**Case Study**

IoT Led Digital Transformation for an Industry Leading Elevator and Escalator Manufacturing

Connected Elevator

The industry-leading elevators, escalators and moving walkways organization has embarked on the journey of IOT led digital transformation for last few years and LTIMindtree has been a prominent partner in helping Client in conceptualizing, defining, implementing, deploying the solutions, and overall managing the transformation program.
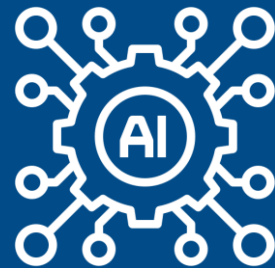
LTIMindtree has partnered with Microsoft and other vendors to build a solution for Client which helps to bring efficiency by being proactive and predictive in the operations. It also helps in presenting information in a transparent way to the customer, improving the customer loyalty and thereby increasing the revenue.
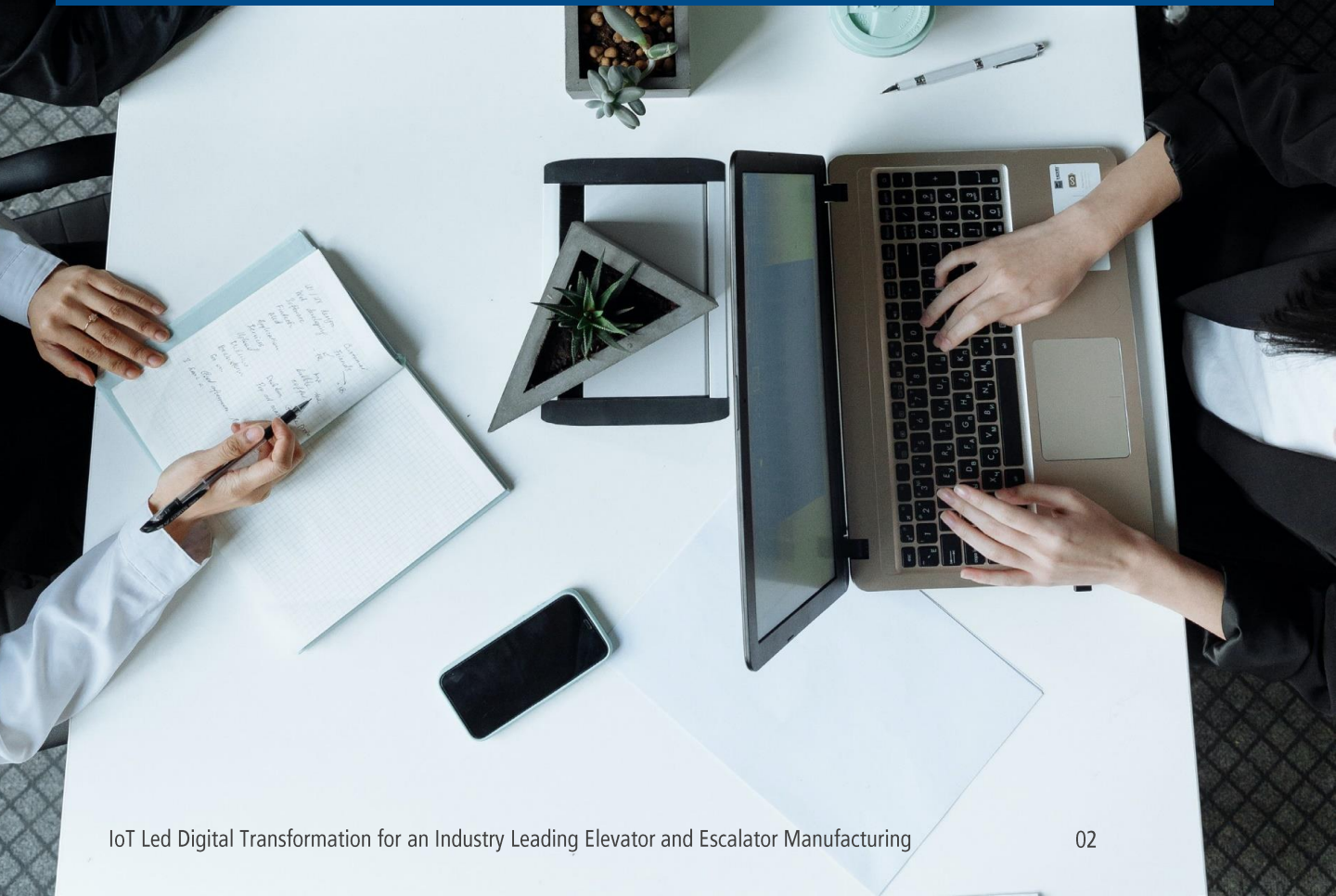
Client Challenges

Client faced multiple challenges in terms of growth in service portfolio and profitability.

- **Retention rate:** Client loses 1 to 2% of the customer to tough competition from Mom-and-Pop shops who are closer to the customer and can-do price war with the larger OEM along with wavering customer loyalty due to servicing issues.

- **Government compliance:** Countries have higher and stricter standards about the safety of passengers. Service companies must spend large amount of money to meet these needs and still have same profitability.

- **Service efficiency:** Various labor laws, and specialty required to address elevator problems makes it difficult to contain costs of Technicians, especially in Europe and North America hence increasing margin pressure.

- **Skillset problem:** Companies are losing the knowledge as workforce retires and there is a scarcity of skilled workforce.

- **Variation across regions and countries:** Client has grown by acquisitions resulting in huge variation in the technologies of these elevators and functional requirements at application level.

- **Value added services:** There are various value-added services that are achievable by adopting digital transformation. They can use cameras, speakers, VoIP (voice over the internet), motion sensors, texting capabilities to address innumerable functionalities like emergency voice, video, eMarketing, interactive elevator, additional passenger safety, remote calling and more.

- **Being ready for the future:** Adopting digital transformation technologies necessary to survive and grow in these changing times. Necessity of effective remote management of the elevators to keep them running.

Our Value Proposition & Strategy

Client turned to LTIMindtree to help them overcome their pertinent challenges. We started with the product development from scratch, our recommendations were around:

A. IMPROVE RESPONSE - Proactive

- Real-time elevator status allows to turn around the conversation ("we call you").

- Additional insights for mechanics enables quicker repairs & improved first-time fix.

B. AVOID SHUTDOWNS - Predictive

- Predictive models assign elevator health scores & highlight potential problems before symptoms arise.

- Preemptive maintenance & upgrades help avoid unexpected shutdowns.

C. PROVIDE VISIBILITY - Transparent

- Relevant information shared with customers to build trust & better set expectations.

- Customizable views and preferences provide tailored data for each customer.

LTIMindtree helped Client with the implementation of below use cases:

Real time Monitoring	Predictive Maintenance, Predictive costing	Remote Diagnostics and Troubleshooting
Real Time Notifications	Code Compliance and Passenger Safety	Behavioral Insights
Customer stickiness due to reduced downtime, reduced Service Calls and transparency	Holistic Building Management	Dashboards and Reports

Technology Solution Provided

Client captures local countries data On Premise. The on-prem data is transferred to Azure using ADF with Azure hosted integration runtime. IoT Data captured from various devices is stored in Cosmos DB and other customer related data is captured into Azure SQL. Country data, IoT data and other master data is pushed into DataLake for analytics and archival purposes.

Azure Data Bricks is used to clean and curate the data which is further used for analytics and made available in the form of APIs and PowerBI based dashboard for reporting purposes.

IoT Data

Client ONE has multiple IoT platforms, in general all these platforms are managed and maintained (Device Management, OTA Update, Device Monitoring etc.,) using Azure IoT Hub. To securely connect millions of elevators we are leveraging Microsoft Azure's Device provisioning service (DPS) and IoT hub. Data from devices is sent to IoT hub which is further routed to CosmosDB, ADX, DataLake and Event hub either directly or via Stream

Business Rule Engine (BRE)

It runs different business rules on IoT data received via Event Hub, the output of the rule is stored in CosmosDB. Depending on the streaming data and outcome of BRE, Elevator Data Model gets created which represents the current state of the elevator(Digital Twin).

Client ONE uses various platforms for hosting applications and APIs viz. AKS, Azure Functions, Azure WebApps. All the applications and APIs are secured using Azure B2C/ AD authentication.

The applications are designed for high scalability, and we have on-boarded 25+ countries now with futuristic 100+ countries. To continuously monitor and support the IoT Azure components and identify the failures, breakdown, and loss of data from Device to Gateway to IOT Hub, we developed
tracking and monitoring based on tolerance scripts on Azure.

The notification flow is triggered once the level exceeds the tolerance level. If the PaaS component exceed the utilization of 60% and continues to grow for a stipulated time, then the notification is sent to Infrastructure monitoring and application team to bring it to notice and take necessary action.

Also, in case of an Azure SQL DB if the data volume or throughput increases beyond the certain capacity, an alert is sent to the support team and owners to take necessary action. This tolerance limit triggers a workflow, and the approvals are attained to take necessary action if there is a certain cost analysis that needs to be done and accordingly scaled to next level.

Our Implementation Highlights:

- 4 Environments (Dev, QA, Stage and Prod) for each application
- 10 + Global applications deployed across geographies (EMEA, APAC, NAA, CHINA)
- 500+ Deployments
- 300+ Build and Release Pipelines
- 50% Cost reduction due to self-service infra provisioning
- 50+ Azure services using Terraform Template Created
- 40% Improvement in Support Productivity
- 100K+ Work Item created in ADO
- 300K+ devices and 25 countries onboarded

In our journey with Client, we have helped them launch the platform in 25+ countries.

As of Q4 of 2022, we have enhanced the IOT capabilities of the platform and are co-innovating along with Client for further releases.

Microsoft Technology Stack Used

- Azure IOT hub, Azure Device provisioning service, Eventhub, Stream Analytics, Cosmosdb, Azure SQL, ADLS Gen2, Azure Databricks, ADX, AKS, WebAPPS Functions, Power BI

- Azure DevOps, Azure Git Repos, Azure Pipelines

- Infrastructure as Code Tool (IaC): ARM Template, Terraform, PowerShell, Ansible

- Code Security Analysis Tool: Blackduck, Coverity, Wiz.IO and Netsparker (Client suggested tools for their enterprise level)

- Testing Tool: Azure Test Plan Selenium

- App & Mobile Deployment Platform: Visual Studio Code, Visual Studio App Center