

Six Sigma–Driven, Digitally Enabled Reduction of Early Deliveries, Delays and Failures

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Abstract

The increasing pressure to provide reliable service in logistics constantly faces big challenges during last-mile operations. To deal with the inefficient process by which G&P Logistics delivers ATM cards for B Bank in Kuwait, it was obvious that an improvement strategy was needed in February 2025, since delivery errors were at 14.84% and almost 27% of deliveries were delayed. In response to increasing customer dissatisfaction and logistical inefficiencies in the ATM card delivery service, this project applied Lean Six Sigma methodology to identify root causes and implement sustainable improvements. Through detailed analysis using tools such as SIPOC diagrams, Ishikawa (fishbone) diagrams, Pareto charts, and Failure Mode and Effects Analysis (FMEA), the project uncovered key contributors to late and failed deliveries including unclear responsibilities, a lack of delivery monitoring, and data fragmentation. To address these challenges, the team developed an automated solution to track daily delivery status, categorize final outcomes, and provide real-time KPIs. This low-cost solution significantly enhanced visibility, allowing for timely decision-making and improved compliance with On-Time Delivery (OTD) goals. The dashboard incorporated 100% stacked bar charts, top driver metrics, and trend analyses, effectively transforming raw register data into actionable insights. Beyond solving the initial problem, the Six Sigma framework enabled the identification of additional opportunities, such as reassigning delivery territories, digitizing delivery confirmations, and reducing the number of failed attempts through predictive dispatching and routing optimization. This project not only improved service quality but also demonstrated how Lean Six Sigma tools can drive continuous improvement through both root cause elimination and innovation.

Keywords

Lean Six Sigma, Service Quality, Delivery Optimization, On-Time Performance, Operational Efficiency

Biographies

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Oumayma Hamlaoui Assistant Professor at the American University of the Middle East-AUM. She earned her Engineering degree in Mechanics from the National School of Engineering of Tunis in 2017 and her Ph.D. in Material Mechanical Engineering from Cergy Pontoise Paris University and ISAE-Supméca, France, in 2022. Her research focuses on advanced materials, structural integrity of composites, and process optimization in industrial applications. As a Research Assistant at ISAE-Supméca (2018–2021), she worked on composite materials' mechanical characterization and manufacturing process enhancement. She later contributed to industrial process optimization and sustainable material solutions as a Research Engineer at Bulgin Ltd. (2018–2023). Dr. Hamlaoui has published extensively in peer-reviewed journals, integrating experimental research with computational modeling in materials science and engineering. She is a member of the Tunisian Engineers' Order and has received research funding from the European Union (EMORI). She actively participates in academic development, research collaborations, and industrial consulting projects.