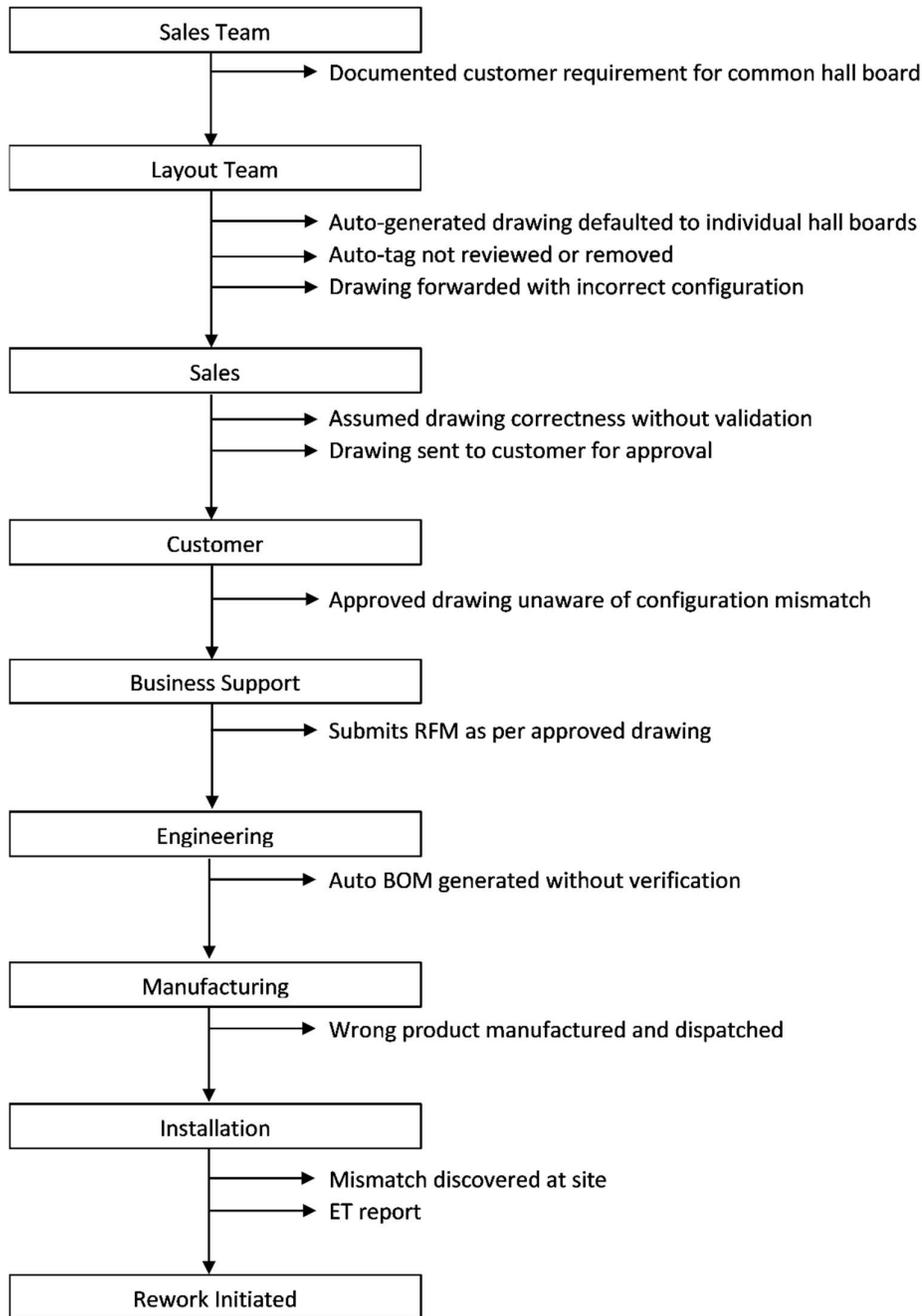
##### **6.1.2.4 Business Support and Engineering Processing**

The Business Support team prepared and submitted the Request for Manufacturing (RFM) based on the incorrectly approved drawing.

Engineering proceeded with auto-generation of the Bill of Materials (BOM), assuming the layout was correct, and manufacturing was carried out accordingly.

##### **6.1.2.5 Installation and Error Discovery**

Due to contamination-prevention protocols, the hall boards were not unpacked for verification upon delivery. During installation, the team discovered that the site had been prepared with cut-outs suitable for individual hall boards—not the centrally placed common board originally specified. An Error and Trouble (ET) report was filed, resulting in rework and project delay.



**Figure 2: Error propagation in Hall Board Configuration – Two-Car Elevator Project**

### 6.1.3 Root Cause Analysis

1. Reliance on default auto-generated outputs led to inclusion of incorrect hall board tags.
2. Lack of manual review for exception cases in layout drawings.
3. Failure to cross-check customer-approved drawings against the original order specification.

4. No final validation gate to reconcile the order specification, layout, and BOM before dispatch.
5. Process ownership was fragmented, and each team assumed prior checks were completed.

#### **6.1.4 Lessons Learned**

1. Auto-generated drawings require manual review when non-standard configurations like common hall boards are involved.
2. Introduce a Sales Handover Checklist including mandatory hall board type and placement fields.
3. Implement multi-document alignment protocols before confirming manufacturing: order spec vs drawing vs BOM.
4. Encourage a culture of ownership where each team verifies—not assumes—spec integrity.

#### **6.1.5 Recommendation**

Establish a Final Validation Gate at the post-RFM stage where:

1. Order specification, layout drawing, and BOM are compared for consistency.
2. Exception conditions (e.g., shared components, custom placements) trigger manual review alerts.
3. Include hall board type as a mandatory field in the RFM checklist.  
This simple measure can prevent major downstream errors in multi-car projects.

### **6.2 Case Study: LED Reflection Issue in Mirror-Finish Double Ceiling**

#### **6.2.1 Project Overview**

In a premium elevator interior project, the customer requested a mirror-finish double ceiling. The design consisted of:

1. A false ceiling on both sides, housing LED downlights.
2. A top ceiling that remained visible in the middle section, also finished in mirror polish.

The objective was to create an elegant visual experience using full mirror-finish surfaces. However, after installation, the mirror-finished top ceiling reflected the internal components of the LED fixtures, resulting in a visually displeasing outcome that the customer found unacceptable.

#### **6.2.2 Sequence of Events**

##### **6.2.2.1 Customer Request and Sales Approval**

The customer requested mirror finishes on both the top and false ceilings. Sales approved the request and proceeded with layout coordination without consulting Product Development for any design caution or reflection impact.

##### **6.2.2.2 Layout Design and Drawing Approval**

The Layout team drafted and finalized the drawings as per the request. The exposed top ceiling area in the middle was retained as mirror-finished, and the

drawings were sent to the customer, who approved them without being shown visual behaviour or simulations.

#### **6.2.2.3 Manufacturing and Dispatch**

Based on approved drawings, the mirror-finish ceiling components were manufactured and dispatched.

No objections were raised during production or quality checks, as the specifications were technically fulfilled.

#### **6.2.2.4 Installation and Error Detection**

During installation, the LED lights from the false ceiling were clearly reflected onto the mirror-finished top ceiling, making the internal light components visible to passengers. The customer found this aesthetic flaw unacceptable, and Sales filed an Error and Trouble (ET) report, requesting a change to a plain top ceiling.

#### **6.2.3 Root Cause Analysis**

1. The Sales team lacked design sensitivity awareness related to mirror reflections in partially exposed areas.
2. No knowledge transfer session or caution checklist was in place from Product Development to Sales or Layout teams.
3. Visual simulation or experiential review of the design was not performed prior to customer confirmation.

#### **6.2.4 Lessons Learned**

1. Design-level understanding must be part of the Sales and Layout function, especially in aesthetic-sensitive requests.
2. Maintain and circulate a “Design Behaviour Checklist”, particularly for finishes like mirrors, glass, and lighting-sensitive features.
3. Introduce render-based pre-approval visualizations or simulated walkthroughs for customer confirmation when high-finish materials are involved.
4. Create a loop where Product Development insights are routinely shared across customer-facing and drafting teams through quarterly reviews or ET debriefs.

#### **6.2.5 Recommendation**

Establish a knowledge-sharing protocol between Product Development and Sales that includes:

1. Regular ET learnings briefings.
2. Accessible design caution documentation.
3. Mandatory cross-team review for non-standard aesthetic features before order finalization.

## **7. DISCUSSION**

While this paper primarily focuses on internal process gaps, the observed inefficiencies also reflect a deeper cultural issue: the invisibility of elevator engineering. Much of the critical work done by layout engineers, field technicians, and component designers remains unnoticed—often only acknowledged when something goes wrong.

These roles demand millimetre-level precision, safety-critical decisions, and collaborative problem-solving, yet their contributions are often undervalued, even within internal teams. This lack of visibility can lead to communication breakdowns, low morale, and fragmented coordination.

To counter this, the industry must foster visibility—through improved documentation, annotated site photos, cross-department technical briefings, and even public-facing initiatives. When stakeholders—both internal and external—understand the depth and importance of elevator work, it not only improves collaboration but also builds a culture of mutual respect and accountability. Elevating the narrative around elevator engineering is essential to shaping how it's perceived, supported, and pursued as a profession.

## **8. CONCLUSION**

The vertical transportation (VT) industry operates at the intersection of engineering precision and real-world complexity. This paper, grounded in practical experience at an established organization within the elevator industry, highlighted how areas of misalignment in internal communication, documentation standards, and component clarity can lead to costly delays and preventable confusion. Issues as small as unspecified shaft assignments or ambiguous bolt placement can disrupt workflows when handovers rely on staggered inputs from multiple teams.

Mitigating these challenges calls for targeted process standardization—such as defining drawing page norms, creating fitment handbooks, and enforcing sales documentation completeness. Equally important is the creation of a robust field-to-design feedback loop to ensure on-site learnings are captured and institutionalized.

Looking ahead, the VT industry must embrace digital collaboration platforms, automated input validation, and lightweight knowledge-sharing tools. Field learning should evolve into design intelligence, and departmental silos should be replaced by transparent, traceable workflows.

Finally, the broader implication lies in recognizing the critical yet underappreciated engineering behind elevators. Creating public awareness—not just of the products, but of the thoughtful, precise, and collaborative work that enables safe vertical mobility—can reshape how elevator professionals are valued and how the industry attracts new talent.

## **9. REFERENCES**

- Azhar, S., Hein, M., & Sketo, B. (2008). *Building Information Modeling (BIM): Benefits, risks and challenges*. McWhorter School of Building Science, Auburn University.
- Barney, G. C. (2003). *Elevator traffic handbook: Theory and practice*. Spon Press.

- Construction Industry Institute. (2019). *Maximizing success in integrated projects* (Research Summary RS260-1). Construction Industry Institute.
- Love, P. E. D., Mandal, P., & Li, H. (2002). Determinants of rework in building construction projects. *Engineering, Construction and Architectural Management*, 6(4), 259–268. <https://doi.org/10.1108/eb021141>
- Montenegro, M. A., Costa, D. B., & Granja, A. D. (2012). The use of Lean tools to improve the performance of an elevators company. *Gestão & Produção*, 19(1), 165–180. <https://doi.org/10.1590/S0104-530X2012000100012>
- Pan, W., & Sidwell, R. (2011). Demystifying the concept of off-site construction: Towards a mature off-site production system. *Construction Management and Economics*, 29(11), 1086–1099. <https://doi.org/10.1080/01446193.2011.615598>
- Peters, R. D. (1998). Lift traffic analysis: Formulae for handling capacity. *Building Services Engineering Research and Technology*, 19(2), 81–86. <https://doi.org/10.1177/014362449801900203>

## 10. AUTHOR BIOGRAPHY



Mohamed Husain Haroon Rasheed is a Graduate Engineer Trainee at Fujitec India Pvt. Ltd., currently in the Layout department. He holds a Bachelor's Degree in Manufacturing Engineering from College of Engineering, Guindy (Anna University), Chennai.

His professional exposure includes a formative internship at Chennai Metco, where he worked on product development and market research — an experience that shaped his interest in aligning design intent with practical feasibility and process workflows. At Fujitec, he has contributed to various elevator projects, including high-rise projects, focusing on layout clarity, interdepartmental coordination and field-level integration.

His interests span design, product development and system-level thinking. Driven by a strong desire to create meaningful impact in every role he undertakes, he is particularly passionate about improving how engineering processes are understood, executed and valued — both within the industry and in the public eye. Vertical transportation, he believes, is a powerful example of the quiet precision that sustains modern life.