Optimizing the ATM Network with Analytics

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Executive Summary

- **Overview of Environment:**
  - Use of the Automated Teller Machine (ATM) has grown exponentially over the past few years due to its ease of use, increased functionality, proximity to high foot and vehicle traffic areas, and customer adaptation to technology.

- **Problem Statement:**
  - Customer Adaptation and Exponential Growth in the ATM Channel has placed high demands and very high customer expectations on three main focus areas:
    - ATM Technology
    - ATM Reliability
    - ATM Cash
      - Demand on ATMs is high but capacity to dispense and receive cash is not
      - Demand on ATMs is not contained to business hours (like it is in a Bank Branch)
      - Demand on ATMs is newer and therefore harder to predict
      - Demand on ATMs is highly correlated to locale, localized economics, and local events
      - Demand on ATMs in close proximity to each other is often not correlated
      - Demand at ATMs can be highly volatile with large numbers of customers visiting in short time-frames
      - Demand on ATMs often outpaces the ability to supply during busy times

- **Objective**
  - Determine how to meet High Demand in the ATM Channel using existing, non-elastic, supply chain constraints

- **Goal**
  - Optimize the Transit of Cash to and from ATMs in the most cost effective manner while always meeting customer demand

- **Expected Benefits of Proposed Solution**
  - Over $7MM Logistics Savings Annually
  - Over $10MM Cost of Cash Savings Annually
  - Over 3MM Better Customer Experiences
Transform CTO into a mature analytics-driven organization to realize business value - improving the customer’s experience, mitigating risk and creating efficiencies.

**Probabilistic:** What can we infer that may have happened, what do we think will happen in the future, how certain are we, and what is the optimal response or action.

**Deterministic:** What has happened, or is happening right now.
What is the R² Project?

**Client's Responsibilities**
- Set “Base” ATM Schedules
- Request “Emergency” Services
- Communicate Schedules to Vendors
- Verify Supplier Compliance to Schedules
- Billing & Invoicing
- Emergency Preparedness
- Etc

**Mission**
Optimize ATM Cash Services using Advanced Analytics

**Analytics Value Chain**
- Data → Insight → Action

- 9000 Vendor Serviced ATM's
- 100 Vendor Branch Locations
- Make Deposits
- Withdraw Cash
- Empty Deposit Bins
- Replenish Cash

**Mission**
Optimize ATM Cash Services using Advanced Analytics
SYSTEM CONTROL  What is the Difference Between:

Scripted Show

- Scripted
- Controlled
- No external factors

“Reality” Show

- (Mostly) Unscripted
- Partial control
- External factors

Comparison

Traditional Optimization Model

Simulation Model that Optimizes Across Known and Unknown Variables
Problem Statement

How do we make decisions on both Deposit Collection & Cash Refill Schedules for a fleet of 20,000 ATM’s given the following challenges:

1) Extremely variable demand at each ATM and in aggregate
2) Cash & Deposit Service Costs are interdependent
3) Some ATM’s have restrictions on when they can be serviced
4) Suppliers have an inflexible service model
   a. Must service machine on a fixed schedule each week. E.G. - Every Monday & Thursday
   b. Need several weeks lead time before adopting schedule changes
   c. Chosen schedules must be applicable for 60-90 days
   d. No control over time of day that the service occurs
   e. No visibility into Vendor’s routing challenges
   f. Misaligned financial incentives to optimize service routing
   g. Decentralized vendor management - each market is fairly autonomous
   h. Failure to complete requested services
High Level Map of the Analytical Solution

1. **Forecast Uncertainty**
2. **Vendor Arrival Time Uncertainty**
3. **Withdraw Volume Forecast**
4. **Deposit Volume Forecast**
5. **Withdraw Simulation**
6. **Deposit Simulation**
7. **Business Rules**
8. **Decision Engine**
9. **Recommended ATM Service Schedules**

- **Deposit Bin Capacity Uncertainty**
- **Deposit Uncertainty**
- **Vendor Arrival Time Uncertainty**
What is the Capacity of an ATM?

1. Manufacturer Stated Capacity is not Useable
   • Based on “Lab Tests”
   • Inconsistent Definition of “Capacity” across Manufacturers. – Mean, Median, 95%ile?

2. Mean / Median will Under Service 50% of the Time

3. 95% Confidence Interval
   • Still faults below that level 5% of the time
   • Would Reduce Planned ‘Capacity’ ~50%

"Using a Monte Carlo Simulation rather than a static value for ATM Capacity utilizes ALL of the data we have on ATM performance in the field, and quantifies & reflects how fault risk increases the higher you push an ATM's bill count."
Service Time Uncertainty

1. Service Time Uncertainty
   • Very Important for High Volume ATM's

2. Service Variability
   • Vendors deliberately vary their service routes for security reasons
Finding the Optimum Schedule for a Single ATM

Service Cost

$0 $50 $100 $150 $200 $250

Service Frequency

Fault Cost  Base Cost  Total Cost
2013 Results

- Net Savings of several million dollars due to reduced servicing of ATM’s
- Eliminated over 60,000 unnecessary replenishment services
- Eliminated over 30,000 unnecessary deposit services
- Over 3 Million Improved Customer Experiences
  - Reduced Out of Cash Events by 95%
  - Reduced Deposit Bin Full Events by 82%
Green Benefits

The optimization of nearly 9,000 ATMs has resulted in incredible reductions in the total number of miles driven to service these ATMs. This reduction has resulted in a considerable decrease in JPMC’s overall carbon footprint.

- Over 172 thousand vendor trips eliminated
- Over 65 thousand gallons of diesel fuel saved annually
- By 2015 we will have had a reduction of over 1,000,000 miles driven
- 29 states directly impacted
- 1.5 million pounds of carbon emissions eliminated annually
- Equivalent effect of planting 110,000 trees
Thank You!

Questions?
Innovate.
Optimize.
Transform.