Service Delivery Models: Formal Definitions and Analysis Framework

Service Platform Investment Calculator

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Contents

1 Introduction

This document provides a comprehensive framework for analyzing service delivery models and their associated costs. We present formal definitions, mathematical models, and evaluation metrics for different service delivery approaches. The analysis focuses on two primary models - Team-Based and Ticket-Based - each with three potential transformation strategies: Platform Automation, Outsourcing, and Hybrid solutions.

1.1 Purpose and Scope

Definition: Framework Purpose

The framework serves several key purposes:

- Standardize the evaluation of service delivery options
- Provide quantitative methods for cost-benefit analysis
- Enable data-driven decision making
- Account for both direct and indirect costs
- Consider quality and efficiency impacts

Explanation

The analysis framework is built around two fundamental models:

- **Team-Based Model:** Focuses on dedicated service teams
- **Ticket-Based Model:** Centers on service requests
- **Transformation Options:**
  - Platform Automation
  - Outsourcing
  - Hybrid Solutions

1.2 Model Overview

Explanation

The analysis framework is built around two fundamental models, each representing a different approach to measuring and managing service delivery:

Team-Based Model: Focuses on the costs and efficiency of dedicated service teams, measuring productivity in terms of time and resource utilization.

Ticket-Based Model: Centers on individual service requests, measuring efficiency in terms of resolution times and throughput.

Each model can be transformed through three strategic approaches:

- **Platform Automation:** Investment in technology to automate processes
- **Outsourcing:** Transfer of operations to external providers
- **Hybrid:** Combination of automation and outsourcing

2 Common Variables and Constants

2.1 Time Variables

Definition: Time Parameters

$$T_{month} = 160 \text{ hours} \qquad T_{year} = 1920 \text{ hours}$$
$$t = \text{Time period} \qquad \Delta t = 36 \text{ months}$$

Explanation

Standard Month:

- 40-hour work weeks
- 4 weeks per month
- Excludes holidays/leave

Analysis Horizon:

- Implementation phase
- Stabilization phase
- Benefits realization

2.2 Financial Variables

Definition: Financial Parameters

Core financial metrics:

$$r = \text{Discount rate} \qquad NPV = \text{Net Present Value}$$
$$i = \text{Inflation rate} \qquad ROI = \text{Return on Investment}$$
$$IRR = \text{Internal Rate of Return}$$

Explanation

Key Applications:

- Time value calculations
- Investment analysis
- Cost comparisons
- Risk adjustments

Discount Rate Components:

- Cost of capital
- Risk premium
- Market conditions

3 Team-Based Model

3.1 Base Case Analysis

Definition: Team Model Variables

Let $\mathcal{T}$ represent the team-based model:

n = Team size (FTEs) $\quad$ h = Hourly rate

η_s = Service efficiency $\quad$ η_o = Operational overhead

w = Working hours/month

Explanation

Model Components:

- FTEs: Dedicated team members
- Efficiency: Productive time ratio
- Overhead: Management costs
- Hours: Service delivery time

3.2 Base Cost Structure

Definition: Base Team Cost

Monthly base cost calculation:

$$C_b = n \cdot h \cdot w \cdot \eta_s \cdot (1 + \eta_o) \tag{1}$$

Components:

- $n \cdot h \cdot w$: Labor cost

- η_s: Efficiency factor
- $(1 + \eta_o)$: Overhead factor

Explanation

Cost Factors:

- Direct labor costs
- Service efficiency impact
- Operational overhead

Benefits:

- Clear cost structure
- Efficiency tracking
- Resource optimization

3.3 Platform Solution

Definition: Platform Variables

For solution $\mathcal{P}$:

$$P_i = \text{Initial investment} \qquad P_m = \text{Monthly maintenance}$$
$$\alpha_t = \text{Team reduction} \in [0, 1] \qquad \alpha_p = \text{Process efficiency} \in [0, 1]$$
$$T_i = \text{Implementation time}$$

Explanation

Key Elements:

- Investment: Development and setup costs
- Maintenance: Ongoing platform costs
- Team Reduction: Automated task replacement
- Process Efficiency: Streamlined operations
- Timeline: Implementation and rollout

3.3.1 Platform Cost Structure

Definition: Platform Cost

Monthly cost after implementation:

$$C_p = C_b \cdot (1 - \alpha_t) \cdot (1 - \alpha_p) + P_m \tag{2}$$

Impact Factors:

- Team size reduction through automation
- Process efficiency improvements
- Ongoing maintenance requirements

Observation

Cost Benefits:

- Reduced labor requirements
- Improved process efficiency
- Standardized operations

Key Considerations:

- Initial investment planning
- Maintenance cost management
- Training and transition needs

3.4 Outsourcing Solution

Definition: Outsourcing Variables

For solution $\mathcal{O}$:

v = Vendor hourly rate
β_m = Management overhead $\in [0, 1]$
β_q = Quality impact $\in [0, 1]$
β_k = Knowledge loss $\in [0, 1]$
O_t = Transition cost
T_t = Transition time

Explanation

Impact Areas:

- Vendor Management: Coordination and oversight
- Service Quality: Performance standards
- Knowledge Retention: Critical information
- Transition Process: Implementation steps

Risk Factors:

- Quality degradation over time
- Knowledge transfer challenges
- Management overhead increase
- Transition period disruption

3.4.1 Outsourcing Cost Structure

Definition: Outsourcing Cost

Monthly cost calculation:

$$C_o = v \cdot w \cdot n \cdot (1 + \beta_m) \cdot (1 + \beta_q) \cdot (1 + \beta_k \cdot \log_{10}(T_t + 1)) \tag{3}$$

Cost Components:

- Base: $v \cdot w \cdot n$
- Management: $(1 + \beta_m)$
- Quality: $(1 + \beta_q)$
- Knowledge: $1 + \beta_k \cdot \log_{10}(T_t + 1)$

Observation

Time Impact:

- Initial knowledge transfer challenges
- Gradual process stabilization
- Long-term expertise erosion

Quality Factors:

- Service level maintenance
- Process standardization
- Knowledge documentation

3.5 Hybrid Solution Variables

Definition: Hybrid Variables

For the hybrid solution $\mathcal{H}$:

$$\begin{aligned}\gamma_p &= \text{Platform portion} \in [0,1]\\ \gamma_o &= \text{Outsourced portion} \in [0,1]\\ P_h &= \text{Reduced platform investment}\\ v_h &= \text{Negotiated vendor rate}\end{aligned}$$

where $\gamma_p + \gamma_o \leq 1$

Explanation

The hybrid approach combines platform and outsourcing benefits:

- Balanced workload distribution
- Reduced platform investment needs
- Potentially lower vendor rates
- Flexibility in service delivery

Key considerations include:

- Optimal work distribution
- Integration requirements
- Coordination overhead
- Risk diversification

4 Ticket-Based Model

4.1 Base Case Analysis

Definition: Ticket Model Variables

Let $\mathcal{B}$ represent the ticket-based model with:

$$\begin{aligned}m &= \text{Monthly tickets}\\ t_h &= \text{Hours per ticket}\\ p &= \text{People per ticket}\\ h &= \text{Hourly rate}\\ \sigma &= \text{SLA compliance rate} \in [0,1]\end{aligned}$$

Explanation

The ticket-based model focuses on individual service requests:

- Volume-based measurement
- Resource requirements per ticket
- Service level compliance
- Direct cost attribution

This approach is particularly suitable for:

- Help desk operations
- Service request handling
- Incident management
- Standard service delivery

4.2 Ticket Cost Structure

Definition: Base Ticket Cost

The monthly base ticket cost C_t is:

$$C_t = m \cdot t_h \cdot p \cdot h \tag{4}$$

Explanation

The base ticket cost incorporates:

- Volume of service requests
- Time investment per request
- Required staff involvement
- Labor cost rates

This formula enables:

- Per-ticket cost analysis
- Volume-based planning
- Resource allocation optimization
- Service level management

4.3 Outsourcing Impact on Ticket-Based Model

Definition: Ticket Outsourcing Variables

For the ticket-based outsourcing model $\mathcal{TO}$:

$$\begin{aligned} v_t &= \text{Vendor cost per ticket} \\ \mu &= \text{Ticket multiplication factor} \geq 1 \\ \tau &= \text{Resolution time factor} \geq 1 \\ \omega &= \text{Rework probability} \in [0,1] \\ \theta &= \text{Quality threshold} \in [0,1] \end{aligned}$$

Explanation

The ticket-based outsourcing model introduces quality impact through:

- Ticket multiplication (μ): Additional tickets generated due to incomplete or incorrect resolutions
- Extended resolution times (τ): Increased handling time due to communication overhead
- Rework probability (ω): Likelihood of ticket reopening
- Quality threshold (θ): Minimum acceptable resolution quality

Definition: Outsourced Ticket Cost

The effective monthly outsourced ticket cost C_{to} is:

$$C_{to} = m \cdot v_t \cdot \mu \cdot (1+\omega) \cdot \tau \tag{5}$$

The effective number of tickets handled becomes:

$$m_{eff} = m \cdot \mu \cdot (1+\omega) \tag{6}$$

Observation

Quality degradation in ticket-based outsourcing manifests through:

- Increased ticket volume due to incomplete resolutions
- Extended resolution times affecting SLA compliance
- Higher rework rates impacting cost efficiency
- Customer satisfaction correlation with quality metrics

4.4 Hybrid Ticket-Based Model

Definition: Hybrid Ticket Variables

For the hybrid ticket-based model $\mathcal{TH}$:

$$\begin{aligned}\gamma_a &= \text{Automated ticket portion} \in [0,1]\\ \gamma_v &= \text{Vendor ticket portion} \in [0,1]\\ \gamma_i &= \text{Internal ticket portion} \in [0,1]\\ c_a &= \text{Cost per automated ticket}\\ \eta_a &= \text{Automation success rate} \in [0,1]\end{aligned}$$

where $\gamma_a + \gamma_v + \gamma_i = 1$

Definition: Hybrid Ticket Cost

The monthly hybrid ticket cost C_{th} is:

$$C_{th} = m \cdot (\gamma_a \cdot c_a + \gamma_v \cdot v_t \cdot \mu \cdot \tau + \gamma_i \cdot t_h \cdot p \cdot h) \tag{7}$$

The effective success rate η_{eff} is:

$$\eta_{eff} = \gamma_a \cdot \eta_a + \gamma_v \cdot \frac{1}{\mu \cdot \tau} + \gamma_i \tag{8}$$

Explanation

The hybrid ticket model optimizes service delivery through:

- Automated handling of standard tickets
- Vendor management of medium-complexity tickets
- Internal handling of complex or critical tickets
- Dynamic workload distribution based on ticket characteristics

5 Performance Metrics

5.1 Financial Analysis

Definition: NPV Calculation

For any solution s:

$$NPV_s = -I_0 + \sum_{t=1}^{\Delta t} \frac{(C_b - C_s)_t}{(1+r)^t} \tag{9}$$

where:

- I_0 is initial investment
- $(C_b - C_s)_t$ is monthly savings
- r is the discount rate
- Δt is the analysis period

Explanation

The NPV calculation:

- Accounts for time value of money
- Includes all cash flows
- Considers opportunity cost
- Enables investment comparison

5.2 Operational Metrics

Definition: Team Efficiency Metrics

For team-based model:

$$\text{Utilization Rate: } \eta_u = \frac{\text{Productive Hours}}{\text{Total Hours}}$$

$$\text{Service Efficiency: } \eta_e = \frac{\text{Service Delivery Time}}{\text{Total Time}}$$

$$\text{Cost per FTE: } C_{fte} = \frac{\text{Total Operating Cost}}{n}$$

$$\text{Overhead Ratio: } \omega_r = \frac{\text{Management \& Support Cost}}{\text{Direct Service Cost}}$$

Explanation

Metric Applications:

- **Utilization Rate:** Measures productive time usage
  - Excludes meetings, training, admin tasks
  - Key indicator of team efficiency
- **Service Efficiency:** Direct service delivery effectiveness
  - Measures actual service delivery time
  - Indicates process optimization needs

- **Cost per FTE:** Resource cost effectiveness
  - Includes salary, benefits, tools, training
  - Used for budget planning and benchmarking
- **Overhead Ratio:** Administrative burden
  - Measures management and support costs
  - Identifies operational efficiency

Definition: Ticket Performance Metrics

For ticket-based model:

$$\text{Resolution Rate: } \rho_r = \frac{\text{Resolved Tickets}}{\text{Total Tickets}}$$

$$\text{Mean Resolution Time: } \bar{t}_r = \frac{\sum \text{Resolution Times}}{\text{Total Tickets}}$$

$$\text{Cost per Ticket: } C_{pt} = \frac{\text{Total Operating Cost}}{\text{Total Tickets}}$$

$$\text{SLA Compliance: } \sigma = \frac{\text{Compliant Tickets}}{\text{Total Tickets}}$$

$$\text{First Contact Resolution: } \phi = \frac{\text{Single-Touch Resolutions}}{\text{Total Tickets}}$$

Explanation

Performance Indicators:

- **Resolution Rate:** Service completion efficiency
  - Measures ticket closure performance
  - Tracks backlog management
- **Mean Resolution Time:** Service speed
  - Compared against SLA requirements
  - Identifies process bottlenecks
- **Cost per Ticket:** Economic efficiency
  - Used for service pricing
  - Enables cost optimization
- **SLA Compliance:** Service quality
  - Measures contract adherence

- Key performance indicator

- **First Contact Resolution:** Process efficiency
  - Measures one-touch resolution rate
  - Indicates process maturity

Definition: Financial Performance Metrics

$$\text{Break-Even Period: } T_{be} = \min\{t : \sum_{i=1}^{t}(S_i - C_i) \geq I_0\}$$

$$\text{Cost Reduction: } \Delta C = \frac{C_{baseline} - C_{current}}{C_{baseline}} \times 100\%$$

$$\text{ROI: } R_{inv} = \frac{\text{Net Benefits}}{\text{Total Investment}} \times 100\%$$

$$\text{Benefit-Cost Ratio: } BCR = \frac{\sum \text{PV(Benefits)}}{\sum \text{PV(Costs)}}$$

Where:

- S_i: Savings in period i
- C_i: Costs in period i
- I_0: Initial investment
- PV: Present Value

Observation

Key Financial Considerations:

- **Break-Even Analysis:**
  - Platform: Longer term due to initial investment
  - Outsourcing: Shorter term with immediate impact
  - Hybrid: Balanced approach between the two
- **Cost Reduction Patterns:**
  - Platform: Gradual with long-term benefits
  - Outsourcing: Immediate with potential variability
  - Hybrid: Progressive with balanced risk
- **ROI Characteristics:**

- Platform: Higher initial investment, longer-term returns
- Outsourcing: Lower initial investment, quicker returns
- Hybrid: Moderate investment, balanced returns

Explanation

Monitoring Framework:

- **Frequency:**
  - Operational metrics: Daily/Weekly
  - Financial metrics: Monthly/Quarterly
  - Strategic metrics: Quarterly/Yearly
- **Analysis Methods:**
  - Trend analysis and forecasting
  - Variance analysis against baselines
  - Peer benchmarking
  - Root cause analysis
- **Action Triggers:**
  - Significant performance deviations
  - Consistent negative trends
  - Missed performance targets
  - Customer satisfaction issues

6 Risk Analysis

6.1 Quality Management

Definition: Quality Functions

Quality degradation for outsourcing:

$$Q(t) = 1 - \beta_q \cdot (1 - e^{-\lambda t}) \tag{10}$$

where λ is the quality decay rate.

Explanation

The quality function models:

- Initial quality impact
- Stabilization period
- Long-term quality levels
- Improvement potential

6.2 Knowledge Management

Definition: Knowledge Functions

Knowledge retention for outsourcing:

$$K(t) = 1 - \beta_k \cdot \log_{10}(t + 1) \tag{11}$$

Explanation

The knowledge retention function captures:

- Initial knowledge transfer
- Ongoing knowledge loss
- Documentation effectiveness
- Training impact