Service Delivery Models:
Formal Definitions and Analysis Framework

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Contents

1 Introduction

This document outlines a practical framework for evaluating and implementing different service delivery models. It provides concrete formulas, metrics, and decision criteria to help teams analyze costs and benefits of various delivery approaches.

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

Time-based calculations are fundamental to service delivery analysis, as they directly impact costs, efficiency, and resource utilization. The following variables provide a standardized approach to temporal measurements.

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

These variables capture both direct costs and the time value of money, enabling comprehensive financial evaluation.

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

The team-based model represents a traditional approach to service delivery, where dedicated teams handle various service requests and operational tasks.

3.1 Base Case Analysis

The base case establishes the current state of operations, serving as a reference point for comparing different transformation options. It captures all relevant costs and efficiency metrics of the existing team-based delivery model.

Definition: Team Model Variables

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

$$n = \text{Team size (FTEs)} \qquad h = \text{Hourly rate}$$
$$\eta_s = \text{Service efficiency} \qquad \eta_o = \text{Operational overhead}$$
$$w = \text{Working hours/month}$$

Explanation

Model Components:

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

3.2 Base Cost Structure

The following formulation provides a comprehensive view of all cost components in the current delivery model.

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

Platform automation represents a transformative approach to service delivery. This solution requires upfront investment but can deliver long-term benefits through improved efficiency and scalability.

Definition: Platform Variables

For solution $\mathcal{P}$:

$$\begin{aligned} P_i &= \text{Initial investment} & P_m &= \text{Monthly maintenance} \\ \alpha_t &= \text{Team reduction} \in [0,1] & \alpha_p &= \text{Process efficiency} \in [0,1] \\ T_b &= \text{Time to build} \end{aligned}$$

Explanation

Key Elements:

- Investment: Development and setup costs
- Maintenance: Ongoing platform costs
- Team Reduction: Automated task replacement
- Process Efficiency: Streamlined operations
- Build Time: Platform development period

3.3.1 Platform Cost Structure

The platform cost structure reflects both the initial investment and ongoing operational costs.

Definition: Platform Cost

Monthly cost after implementation:

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

Break-even calculation considering build time:

$$T_{be} = \begin{cases} T_b + \lceil \frac{P_i}{C_b - C_p} \rceil & \text{if } C_b > C_p \\ \infty & \text{otherwise} \end{cases} \tag{3}$$

Impact Factors:

- Team size reduction through automation
- Process efficiency improvements
- Ongoing maintenance requirements
- Build time delay on benefits realization

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

Outsourcing presents an alternative transformation path, transferring service delivery responsibilities to external providers. While this approach can offer immediate cost benefits, it introduces various challenges and risks that must be evaluated.

Definition: Outsourcing Variables

For solution $\mathcal{O}$:

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

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

The outsourcing cost structure must account for both direct vendor costs and various indirect impacts on service delivery. This view ensures all relevant factors are considered.

Definition: Outsourcing Cost

Monthly cost calculation:

$$C_o = v \cdot w \cdot n \cdot (1+\beta_m) \cdot \begin{cases} (1-\beta_q) & \text{if } \beta_q \geq 0 \text{ (improved quality)} \\ (1+|\beta_q|) & \text{if } \beta_q < 0 \text{ (degraded quality)} \end{cases} \cdot (1+\beta_k \cdot \log_{10}(T_t+1)) \tag{4}$$

Cost Components:

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

Observation

Quality Impact:

- Positive β_q: Quality improvements reduce costs
- Negative β_q: Quality degradation increases costs
- Impact factors include:
  - Ticket volume changes
  - SLA compliance
  - Management overhead
  - Rework requirements

3.5 Hybrid Solution Variables

The hybrid approach combines elements of both platform automation and outsourcing.

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

The ticket-based model focuses on individual service requests as the primary unit of analysis. This approach is well-suited for organizations with clearly defined service requests, standardized processes, and measurable resolution times. It provides a granular view of service delivery costs and efficiency.

4.1 Base Case Analysis

The base case for the ticket-based model establishes current performance metrics and costs associated with handling individual service requests. This analysis provides insights into volume patterns, resource requirements, and efficiency opportunities.

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 ticket cost C_t includes both fixed and variable components:

$$C_t = B + m \cdot t_h \cdot p \cdot h \tag{5}$$

Where:

- B: Base monthly cost (independent of volume)
- m: Monthly ticket volume
- t_h: Hours per ticket
- p: People per ticket
- h: Hourly rate

The effective cost per ticket c_t is:

$$c_t = \frac{B}{m} + t_h \cdot p \cdot h \tag{6}$$

Explanation

The ticket cost structure incorporates:

- Fixed operational costs (B)
  - Infrastructure
  - Core team
  - Management overhead
  - Tool licenses
- Variable costs per ticket

- Direct labor
- Resource allocation
- Time investment

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:

$$C_{to} = m \cdot v_t \cdot \mu \cdot (1 + \omega) \cdot \tau \tag{7}$$

The effective number of tickets handled becomes:

$$m_{eff} = m \cdot \mu \cdot (1 + \omega) \tag{8}$$

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:

$$C_{th} = m \cdot (\gamma_a \cdot c_a + \gamma_v \cdot v_t \cdot \mu \cdot \tau + \gamma_i \cdot t_h \cdot p \cdot h) \tag{9}$$

The effective success rate η_{eff} is:

$$\eta_{eff} = \gamma_a \cdot \eta_a + \gamma_v \cdot \frac{1}{\mu \cdot \tau} + \gamma_i \tag{10}$$

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

4.5 Platform Solution for Ticket-Based Model

Platform automation in the ticket-based model focuses on automating ticket resolution and improving processing efficiency.

Definition: Ticket Platform Variables

For the ticket-based platform solution $\mathcal{TP}$:

$$
\begin{aligned}
P_i &= \text{Initial platform investment} \\
P_m &= \text{Monthly maintenance cost} \\
\alpha_a &= \text{Automation rate} \in [0,1] \\
\alpha_t &= \text{Time reduction factor} \in [0,1] \\
\alpha_q &= \text{Quality improvement} \in [0,1] \\
c_a &= \text{Cost per automated ticket}
\end{aligned}
$$

Explanation

The platform solution impacts ticket processing through:

- **Automation Rate (α_a):** Percentage of tickets handled automatically
- **Time Reduction (α_t):** Processing time improvement for non-automated tickets
- **Quality Improvement (α_q):** Error reduction and consistency enhancement
- **Automated Cost (c_a):** Direct cost for automated ticket resolution

Definition: Platform Ticket Cost

The monthly platform-based ticket cost C_{tp} is:

$$C_{tp} = m \cdot [\alpha_a \cdot c_a + (1 - \alpha_a) \cdot t_h \cdot (1 - \alpha_t) \cdot p \cdot h] + P_m \tag{11}$$

The effective quality factor Q_{eff} becomes:

$$Q_{eff} = 1 + \alpha_q \cdot (1 - \alpha_a) \tag{12}$$

Observation

Platform automation benefits in ticket processing:

- Reduced manual processing time
- Increased consistency in resolutions
- Scalable ticket handling capacity
- Improved first-contact resolution rate

Key considerations:

- Automation complexity requirements
- Integration with existing systems

- Training and transition planning
- Maintenance and updates

5 Performance Metrics

5.1 Financial Analysis

Definition: NPV Calculation

For any solution s:

$$NPV_s = -I_0 + \sum_{t=1}^{\Delta t} \frac{(C_b - C_s)_t}{(1+r)^t} \tag{13}$$

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 Application Implementation

This section outlines the practical implementation of the theoretical framework in the application, detailing required inputs, cost formulas, and metrics for each model and transformation option.

6.1 Team-Based Model Implementation

Definition: Base Team Model Inputs

Required parameters:

- **Team Size (n):** Number of FTEs [1-1000]
- **Hourly Rate (h):** Cost per FTE [$1-$1000]
- **Service Delivery (η_s):** Productive time [0-100%]
- **Working Hours (w):** Monthly hours [120-200]
- **Overhead (η_o):** Administrative overhead [0-100%]

Cost calculation:

$$C_{base} = n \cdot h \cdot w \cdot \eta_s \cdot (1 + \eta_o) \tag{14}$$

Key metrics:

- **Monthly Cost:** Direct calculation from formula
- **Team Utilization:** $\eta_s \cdot 100\%$

- **Cost per FTE:** $\frac{C_{base}}{n}$

Definition: Team Platform Solution Inputs

Required parameters:

- **Initial Cost (P_i):** Platform investment [$0-$10M]
- **Build Time (T_b):** Implementation period [1-24 months]
- **Maintenance (P_m):** Monthly upkeep [$0-$1M]
- **Team Reduction (α_t):** Staff efficiency [0-100%]
- **Process Efficiency (α_p):** Automation impact [0-100%]

Cost calculation:

$$C_{platform} = C_{base} \cdot (1 - \alpha_t) \cdot (1 - \alpha_p) + P_m \tag{15}$$

Key metrics:

- **Monthly Savings:** $C_{base} - C_{platform}$
- **Break-even Period:** $\frac{P_i}{\text{Monthly Savings}}$
- **ROI:** $\frac{\text{Annual Savings} - P_i}{P_i} \cdot 100\%$

Definition: Team Outsourcing Solution Inputs

Required parameters:

- **Vendor Rate (v):** Hourly cost [$1-$1000]
- **Transition Time (T_t):** Handover period [1-12 months]
- **Transition Cost (O_t):** One-time cost [$0-$1M]
- **Management Overhead (β_m):** Additional oversight [0-100%]
- **Knowledge Loss (β_k):** Expertise reduction [0-100%]

Cost calculation:

$$C_{outsource} = v \cdot w \cdot n \cdot (1 + \beta_m) \cdot (1 + \beta_k \cdot \log_{10}(T_t + 1)) \tag{16}$$

Key metrics:

- **Monthly Savings:** $C_{base} - C_{outsource}$
- **Quality Factor:** $1 - \beta_q$
- **Knowledge Retention:** $1 - \beta_k \cdot \log_{10}(T_t + 1)$

Definition: Team Hybrid Solution Inputs

Required parameters:

- **Platform Portion (γ_p):** Platform coverage [0-100%]
- **Platform Cost (P_h):** Reduced investment [$0-$10M]
- **Vendor Portion (γ_o):** Outsourced portion [0-100%]
- **Vendor Rate (v_h):** Reduced rate [$1-$1000]

Cost calculation:

$$C_{hybrid} = \gamma_p \cdot C_{platform} + \gamma_o \cdot C_{outsource} \tag{17}$$

Key metrics:

- **Monthly Savings:** $C_{base} - C_{hybrid}$
- **Blended Efficiency:** $\gamma_p \cdot (1 - \alpha_p) + \gamma_o \cdot (1 - \beta_q)$
- **Combined ROI:** $\frac{\text{Annual Savings} - (P_h + O_t)}{P_h + O_t} \cdot 100\%$

6.2 Ticket-Based Model Implementation

Definition: Base Ticket Model Inputs

Required parameters:

- **Monthly Tickets (m):** Request volume [1-10000]
- **Hours per Ticket (t_h):** Resolution time [0.1-100]
- **People per Ticket (p):** Team members needed [1-10]
- **Hourly Rate (h):** Internal cost [$1-$1000]
- **SLA Compliance (σ):** Service level met [0-100%]

Cost calculation:

$$C_{ticket} = m \cdot t_h \cdot p \cdot h \tag{18}$$

Key metrics:

- **Monthly Cost:** Direct calculation from formula
- **Cost per Ticket:** $\frac{C_{ticket}}{m}$
- **Resource Utilization:** $\frac{m \cdot t_h}{w \cdot p} \cdot 100\%$

Definition: Ticket Platform Solution Inputs

Required parameters:

- **Initial Cost (P_i):** Platform investment [$0-$10M]
- **Build Time (T_b):** Implementation period [1-24 months]
- **Automation Rate (α_a):** Automated tickets [0-100%]
- **Time Reduction (α_t):** Processing speed [0-100%]
- **Quality Improvement (α_q):** Error reduction [0-100%]

Cost calculation:

$$C_{tp} = m \cdot [\alpha_a \cdot c_a + (1 - \alpha_a) \cdot t_h \cdot (1 - \alpha_t) \cdot p \cdot h] + P_m \tag{19}$$

Key metrics:

- **Automation Rate:** $\alpha_a \cdot 100\%$
- **Processing Efficiency:** $(1 - \alpha_t) \cdot 100\%$
- **Quality Factor:** $1 + \alpha_q$

Definition: Ticket Outsourcing Solution Inputs

Required parameters:

- **Ticket Cost (v_t):** Cost per ticket [$1-$1000]
- **Transition Time (T_t):** Handover period [1-12 months]
- **Multiplication Factor (μ):** Volume impact [≥ 1]
- **Resolution Factor (τ):** Time impact [≥ 1]
- **Rework Rate (ω):** Reopening probability [0-100%]

Cost calculation:

$$C_{to} = m \cdot v_t \cdot \mu \cdot (1 + \omega) \cdot \tau \tag{20}$$

Key metrics:

- **Effective Volume:** $m \cdot \mu \cdot (1 + \omega)$
- **Resolution Rate:** $\frac{1}{\tau}$
- **First Contact Resolution:** $1 - \omega$

Definition: Ticket Hybrid Solution Inputs

Required parameters:

- **Automated Portion (γ_a):** Platform handled [0-100%]
- **Outsourced Portion (γ_v):** Vendor handled [0-100%]
- **Internal Portion (γ_i):** Manual handled [0-100%]
- **Automation Success (η_a):** Platform effectiveness [0-100%]

Cost calculation:

$$C_{th} = m \cdot (\gamma_a \cdot c_a + \gamma_v \cdot v_t \cdot \mu \cdot \tau + \gamma_i \cdot t_h \cdot p \cdot h) \tag{21}$$

Key metrics:

- **Effective Success Rate:** $\gamma_a \cdot \eta_a + \gamma_v \cdot \frac{1}{\mu \cdot \tau} + \gamma_i$
- **Blended Cost per Ticket:** $\frac{C_{th}}{m}$
- **Distribution Balance:** $\gamma_a + \gamma_v + \gamma_i = 1$

Observation

Implementation considerations:

- All inputs require validation within specified ranges
- Cost calculations update in real-time as inputs change
- Break-even calculations consider initial investments
- ROI metrics account for both cost savings and quality impacts
- Sensitivity analysis applies $\pm 20\%$ variation to key parameters

Definition: Cost Calculation Formulas

For all models, let:

- C_b: Base monthly cost
- h: Hourly rate
- w: Working hours per month
- n: Number of team members

Base Cost:

$$C_b = h \cdot w \cdot n \tag{22}$$

Platform Solution:

$$C_p = C_b \cdot (1 - \alpha_t) \cdot (1 - \alpha_p) + P_m \tag{23}$$

Where:

- α_t: Team reduction percentage
- α_p: Process efficiency gain
- P_m: Monthly maintenance cost

Outsourcing Solution:

$$C_o = v \cdot w \cdot n \cdot (1 + \beta_m) \cdot Q(\beta_q) \cdot (1 + \beta_k \cdot \log_{10}(T_t + 1)) \tag{24}$$

Where:

- v: Vendor hourly rate
- β_m: Management overhead percentage
- β_k: Knowledge loss percentage
- T_t: Transition time in months
- $Q(\beta_q)$: Quality impact function:

$$Q(\beta_q) = \begin{cases} 1 - \beta_q & \text{if } \beta_q \geq 0 \text{ (quality improvement)} \\ 1 + |\beta_q| & \text{if } \beta_q < 0 \text{ (quality degradation)} \end{cases} \tag{25}$$

Hybrid Solution:

$$C_h = \gamma_p \cdot C_p + \gamma_o \cdot C_o + (1 - \gamma_p - \gamma_o) \cdot C_b \tag{26}$$

Where:

- γ_p: Platform portion [0,1]
- γ_o: Outsourced portion [0,1]
- $1 - \gamma_p - \gamma_o$: Internal portion

Definition: Break-Even Analysis

For any solution s, the break-even period T_{be} is calculated as:

$$T_{be} = \begin{cases} \lceil \frac{I_s}{C_b - C_s} \rceil & \text{if } C_b > C_s \\ \infty & \text{otherwise} \end{cases} \tag{27}$$

Where:

- I_s: Initial investment for solution s
- C_s: Monthly cost for solution s
- Solution is considered viable if $T_{be} \leq 24$ months

Observation

Key Cost Considerations:

- **Platform Solution:**
  - Initial investment vs. ongoing maintenance
  - Process efficiency gains compound with team reduction
  - Break-even affected by maintenance costs
- **Outsourcing Solution:**

- Quality impact directly affects cost
- Knowledge loss increases over transition time
- Management overhead remains constant

- **Hybrid Solution:**
  - Balances initial investment with operational flexibility
  - Allows gradual transition and risk mitigation
  - Combines benefits of automation and outsourcing

Explanation

The cost models account for:

- **Direct Costs:**
  - Labor (internal and vendor)
  - Platform development and maintenance
  - Transition and implementation
- **Indirect Costs:**
  - Quality impact on service delivery
  - Knowledge retention and transfer
  - Management and coordination
- **Time-Based Factors:**
  - Break-even analysis
  - Transition period effects
  - Long-term viability assessment

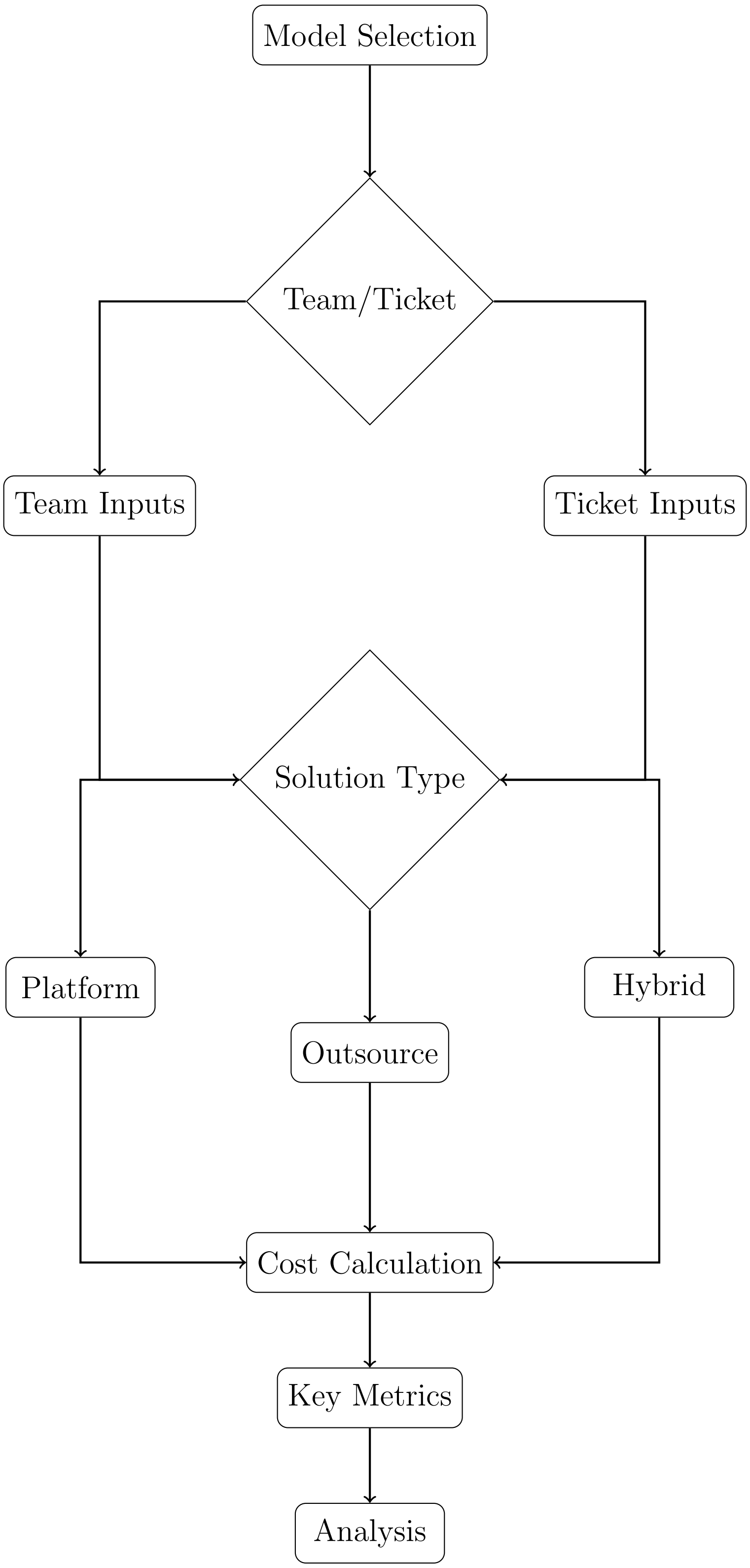

Figure 1: Application Implementation Flow