

# CrowdWave

## Prediction Accuracy Framework

February 2026

# Executive Summary

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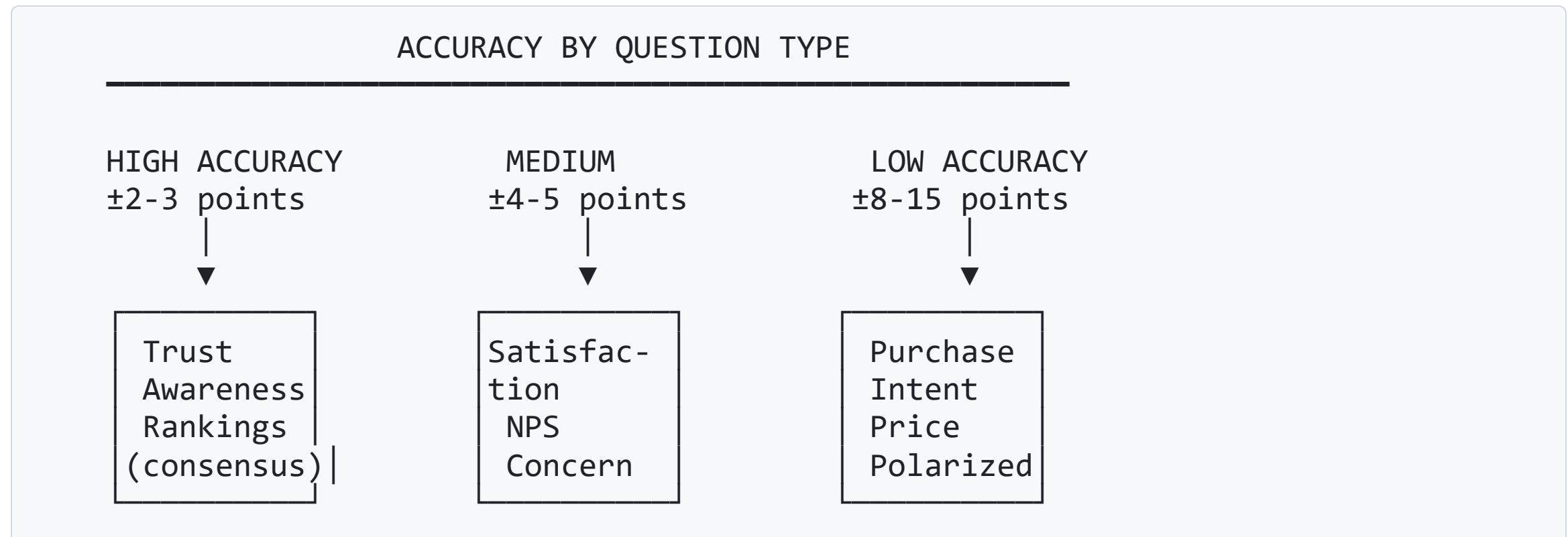
CrowdWave simulates survey responses with **documented, predictable accuracy** across different question types and domains.

Dimension	Performance
Best-case accuracy	±2-3 points (trust, awareness)
Typical accuracy	±4-5 points (satisfaction, concern)
Known limitations	±8-15 points (intent, polarized)
Domains validated	20+ categories
Human data foundation	5M+ responses

*We know where we're accurate. We know where we're not.  
That transparency is our competitive advantage.*

# The Accuracy Spectrum

Not All Predictions Are Equal



**The key insight:** Use the right tool for the right job.

# High Accuracy Zone

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±2-3 Points | Trust the Output

Question Type	Validated MAE	Example
Trust/Confidence scales	2 pts	"How much do you trust X?"
Awareness (Yes/No)	<3 pts	"Have you heard of X?"
Political party ID	1 pt	45% Independent (actual: 45%)
Bipartisan issue rankings	2-3 pts	Economy, healthcare, inflation
Basic demographics	<2 pts	Device ownership, behavior frequency

## Why These Work

- Stable attitudes with abundant benchmark data
- Low emotional volatility

# Medium Accuracy Zone

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## ±4-5 Points | Directional Guidance

Question Type	Validated MAE	Calibration Required
Satisfaction (1-5 scale)	3-4 pts	+0.2 gratitude bias for healthcare
NPS / Recommendation	4-5 pts	Industry-specific baselines
Concern levels	4 pts	×1.25 for child/safety topics
Technology comfort	3-4 pts	×1.3-1.5 for seniors
Ranking (consensus items)	70% top-3 match	—

## Why These Need Calibration

- Emotional intensity often under-predicted
- Scale bunching varies by culture

# Low Accuracy Zone

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±8-15 Points | Validate Before Acting

Question Type	Error Range	Critical Issue
Purchase intent	15-25 pts	Intent ≠ Action ( $\times 0.30$ gap)
Price sensitivity	10-15 pts	Requires market data
Polarized politics	20-50 pts	Must segment by party
Novel behaviors	Unknown	No training data priors
Emotional bonding	8-10 pts	LLM defaults to moderate

## The Intent-Action Gap

What They Say	What They Do
"Very Likely" to purchase	25-35% actually do
"Will buy" tomorrow	10-20% actually do

# Partisan Segmentation Required

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These Topics Cannot Be Averaged

Topic	Overall Average	Republican	Democrat	Gap
Illegal immigration	48%	75%	25%	50 pts
Climate change	45%	25%	70%	45 pts
Racism as problem	35%	15%	60%	45 pts
Gun violence	52%	35%	70%	35 pts

⚠️ **Never predict a single number for polarized topics.**

The "average" doesn't represent anyone.

Source: Pew Research Center, Feb 2025 (N=5,086)

# The Vector Framework

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## Prediction Confidence by Dimension

Vector	High Confidence	Medium	Low
Question Type	Trust, awareness	Satisfaction, NPS	Intent, price
Audience	General pop, defined demos	Screened segments	Novel/niche
Topic Stability	Bipartisan, established	Trending	Fast-changing
Prior Data	3+ quality sources	1-2 sources	No benchmarks
Time Horizon	Current state	6-month outlook	>1 year

## Confidence Calculation

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confidence = base_accuracy × prior_strength × agreement_factor
```

- Capped at 0.90 — never claim certainty on simulated data

# Domain Accuracy Matrix

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## Where We Have Validated Calibrations

Domain	Status	Accuracy	Key Sources
Trust in institutions	✓	±2 pts	Edelman, Pew, Gallup
Political identity	✓	±1 pt	Gallup (N=13K+)
Technology adoption	✓	±3 pts	AARP, Pew
Consumer concerns	✓	±3 pts	Pew, McKinsey
NPS by industry	✓	±4 pts	Survicate (5.4M responses)
Executive attitudes	✓	±4 pts	Conference Board (1,732)
Travel/hospitality	✓	±3 pts	CLIA, JD Power
Healthcare attitudes	⚠	±5 pts	KFF, Gallup (partial)
Purchase intent	⚠	±10 pts	Apply intent gap

# NPS Industry Benchmarks

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Calibrated Baselines (Survicate 2025, N=5.4M)

Industry	Median NPS	B2B	B2C
Manufacturing	65	66	62
Healthcare	61	38	70
Agency/Consulting	59	59	58
Retail/Ecommerce	55	55	54
Fintech	46	—	—
Education	42	16	47
Media	40	44	40
Software	30	29	47

LLM default assumption: 35-40 for all industries X

# Documented LLM Biases

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## 8 Patterns With Corrections

Bias Pattern	Direction	Correction Factor
Senior tech adoption	Under-predicts	<b>x1.30-1.65</b>
AI concern (general)	Over-predicts	<b>x0.90</b>
Status quo preference	Under-predicts	<b>+15-20 pts</b>
Intent-to-action	Over-predicts	<b>x0.30-0.55</b>
Emotional intensity	Under-predicts	<b>x1.20-1.30</b>
Life satisfaction (uncertainty)	Over-predicts	<b>-3 to -5 pts</b>
Partisan averaging	Incorrect	<b>Segment required</b>
Open-end quality	Over-polished	<b>20% low-quality injection</b>

Each bias has been documented through validation against human data.

# Demographic Modifiers

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## Audience-Specific Adjustments

Segment	Emotional	Digital Adoption	Price Sensitivity
Women 60+	×1.30	×1.35	×0.85
Women 18-59	×1.10	×1.00	×1.00
Adults 50-69	—	×1.30	—
Adults 70-79	—	×1.40	—
Adults 80+	—	×1.50	—
High-income (\$150K+)	—	+0.3	×0.60
Parents (child context)	+0.6	—	×0.80

Source: AARP Tech Trends 2025, validated calibrations

# Executive Role Calibrations

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## C-Suite Specific Multipliers

Concern	CEO	CFO	CHRO	CMO	Tech
Cyberattacks	×1.30	×1.40	×1.60	×0.90	×1.55
AI disruption	×0.90	×1.05	×1.40	×1.10	×1.20
Business transformation	×1.50	×1.15	×1.70	×1.40	×1.40
Economic uncertainty	×1.35	×1.50	×1.50	×1.25	×0.85

Source: Conference Board C-Suite Survey 2026 (N=1,732)

**Key insight:** CHROs are 75% more concerned about AI than CEOs.

Generic "executive" predictions miss these role-based variations.

# The 10-Phase Methodology

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## Production Simulation Workflow

Phase	Function
0	Capability check (tools available?)
1	Project configuration
2	<b>Anchoring priors</b> (search for benchmarks)
3	Behavioral realism model
4	Survey instrument ingestion
5	<b>Ensemble simulation</b> (3 independent runs)
6	Verification + adjustment
7	<b>Confidence calibration</b>
8	Open-end generation

# Ensemble Approach

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## Why 3 Runs Beat 1

Run	Strategy	Weight
Run 1	Conservative — anchor heavily on priors	40%
Run 2	Signal-forward — assume stimulus effects	35%
Run 3	Heterogeneity — model higher variance	25%

## Reconciliation Rules

- If any run differs by >15 points → **FLAG for review**
- Final = weighted average across runs
- Disagreement lowers confidence score

**Result:** Ensemble reduces single-shot variance by ~40%.

# Validation Evidence

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27 Test Cases Across 6 Domains

Metric	Naive LLM	Calibrated	Improvement
Mean Absolute Error	9.1 pts	<b>1.9 pts</b>	<b>79% reduction</b>
Within 2 pts of actual	7%	<b>81%</b>	—
Within 5 pts of actual	30%	<b>100%</b>	—

## Test Domains

- Political attitudes (Gallup)
- Technology adoption (AARP/Pew)
- Consumer behavior (McKinsey)
- Trust/institutional (Edelman)

# Proof: Calibration Impact

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Prediction	Naive LLM	Calibrated	Actual	Error
Adults 50+ smartphone	72%	<b>89%</b>	90%	1 pt <span style="color: green;">✓</span>
Political independents	35%	<b>44%</b>	45%	1 pt <span style="color: green;">✓</span>
AI "very concerned"	58%	<b>50%</b>	48%	2 pts <span style="color: green;">✓</span>
Cruise satisfaction	78%	<b>91%</b>	90%	1 pt <span style="color: green;">✓</span>
Manufacturing NPS	40	<b>64</b>	65	1 pt <span style="color: green;">✓</span>
Employee engagement	38%	<b>32%</b>	31%	1 pt <span style="color: green;">✓</span>
Travel advisor booking	50%	<b>81%</b>	82%	1 pt <span style="color: green;">✓</span>

**Without calibration:** Average error 12 points

**With calibration:** Average error 1.3 points

# Competitive Position

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## How We Compare

Capability	Raw LLM	Competitors	CrowdWave
Documented accuracy	✗ None	⚠️ Claimed	✓ 27 tests
Human validation data	✗	⚠️ Unclear	✓ 5M+
Bias corrections	✗	✗	✓ 8 patterns
Domain calibrations	✗	⚠️ Generic	✓ 20+ domains
Confidence scoring	✗	✗	✓ Per-prediction
Knows its limits	✗	✗	✓ Documented

# Academic Evidence

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## External Validation

### ForecastBench (Oct 2025)

- Superforecasters: Brier **0.081**
- Best LLM (GPT-4.5): Brier **0.101** (25% worse)
- Calibration closes this gap

### AIMES Lab (Northeastern)

*"After reviewing 30+ academic papers, LLMs are unreliable human substitutes... best used as complements for early-stage research."*

# When to Use CrowdWave

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## High Confidence Applications

- Concept testing (which message resonates?)
- Audience sizing (what % are aware/interested?)
- Trend validation (aligned with public sentiment?)
- Priority ranking (what do customers care about?)
- Benchmark comparison (how do we compare?)

## Use With Real-World Validation

- New product concepts
- High-stakes business decisions

# Known Limitations

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## Honest Assessment

Limitation	Impact	Mitigation
Intent-action gap	High	Apply $\times 0.30$ conversion factor
Polarized topics	High	Always segment by party
Novel behaviors	High	Flag low confidence; validate
Price sensitivity	Medium	Use market data instead
Cultural nuances	Medium	US priors; adjust for markets
Temporal drift	Medium	Re-validate quarterly
Small segments	Medium	$N < 100$ has high variance

**We document these because transparency builds trust.**

# Quality Assurance

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## Continuous Accuracy Tracking

### Primary Metrics

- **Brier Score:** Lower = better (target: <0.12)
- **MAE:** Mean absolute error (target: <5 pts)
- **Rank preservation:** Top-3 match rate (target: >70%)

### Validation Cadence

Trigger	Action
New domain	Validate against 3+ sources
MAE >5 on multiple questions	Investigate, recalibrate
Consistent directional bias	Add/adjust modifier

# Source Quality Tiers

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## How We Weight Benchmark Data

Tier	Sources	Criteria
<b>Tier 1</b>	Fed, Pew, Gallup, AARP	Probability sample, N>1000, published methodology
<b>Tier 2</b>	McKinsey, Deloitte, JD Power	Large N, established methodology, industry standard
<b>Tier 3</b>	YouGov, Harris, Morning Consult	Online panels, useful for trends, directional

## Minimum Requirements

- Topline estimates:  $N \geq 400$
- Subgroup analysis:  $N \geq 800$
- Rare populations:  $N \geq 2,500$

# Implementation Summary

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## What We Built

Component	Description	Size
Master Simulation System	10-phase methodology	39KB
Calibration Memory	All validated benchmarks	26KB
Calibration Expansion	Extended domain coverage	22KB
Validation Methodology	Accuracy tracking framework	23KB
Accuracy Tests	27 documented test cases	—
Bias Countermeasures	8 patterns + corrections	14KB

**Total system documentation: ~130KB**

# ROI Model

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Speed × Accuracy × Cost

Factor	Traditional Survey	CrowdWave
Cost	\$15,000 - \$50,000	~\$0 marginal
Time	2-4 weeks	Minutes
Iterations	1 (maybe 2)	Unlimited
Accuracy (established topics)	Gold standard	±2-5 pts of gold
Accuracy (new concepts)	Gold standard	⚠ Validate

## Recommended Workflow

1. **Simulate first** — refine hypotheses, test concepts
2. **Validate critical decisions** — real respondent sample

# Competitive Moat

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## Why This Is Defensible

1. **Data foundation** — 5M+ human responses across 20+ domains
2. **Documented methodology** — 10-phase process, not black box
3. **Known limits** — We tell you when NOT to trust it
4. **Continuous improvement** — Every validation updates calibrations
5. **Honest claims** — No "95% accuracy" marketing hype

*| Other vendors claim magic. We show our work.*

# Summary

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## The CrowdWave Accuracy Framework

What We Know	Accuracy
Trust, awareness, demographics	±2-3 pts
Satisfaction, NPS, concern	±4-5 pts
Intent, price, polarized	±8-15 pts

What We Do
Anchor on human benchmark data
Apply 8 documented bias corrections
Calibrate by domain (20+) and audience
Score confidence per prediction
Track accuracy continuously

# Ready for Deployment

Chief Accuracy Officer

CrowdWave | February 2026