Service Delivery Models: Formal Definitions and Analysis Framework

Service Platform Investment Calculator

December 15, 2024

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

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 in service transformation
- Account for both direct and indirect costs
- Consider quality and efficiency impacts

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):

Standard time units and periods used across all calculations:

$$\begin{aligned}
T_{month} &= \text{Hours per month} = 160 \text{ hours} \\
T_{year} &= \text{Hours per year} = 1920 \text{ hours} \\
t &= \text{Time period (in months)} \\
\Delta t &= \text{Time horizon for analysis (typically 36 months)}
\end{aligned}$$

Explanation:

Time variables form the foundation of our cost calculations. The standard month is based on:

- 40-hour work weeks
- 4 weeks per month
- Excluding holidays and standard leave

The analysis horizon (Δt) is set to 36 months to capture:

- Initial implementation period
- Stabilization phase
- Long-term benefits realization

2.2 Financial Variables

Definition (Financial Parameters):

Core financial metrics and rates:

$$\begin{aligned} r &= \text{Discount rate (annual)} \\ i &= \text{Inflation rate (annual)} \\ NPV &= \text{Net Present Value} \\ ROI &= \text{Return on Investment} \\ IRR &= \text{Internal Rate of Return} \end{aligned}$$

Explanation:

Financial variables are essential for:

- Time value of money calculations
- Investment return analysis
- Cost comparison across different time periods
- Risk-adjusted decision making

The discount rate (r) should reflect:

- Organization's cost of capital
- Risk premium for technology investments
- Market conditions

3 Team-Based Model

3.1 Base Case Analysis

Definition (Team Model Variables):

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

$$\begin{aligned}
n &= \text{Team size (FTEs)} \\
h &= \text{Hourly rate per FTE} \\
\eta_s &= \text{Service delivery efficiency} \in [0,1] \\
\eta_o &= \text{Operational overhead} \in [0,1] \\
w &= \text{Working hours per month}
\end{aligned}$$

Explanation:

The team-based model focuses on resource utilization and efficiency:

- FTE count represents fully dedicated team members
- Efficiency factors capture productive vs. non-productive time
- Overhead includes administrative and management costs
- Working hours account for actual service delivery time

3.2 Base Cost Structure

Definition (Base Team Cost):

The monthly base cost C_b is defined as:

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

Explanation:

The base cost formula incorporates:

- Direct labor costs $(n \cdot h \cdot w)$
- Service delivery efficiency (η_s)
- Operational overhead impact $(1 + \eta_o)$

This provides a baseline for comparing transformation options.

3.3 Platform Solution

Definition (Platform Variables):

For the platform solution $\mathcal{P}$:

$$\begin{aligned} P_i &= \text{Initial platform investment} \\ P_m &= \text{Monthly maintenance cost} \\ \alpha_t &= \text{Team reduction factor} \in [0,1] \\ \alpha_p &= \text{Process efficiency improvement} \in [0,1] \\ T_i &= \text{Implementation time (months)} \end{aligned}$$

Explanation:

The platform solution represents automation through technology:

- Initial investment covers development and implementation
- Maintenance ensures platform sustainability
- Team reduction captures automated task replacement
- Process efficiency measures streamlined operations
- Implementation time affects benefit realization

3.3.1 Platform Cost Structure

Definition (Platform Cost):

Monthly platform cost C_p after implementation:

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

Explanation:

The platform cost formula reflects:

- Reduced team size through automation
- Improved process efficiency
- Ongoing maintenance requirements

Cost savings are realized through:

- Reduced labor requirements
- Increased process efficiency
- Standardized operations

3.4 Outsourcing Solution Variables

Definition (Outsourcing Variables):
For the outsourcing solution $\mathcal{O}$:

$$\begin{aligned}
v &= \text{Vendor hourly rate} \\
\beta_m &= \text{Management overhead factor} \in [0,1] \\
\beta_q &= \text{Quality impact factor} \in [0,1] \\
\beta_k &= \text{Knowledge loss factor} \in [0,1] \\
O_t &= \text{Transition cost} \\
T_t &= \text{Transition time (months)}
\end{aligned}$$

Explanation:
Outsourcing introduces several impact factors:

- Management overhead for vendor coordination
- Quality changes from service transfer
- Knowledge loss over time
- Transition costs and duration

The impact factors reflect:

- Communication and coordination needs
- Service quality maintenance
- Knowledge transfer and retention
- Organizational learning curve

3.4.1 Outsourcing Cost Structure

Definition (Outsourcing Cost):
The monthly outsourcing cost C_o is:

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

Explanation:
The outsourcing cost formula accounts for:

- Base vendor costs $(v \cdot w \cdot n)$
- Management overhead multiplier $(1 + \beta_m)$
- Quality impact adjustment $(1 + \beta_q)$

- Time-dependent knowledge loss $\log_{10}(T_t + 1)$

The logarithmic knowledge loss factor reflects:

- Initial rapid knowledge transfer challenges
- Gradual stabilization over time
- Long-term institutional knowledge erosion

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 (Key Performance Indicators):
For team-based model:

$$\eta_u = \frac{\text{Productive Hours}}{\text{Total Hours}}$$
$$\eta_e = \frac{\text{Service Time}}{\text{Total Time}}$$
$$C_{fte} = \frac{\text{Total Cost}}{n}$$

For ticket-based model:

$$\rho_r = \frac{\text{Resolved Tickets}}{\text{Total Tickets}}$$
$$\bar{t}_r = \frac{\sum \text{Resolution Times}}{\text{Total Tickets}}$$
$$C_{pt} = \frac{\text{Total Cost}}{\text{Total Tickets}}$$
$$\sigma = \frac{\text{Compliant Tickets}}{\text{Total Tickets}}$$

Explanation:

These metrics provide:

- Performance measurement
- Quality monitoring
- Efficiency tracking
- Cost control

They should be monitored:

- Regularly (daily/weekly/monthly)
- Against established baselines
- With trend analysis
- For continuous improvement

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

7 Comparative Analysis

7.1 Model Selection Framework

Criterion	Team-Based	Ticket-Based	Hybrid
Cost Predictability	High	Medium	Medium-High
Quality Control	High	Variable	High
Scalability	Low	High	Very High
Knowledge Retention	High	Medium	High
Implementation Complexity	Low	Medium	High
Process Standardization	Medium	High	Very High
Resource Flexibility	Low	High	Very High
Technology Leverage	Medium	High	Very High

Table 1: Comprehensive Model Comparison Matrix

Explanation:

Model selection criteria prioritize:

- **Cost Predictability:** Ability to forecast and control costs
- **Quality Control:** Maintaining service standards
- **Scalability:** Capacity to handle volume changes
- **Knowledge Retention:** Preservation of institutional knowledge
- **Implementation Complexity:** Effort required for deployment
- **Process Standardization:** Consistency in service delivery
- **Resource Flexibility:** Ability to adjust capacity

- **Technology Leverage:** Utilization of automation