Section 8: Workflow Diagrams

Elaborated Process Flows & Decision Trees

AI Customer Support Platform

8.1 Workflow Overview

This section provides comprehensive documentation of all critical workflows within the AI Customer Support Platform. Each workflow is detailed with step-by-step processes, decision points, system interactions, and error handling procedures.

8.1.1 Workflow Categories

Category	Workflows Included	Primary Actors
Customer Journeys	New conversation, message flow, session management	Customer, AI, System
AI Processing	Intent recognition, response generation, learning	AI Engine, Knowledge Base
Human Handoff	Escalation, queue management, agent assignment	AI, Agent, Supervisor
Agent Operations	Conversation handling, transfer, resolution	Agent, Customer, System
Administrative	Configuration, reporting, user management	Admin, Supervisor

8.1.2 Workflow Notation

Symbol	Meaning	Example
[Actor]	The entity performing the action	[Customer], [AI], [Agent]
→	Flow direction / leads to	Step 1 → Step 2
◆	Decision point	◆ Confidence ≥ 70%?
⚡	Trigger / Event	⚡ New message received
✓	Success outcome	✓ Response sent

✗	Failure / Error	✗ Connection failed
⏱	Time-based action	⏱ Wait 30 seconds

8.2 Customer Message Flow

The Customer Message Flow describes the complete journey of a message from the moment a customer sends it until they receive a response. This is the core workflow of the platform.

8.2.1 Flow Diagram

Step 1	⚡ TRIGGER	Customer sends message via chat widget
Step 2	RECEIVE	WebSocket server receives message payload
Step 3	VALIDATE	Validate message format, length, content safety
Step 4	PERSIST	Save message to database with timestamp
Step 5	ROUTE	Determine routing: AI or existing human agent
Step 6	PROCESS	AI Engine analyzes message (or agent receives)
Step 7	RESPOND	Generate and send response to customer
Step 8	CONFIRM	✓ Delivery confirmation via WebSocket

8.2.2 Detailed Step Breakdown

Step 1: Message Trigger

The workflow begins when a customer submits a message through the chat widget.

Component	Action	Data
Chat Widget	Capture user input	Message text, attachments
Widget JS	Validate client-side	Length check, empty check
WebSocket Client	Send to server	JSON payload with metadata
UI	Show sending indicator	Spinner, disabled input

Message Payload Structure:

JSON Payload

{ conversation_id: 'uuid', content: 'message text', type: 'text', timestamp: 'ISO-8601', metadata: { source: 'widget', device: 'desktop' } }

Step 2: Message Reception

The server receives and acknowledges the message.

- WebSocket server validates connection authentication
- Message is parsed and validated against schema
- Rate limiting check (max 10 messages per minute)
- Acknowledgment sent back to client

Step 3: Validation

Validation	Rule	On Failure
Format	Valid JSON structure	Reject with error code 400
Length	Max 2000 characters	Truncate or reject
Content	No malicious scripts	Sanitize HTML/JS
Rate Limit	≤10 messages/minute	Queue or reject with 429
Session	Valid session token	Request re-authentication

Step 4: Persistence

Message is saved to the database for history and analytics.

Field	Value	Purpose
id	UUID generated	Unique identifier
conversation_id	From payload	Links to conversation
sender_type	'customer'	Identifies message source
content	Sanitized text	Message body
created_at	Server timestamp	Ordering and analytics
metadata	JSON blob	Device, channel, etc.

Step 5: Routing Decision

The system determines how to handle the message based on conversation state.

◆ Decision Point: Message Routing

IF conversation.assigned_to IS NOT NULL AND agent.status = 'online' THEN route to Human Agent ELSE route to AI Engine

Condition	Route To	Reason
New conversation	AI Engine	No prior context, start with AI
AI handling, no escalation	AI Engine	Continue AI conversation
Escalated, agent assigned	Human Agent	Agent is handling
Escalated, no agent yet	Queue + AI ack	Waiting for agent
Agent went offline	Re-queue + notify	Reassign needed

Step 6: AI Processing

When routed to AI, the message goes through the AI Engine pipeline (detailed in Section 8.3).

- Intent recognition with confidence scoring
- Entity extraction from message content
- Context retrieval from conversation history
- Knowledge base search for relevant articles
- Response generation using templates and AI

Step 7: Response Delivery

The generated response is sent back to the customer.

Action	System	Details
Format response	API Server	Apply template, insert variables
Save to database	Database	Persist for history
Send via WebSocket	WS Server	Real-time delivery
Fallback to polling	API Server	If WebSocket unavailable
Update UI	Widget	Display message bubble

Step 8: Delivery Confirmation

- WebSocket acknowledgment confirms message received by client
- Message status updated to 'delivered' in database
- Analytics event logged for reporting
- Typing indicator cleared

8.3 AI Processing Pipeline

The AI Processing Pipeline details how the AI Engine analyzes customer messages and generates appropriate responses. This is the intelligence core of the platform.

8.3.1 Pipeline Overview

Stage 1	PREPROCESS	Clean and normalize input text
Stage 2	INTENT	Classify user intent with confidence
Stage 3	ENTITY	Extract relevant entities (dates, IDs, etc.)
Stage 4	CONTEXT	Retrieve conversation history and customer data
Stage 5	KNOWLEDGE	Search knowledge base for relevant content
Stage 6	DECIDE	◆ Determine response strategy
Stage 7	GENERATE	Create response from template or AI
Stage 8	VALIDATE	Check response quality and safety
Stage 9	OUTPUT	Return formatted response

8.3.2 Stage Details

Stage 1: Preprocessing

Raw input is cleaned and normalized for consistent processing.

Operation	Input	Output	Example
Lowercase	Mixed case	All lowercase	'Hello' → 'hello'
Trim whitespace	Extra spaces	Single spaces	'hi there' → 'hi there'
Remove special chars	Emojis, symbols	Clean text	'Hi!! 😊' → 'Hi'
Spell correction	Typos	Corrected words	'refudn' → 'refund'
Language detection	Any text	Language code	'Bonjour' → 'fr'

Stage 2: Intent Recognition

The system classifies what the customer wants to accomplish.

◆ **Decision Point: Intent Confidence**

HIGH (≥80%): Direct match, proceed with intent MEDIUM (70-79%): Proceed with clarification option LOW (50-69%): Offer multiple options or retry VERY LOW (<50%): Trigger escalation

Input	Processing	Output
'Where is my order #12345'	Pattern matching + ML model	intent: order_status (92%)
'I want my money back'	Semantic analysis	intent: refund_request (87%)
'asdfgh'	No match found	intent: fallback (100%)
'Can you help me with billing and also shipping'	Multi-intent detection	intents: [billing, shipping]

Stage 3: Entity Extraction

Relevant data points are extracted from the message.

Entity Type	Pattern/Method	Example Extraction
Order ID	Regex: #[0-9]+	'#12345' → order_id: 12345
Email	Regex: email pattern	'john@email.com' → email: john@email.com
Date	NLP date parsing	'next Tuesday' → date: 2025-01-28
Amount	Currency pattern	'$99.99' → amount: 99.99, currency: USD
Product	Entity recognition	'iPhone 15' → product: iPhone 15

Stage 4: Context Retrieval

Historical context is gathered to inform the response.

- Last 10 messages from current conversation
- Previous intents detected in this session
- Customer profile data (name, email, tier)
- Previous conversations summary (if returning customer)
- Any pending actions or follow-ups

Context Item	Source	Usage
Conversation history	Messages table	Maintain continuity
Customer name	Customers table	Personalize response
Customer tier	Customers table	Priority routing
Previous issues	Conversations table	Reference past interactions
Pending orders	External API	Proactive information

Stage 5: Knowledge Base Search

Relevant articles are retrieved to enhance the response.

- Semantic search using intent and entities as query
- Top 3 matching articles retrieved
- Relevance score calculated for each
- Article content summarized for inclusion

Stage 6: Response Decision

◆ **Decision Tree: Response Strategy**

IF confidence ≥ 70% AND intent has template: → Use template response ELSE IF confidence ≥ 70% AND KB match: → Generate from KB content ELSE IF confidence 50-69% AND retry_count < 2: → Ask clarifying question ELSE: → Trigger human escalation

Stage 7: Response Generation

Method	When Used	Example
Template + Variables	High confidence, standard query	'Your order #{{order_id}} is {{status}}'
KB Summary	Information request	'Based on our policy: {{article_summary}}'
AI Generation	Complex or novel query	LLM generates contextual response
Clarification	Ambiguous intent	'Did you mean A or B?'
Escalation Message	Low confidence	'Let me connect you with a specialist'

Stage 8: Response Validation

- Check response length (not too short or long)
- Verify all variables were substituted
- Content safety scan (no inappropriate content)
- Grammar and spelling check
- Tone analysis (professional, helpful)

8.4 Human Escalation Workflow

The Human Escalation Workflow manages the transition from AI to human support when automation cannot fully address customer needs.

8.4.1 Escalation Triggers

Trigger ID	Trigger	Detection Method	Priority
ESC-01	User explicitly requests human	Keyword detection	Critical

ESC-02	AI confidence < 50%	Confidence score	High
ESC-03	Confidence 50-69% twice	Consecutive check	High
ESC-04	3 consecutive fallbacks	Fallback counter	High
ESC-05	Negative sentiment	Sentiment analysis	Critical
ESC-06	Complex multi-intent	Intent count > 2	Medium
ESC-07	Sensitive topic detected	Topic classifier	High
ESC-08	Customer is VIP	Customer tier check	High

8.4.2 Escalation Flow

Step 1	⚡ TRIGGER	Escalation condition detected
Step 2	PREPARE	Generate AI summary of conversation
Step 3	NOTIFY	Send pre-escalation message to customer
Step 4	QUEUE	Add to escalation queue with priority
Step 5	ALERT	Notify available agents
Step 6	ASSIGN	Agent claims or auto-assigned
Step 7	HANDOFF	Transfer context to agent interface
Step 8	CONFIRM	✓ Agent connected message to customer

8.4.3 Pre-Escalation Processing

AI Summary Generation

Before escalation, AI generates a summary for the receiving agent.

Summary Component	Content	Purpose
Issue Summary	1-2 sentence problem description	Quick understanding
Detected Intent	Primary intent and confidence	Context for agent
Extracted Entities	Order IDs, dates, amounts	Key data points
Escalation Reason	Why AI escalated	Agent awareness
Suggested Response	AI-recommended reply	Speed up resolution
Related KB Articles	Top matching articles	Reference material

Customer Notification

Customer receives a message indicating the transition.

8.4.4 Queue Management

Queue Entry

Field	Value	Purpose
conversation_id	UUID	Reference to conversation
priority	1-5 (1=highest)	Queue ordering
escalation_reason	Trigger code	Agent context
customer_tier	VIP/Regular	Priority boost
entered_at	Timestamp	Wait time tracking
sla_deadline	Timestamp	SLA monitoring

Priority Calculation

Priority Formula

Base Priority = Escalation Type Priority + VIP Bonus (if applicable): -1 + Long Wait Penalty: -1 for every 2 minutes waiting + Negative Sentiment: -1 Lower number = Higher priority

Factor	Priority Impact	Example
User request for human	Priority 1 (Critical)	"Talk to a person"
Negative sentiment	Priority 1 (Critical)	Angry customer
Low AI confidence	Priority 2 (High)	Confidence < 50%
VIP customer	-1 to base priority	Enterprise tier
Wait > 2 minutes	-1 per 2 min	4 min wait = -2

8.4.5 Agent Assignment

Assignment Methods

Method	Description	When Used

Manual Claim	Agent picks from queue	Default method
Round Robin	System assigns evenly	High volume periods
Skill-Based	Match skills to issue	Technical issues
Load-Based	Assign to least busy	Balancing workload
Direct Assignment	Admin assigns specific agent	Escalations, VIPs

Agent Selection Criteria

- Agent status is 'Online' (not Busy, Away, or Offline)
- Agent has capacity (below max concurrent chats)
- Agent has required skills (if skill-based routing)
- Agent is in correct team/department
- Preference for agent who handled previous conversations

8.5 Agent Conversation Handling

This workflow covers how agents receive, handle, and resolve customer conversations after escalation.

8.5.1 Agent Receives Conversation

Step 1	⚡ NOTIFY	Agent receives notification of assignment
Step 2	LOAD	Conversation appears in agent's inbox
Step 3	CONTEXT	AI summary and history displayed
Step 4	REVIEW	Agent reads conversation history
Step 5	ENGAGE	Agent sends first response to customer

Agent Notification Channels

Channel	Trigger	Content
In-App Badge	Immediate	Inbox count increments
In-App Sound	Immediate	Configurable alert sound
Browser Push	If tab not focused	Customer name + preview
Desktop Alert	If enabled	Native OS notification

Tab Title Flash	If tab not focused	Title flashes with count

8.5.2 Message Handling

Step 1	RECEIVE	Customer message appears in real-time
Step 2	ANALYZE	AI suggests responses (optional)
Step 3	COMPOSE	Agent types or selects response
Step 4	ENHANCE	Use canned response or KB article
Step 5	SEND	Response delivered to customer
Step 6	LOG	Message saved with agent attribution

AI Assistance for Agents

While handling conversations, agents receive AI-powered assistance.

Assistance Type	Description	Display Location
Suggested Responses	2-3 AI-generated reply options	Above message input
Related KB Articles	Relevant knowledge base links	Right panel
Customer Sentiment	Real-time sentiment indicator	Conversation header
Entity Highlights	Key data highlighted in chat	In message bubbles
Quick Actions	One-click common actions	Toolbar

8.5.3 Internal Notes

Agents can add notes visible only to other agents.

Use Case	Example Note	Visibility
Context for transfer	"Customer is frustrated, handle carefully"	Receiving agent
Technical details	"Checked system - order stuck in processing"	All agents
Follow-up reminder	"Promised callback tomorrow at 2 PM"	All agents
Supervisor escalation	"Need manager approval for refund > $500"	Supervisors

8.5.4 Conversation Transfer

Agents can transfer conversations to other agents or teams.

Step 1	INITIATE	Agent clicks Transfer button
Step 2	SELECT	Choose agent or team from list
Step 3	NOTE	Add internal note for receiving agent
Step 4	CONFIRM	Confirm transfer action
Step 5	NOTIFY	Customer informed of transfer
Step 6	HANDOFF	Conversation moves to new agent
Step 7	COMPLETE	✓ Original agent released

Transfer Types

Type	Recipient	Use Case
Agent Transfer	Specific agent by name	Specialist needed, shift handoff
Team Transfer	Team queue (e.g., Billing)	Department routing
Supervisor Escalation	Team supervisor	Authority needed
Return to Queue	General queue	Agent unavailable

8.5.5 Conversation Resolution

Step 1	INITIATE	Agent clicks Resolve button
Step 2	TYPE	Select resolution type
Step 3	SUMMARY	Add optional resolution note
Step 4	TAGS	Apply tags for categorization
Step 5	MESSAGE	Send closing message to customer
Step 6	SURVEY	Trigger CSAT survey (if enabled)
Step 7	CLOSE	Update status to Resolved
Step 8	METRICS	Calculate and log handle time

Resolution Types

Type	Description	Customer Message	CSAT Survey
Resolved	Issue successfully fixed	Closing message sent	Yes
Closed	No action needed/possible	Brief closing sent	Optional

Spam	Spam or abuse	No message	No

8.6 Customer Satisfaction Survey Flow

After conversation resolution, customers may receive a satisfaction survey to measure service quality.

8.6.1 Survey Trigger

Condition	Survey Sent	Reason
Resolved by AI	Yes (if enabled)	Measure AI effectiveness
Resolved by Agent	Yes	Standard feedback
Closed (no resolution)	Optional	Configurable
Marked as Spam	No	Not applicable
Customer abandoned	No	Not completed

8.6.2 Survey Flow

Step 1	TRIGGER	Conversation marked as Resolved
Step 2	DELAY	⏱ Wait 30 seconds
Step 3	DISPLAY	Show rating prompt in widget
Step 4	RATE	Customer selects 1-5 stars
Step 5	COMMENT	Optional text feedback
Step 6	SUBMIT	Save response to database
Step 7	THANK	Display thank you message
Step 8	ANALYZE	Update metrics and reports

8.6.3 Survey Questions

Question	Type	Required
How satisfied are you with our support?	1-5 star rating	Yes
Was your issue resolved?	Yes/No/Partially	Optional

| Any additional feedback? | Free text (500 chars) | No |
| Would you recommend us? | 0-10 NPS scale | Optional |

8.6.4 Survey Analysis

- Individual responses linked to conversation and agent
- Daily/weekly/monthly aggregation for trends
- Low score alerts sent to supervisors
- AI analysis of text feedback for themes
- Correlation with conversation attributes (wait time, transfers, etc.)

8.7 Offline and After-Hours Flow

This workflow handles customer interactions when human agents are unavailable.

8.7.1 Business Hours Check

Scenario	AI Available	Humans Available	Behavior
Business hours, agents online	Yes	Yes	Normal flow
Business hours, all agents busy	Yes	Queue	AI + queue with wait time
After hours	Yes	No	AI only, no escalation option
Holiday	Yes	No	AI + holiday message
System maintenance	Limited	No	Maintenance message

8.7.2 After-Hours Flow

Step 1	DETECT	System checks current time against business hours
Step 2	NOTIFY	Widget shows "Outside business hours" banner
Step 3	AI ONLY	AI handles conversation without escalation
Step 4	COLLECT	If AI can't resolve, collect customer details
Step 5	PROMISE	Promise callback/email when agents return
Step 6	QUEUE	Add to next-day queue with priority

Step 7	CONFIRM	Send confirmation email to customer

8.7.3 Leave Message Flow

When AI cannot resolve and no agents are available, customers can leave a message.

Field	Required	Purpose
Name	Yes	Identify customer
Email	Yes	Contact for follow-up
Phone	Optional	Alternative contact
Issue description	Yes	Understand problem
Preferred callback time	Optional	Schedule follow-up

Leave Message Confirmation

"Thank you for contacting us! We've received your message and a team member will reach out to you at {{email}} within {{sla_hours}} hours. Your reference number is #{{ticket_id}}."

8.8 Error Handling Workflows

This section documents how the system handles various error conditions to ensure graceful degradation and good user experience.

8.8.1 Connection Errors

Error	Detection	User Message	Recovery
WebSocket disconnect	Connection lost event	"Reconnecting..."	Auto-retry 3x, then fallback to polling
Server timeout	No response in 30s	"Taking longer than usual..."	Retry request, show cached data
Network offline	Navigator.onLine = false	"You appear to be offline"	Queue messages, send when online
Session expired	401 response	"Session expired"	Prompt re-authentication

8.8.2 AI Service Errors

Error	Detection	Fallback	Notification
AI API timeout	No response in 10s	Use fallback response	Alert ops team
AI API error	5xx response	Graceful escalation	Alert ops team

| Rate limit exceeded | 429 response | Queue and retry | Log for capacity planning |
| Invalid response | Parse error | Use fallback response | Log for debugging |

8.8.3 Fallback Responses

When AI cannot generate a proper response, fallback messages are used.

Fallback Response Template

"I apologize, but I'm having trouble understanding your request right now. Could you please rephrase your question? Or if you'd prefer, I can connect you with a team member who can help." [Offer escalation option if within business hours]

8.8.4 Error Recovery Flow

Step 1	DETECT	Error condition identified
Step 2	LOG	Record error details for debugging
Step 3	CLASSIFY	Determine error severity and type
Step 4	NOTIFY USER	Display appropriate user message
Step 5	ATTEMPT RECOVERY	Try automatic recovery if possible
Step 6	ESCALATE	If critical, alert operations team
Step 7	FALLBACK	Use fallback behavior if recovery fails
Step 8	MONITOR	Track for patterns and recurring issues

8.9 Administrative Workflows

8.9.1 User Management

Create User	Admin → User Management → Add User → Fill form → Set role → Send invite
Deactivate User	Admin → User Management → Select user → Deactivate → Confirm → Sessions invalidated
Change Role	Admin → User Management → Select user → Edit → Change role → Save → Permissions updated
Reset Password	Admin → User Management → Select user → Reset password → Email sent to user

8.9.2 Knowledge Base Management

Create Article	Admin → KB → New Article → Write content → Set category → Preview → Publish
Edit Article	Admin → KB → Select article → Edit → Make changes → Save draft or Publish
Archive Article	Admin → KB → Select article → Archive → Confirm → Removed from AI search
Bulk Import	Admin → KB → Import → Upload CSV → Map fields → Validate → Import

8.9.3 AI Configuration

Add Intent	Admin → AI Config → New Intent → Name → Add training phrases → Add responses → Test → Activate
Edit Intent	Admin → AI Config → Select intent → Edit phrases/responses → Test → Save
Train Model	Admin → AI Config → Training → Review changes → Start training → Monitor progress
Test Intent	Admin → AI Config → Test Console → Enter message → View results → Adjust if needed

8.9.4 Reporting Workflow

Generate Report	Admin → Reports → Select type → Set date range → Set filters → Generate → View/Export
Schedule Report	Admin → Reports → Select type → Schedule → Set frequency → Set recipients → Activate
Dashboard Review	Admin → Dashboard → Select date range → Review metrics → Drill down → Take action

8.10 Workflow Summary

8.10.1 Key Workflows by Module

Module	Primary Workflows	Triggers
Chat Widget	Session start, message send, reconnection	User action, system events
AI Engine	Processing pipeline, response generation	Incoming message
Human Handoff	Escalation, queue management, assignment	Escalation triggers
Agent Interface	Handle conversation, transfer, resolve	Agent actions
Admin Dashboard	Reporting, configuration, user management	Admin actions

8.10.2 Critical Paths

- Happy Path: Customer → AI → Resolution (target: 70% of conversations)
- Escalation Path: Customer → AI → Human → Resolution (target: <30%)
- Error Path: Error → Fallback → Recovery or Graceful Degradation

8.10.3 Performance Targets by Workflow

Workflow	Target Duration	SLA
Message send to AI response	<2 seconds	95th percentile
Escalation trigger to queue entry	<2 seconds	99th percentile
Queue entry to agent assignment	<2 minutes	90th percentile
Agent response to customer	<1 minute	85th percentile
Total conversation resolution	<10 minutes	80th percentile

— End of Section 8 —