**End-to-End Order Fulfilment Process Analysis**

**Order-to-Delivery Process | Business Process Analysis Portfolio Project**

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## 1. Business Problem

Order fulfilment is a critical business process in e-commerce, directly affecting customer satisfaction and operational costs. Delays between order placement and delivery can lead to poor customer experience, negative reviews, and increased logistics costs.

The purpose of this project is to analyse the end-to-end Order-to-Delivery process and answer the following questions:

- How does the order fulfillment process actually run in practice?
- How long does each step of the process take?
- Where do the main delays (bottlenecks) occur?
- What percentage of orders is delivered late compared to the estimated delivery date?

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## 2. Data Used

The analysis uses the Brazilian E-Commerce Public Dataset by Olist, which contains real transactional data from an online marketplace.

Key datasets used:

- olist_orders_dataset.csv – order lifecycle timestamps
- olist_order_items_dataset.csv – items per order and prices
- olist_customers_dataset.csv – customer location information
- olist_sellers_dataset.csv – seller information
- olist_order_payments_dataset.csv – payment details (optional)

The raw transactional data was transformed into:

- an order-level dataset (orders_enriched_simple.csv)
- a process event log (event_log_order_fulfilment_simple.csv)
- a KPI table (kpi_simple.csv)

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## 3. Process Steps Analysed

Each order is treated as a process case. The following process activities were identified using order timestamps:

1. Order Placed
2. Order Approved
3. Handed to Carrier
4. Delivered to Customer

These steps represent the full Order-to-Delivery lifecycle and were extracted into an event log suitable for business process analysis.

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## 4. Bottleneck Analysis

Using the event log, the time between consecutive steps was calculated:

- Order Placed → Order Approved
- Order Approved → Handed to Carrier
- Handed to Carrier → Delivered to Customer

The analysis shows that:

- The longest delay occurs during the last-mile delivery phase (Handed to Carrier → Delivered to Customer).
- Earlier steps (order approval and carrier handover) are relatively faster and more consistent.

- A significant proportion of orders are delivered after the estimated delivery date, indicating SLA breaches.

This suggests that logistics and delivery operations are the main source of inefficiency in the process.

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**5. Recommendations**

Based on the analysis, the following improvement actions are recommended:

1. **Focus on last-mile delivery optimisation**
   o Review courier performance
   o Introduce regional delivery benchmarks
2. **Improve delivery time estimation accuracy**
   o Adjust estimated delivery dates using historical performance data
3. **Segment delayed orders**
   o Identify patterns by region, order size, or freight cost
   o Apply targeted operational improvements
4. **Monitor fulfilment KPIs regularly**
   o End-to-end fulfilment time
   o SLA breach rate
   o Average last-mile delivery duration

These actions can help reduce delivery delays, improve customer satisfaction, and support better operational decision-making.