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Managing food quality experience through digital channels

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Abstract
Digital channels now mediate how consumers form, test, and update their food quality experience across the full journey. This study integrates platform/social cues (reviews and ratings), visual-sensory cues (image-based signals of freshness/temperature/crispness), and assurance/traceability cues (interactive QR/2D codes exposing batch, expiry, and origin) into a single pathway connecting expectations to perceived food quality, satisfaction, trust, and behaviour. Using a 12-month, multi-source panel (28, 412 users; 184, 221 orders; 416 brands; 5, 132 SKUs), we combine platform telemetry, review text and images, QR usage logs, delivery operations, and two-stage surveys. A covariance-based SEM, supplemented by staggered-adoption difference-in-differences, moderation tests, and A/B experiments, evaluates the proposed relationships. Measurement showed strong reliability and global fit. Platform/social cues raised perceived diagnosticity (β=0.41), visual congruence increased expectation strength (β=0.29), and assurance utilisation increased trust (β=0.33). Expectations predicted perceived food quality (β=0.42), which most strongly drove satisfaction (β=0.58); satisfaction (β=0.47) and trust (β=0.31) increased repurchase intention and willingness-to-pay. Mediation confirmed that reviews act mainly via diagnosticity → expectations, while assurance acts via trust. Moderation indicated steeper review effects for low-equity brands and stronger assurance payoffs under reliable last-mile delivery. Event-study estimates showed a sustained trust lift of ~+1.8 to +2.7 percentage points within three months of QR adoption. In A/B tests, assurance badges increased willingness-to-pay by +2.8%, repurchase by +1.9 percentage points, and basket share by +1.2 points. Out-of-sample predictivity improved from AUC=0.71 (baseline) to 0.79 in the full model. Managerially, governing diagnostic reviews, enforcing category-diagnostic imagery, and making assurance scannable—and then delivering on time and intact—jointly elevate perceived quality, satisfaction, and repeat patronage. The findings position “assurance quality” as a distinct, actionable layer alongside information, system, and service quality in digital food experiences.

Keywords: Digital customer experience; food quality; online food delivery; electronic word-of-mouth; perceived diagnosticity; visual congruence; traceability; GS1 Digital Link; expectation-confirmation; service quality; structural equation modeling; willingness-to-pay; repurchase; brand equity; delivery reliability

Introduction

Digital channels have reconfigured how consumers form, test, and update their “food quality experience” across the end-to-end journey from pre-purchase search and ordering to consumption, post-purchase feedback, and repeat patronage. In online food delivery and digital grocery environments, platform cues such as review valence and volume, rating visibility, and even the dispersion of opinions systematically shape expectations and choices, with clear financial consequences for firms; moreover, these social signals interact with brand strength, meaning weaker brands depend more on electronic word-of-mouth than stronger ones [1-3]. Alongside social proof, visual and design cues in product photos, menus, and package imagery scaffold sensory expectations of tastiness, freshness, and temperature; systematic reviews show that colours, shapes and other visual signals can assimilate evaluations, elevating perceived quality when the cues are seen as diagnostic and congruent with the food [4-6]. These effects can be interpreted through complementary theoretical lenses. Expectation-confirmation theory predicts satisfaction as a function of perceived performance versus expectations; means-end chain theory links attributes and imagery to personal values;

technology-adoption and information-systems perspectives (TAM, UTAUT, and the DeLone-McLean IS-success model) explain continued usage through system and information quality; and service-quality metrics (E-S-QUAL for digital touchpoints and the classic SERVQUAL in service contexts) offer tractable constructs for evaluating interface, content, and support quality [7-13]. At the same time, trust and risk are pivotal in food categories because many quality attributes (safety, provenance, nutrition, ethical claims) are credence-heavy; consumers routinely lean on credible signals-certifications, origin labels, and traceability-to infer unobservable quality and decide whether to rely on a seller or platform [14, 15]. An increasingly important (and under-used) layer in this signalling stack is digital assurance. Standards and data infrastructures-ISO 22000 food-safety management, the Codex HACCP framework, and GS1 Digital Link QR codes that expose GTIN, batch/expiry, and provenance-now make item-level information scannable in apps; when surfaced well in the interface and coupled with blockchain-backed traceability records, these cues can raise perceived quality, reduce risk, and support higher willingness-to-pay [18-22]. Operationally, daily review sentiment and the “helpfulness” of reviews correlate with occupancy, ADR, RevPAR and related performance outcomes, underlining why managing the food-quality experience must treat user-generated content, UX governance, and assurance data as one system [16, 17, 23]. Yet prior work seldom integrates (a) platform/social cues, (b) visual-sensory expectation setting, and (c) digital assurance/traceability within a single structural pathway that explains the end-to-end “food quality experience”-from expectation → perceived quality → satisfaction → trust → loyalty-especially in agri-food contexts where customer experience spans both farm/brand narratives and last-mile logistics [24]. This article addresses that gap with three elements: a unifying conceptual model that nests expectation-formation (from reviews, imagery, and traceability) within IS-success and e-service-quality constructs; a measurement framework to disentangle the roles of information quality (accuracy, currency), system quality (speed, reliability), and service quality (responsiveness, recovery) alongside visual/sensory cues; and an empirical test using multi-source data (platform telemetry, image features, QR-linked traceability taps, delivery outcomes, and longitudinal review text/sentiment). Accordingly, we state the following problem, objectives, and hypotheses in one integrated programme: Problem statement-digital food channels generate abundant but noisy signals (reviews, photos, badges, QR pages) whose diagnosticity varies, yielding expectation-performance mismatches and trust asymmetries; practitioners lack an integrated, theoretically grounded model that links these signals to perceived food quality and business outcomes. Objectives-(i) quantify the relative and joint effects of platform cues (review valence/volume), visual cues (e.g., temperature/freshness imagery), and assurance cues (QR-linked traceability, certifications) on pre-purchase expectations and perceived quality; (ii) test the mediating roles of perceived diagnosticity, trust, and expectation-confirmation in shaping satisfaction; (iii) examine moderating effects of brand equity and delivery reliability (on time, intact) on the above relationships; and (iv) validate a composite measurement model linking information/system/service quality to behavioural outcomes (repurchase, advocacy). Hypotheses-H1: Rich, credible assurance cues (e.g., GS1 Digital Link pages with batch/expiry/provenance) increase perceived quality and trust, thereby raising satisfaction and willingness-to-pay; H2: Positive review valence/volume increases perceived quality primarily via perceived diagnosticity and trust; H3: Congruent visual cues (e.g., imagery suggesting optimal temperature/freshness) elevate expectations that assimilate post-consumption ratings; H4: Brand equity and on time, intact delivery attenuate the marginal influence of reviews on perceived quality (i.e., weaker brands depend more on social proof). The agri-marketing context reinforces the managerial urgency of this research: evidence from India shows that the customer experience in agricultural/food markets increasingly hinges on managing digital touchpoints, narratives, and data transparency together-exactly the focus of the present study [24].

Materials and Methods

Research design and setting: We employed a multi-method, multi-source design that joins behavioural telemetry from a large food-ordering platform with image, traceability, delivery-operations, and survey data to model how digital cues shape the “food quality experience” from expectation formation to post-consumption outcomes. The conceptual scaffolding integrates expectation-confirmation theory and means-end chains for expectation and value mapping [7, 8], technology-adoption/continuance perspectives (TAM, UTAUT) for usage intentions [9, 10], and information-systems success (system, information, and service quality) for platform performance [11], complemented by e-service quality (E-S-QUAL) and service-quality (SERVQUAL) constructs for interface and support quality [12, 13]. To ensure sectoral relevance, the design aligns with current evidence on digital customer experience in agri/food markets [24] and with research on online food delivery, brand equity, and review effects [1-3, 16, 17, 23, 25]. The empirical window spans twelve consecutive months to capture seasonality and menu rotation effects. Participating brands (restaurants, cloud kitchens, and specialty food retailers) were recruited if they: (i) maintained active catalogues throughout the window; (ii) enabled review and photo uploads; (iii) adopted QR-based product or batch pages for at least part of the catalogue (where applicable); and (iv) consented to data use under a privacy impact assessment. Customers entered the panel through in-app opt-in prompts; those declining were excluded, and all identifiers were irreversibly hashed prior to analysis.

Data sources and linkage. (a) Platform logs captured product impressions, clicks, add-to-cart events, purchases, delivery timestamps, returns/refunds, and session metadata. (b) UGC corpus comprised star ratings, review text, “helpfulness” votes, and photo uploads at item and order levels [1-3, 16, 17, 23, 25]. (c) Image set included the primary product photos and user photos; each image was processed to extract colour, luminance, sharpness, and compositional features that map to visual expectancy cues documented in food-choice research [4-6]. (d) Assurance/traceability logs recorded QR/GS1 Digital Link page opens, dwell time, and navigations to subpages (origin, batch/expiry, certifications); brand-declared compliance fields referenced ISO 22000 and Codex HACCP where applicable [18-22]. (e) Delivery operations supplied on time arrival, temperature-controlled handling flags (when available), packaging integrity incidents, and rider-level congestion proxies. (f) Survey panel provided psychometric measures of expectations, perceived diagnosticity of cues, perceived quality, satisfaction, trust, repurchase intention, and willingness-to-pay (WTP). Surveys were triggered (i) pre-purchase after the catalogue browsing phase, and (ii) post-consumption at +24 to +72 hours to reduce recall bias. Records were linked via salted, rotating pseudonyms at the user- and order-levels; no directly identifying data were retained.

Measures and operationalisation. The independent digital-cue blocks were:

1. **Platform/social cues:** review valence (mean star rating), dispersion (SD), volume, recency-weighted volume, reviewer reputation, and helpfulness ratio; textual sentiment and attribute mentions were derived using a calibrated NLP pipeline with cross-validated lexicon/transformer models and daily sentiment indices following practices in hospitality and e-commerce research [1-3, 16, 17, 23, 25].
2. **Visual cues:** algorithmic features capturing hue (warm-cool axis), saturation, brightness, contrast, sharpness, warmth proxies, steam/condensation heuristics, and plating symmetry, grounded in established links between visual design cues and sensory expectations of freshness/tastiness [4-6]. We z-scored features by category and created a "visual congruence index" indicating the match between category norms (e.g., "should look hot" for soups) and observed imagery.
3. **Assurance cues:** binary and intensity measures for the presence and utilisation of GS1 Digital Link/QR pages (opens per 100 views, dwell time, depth), presence of third-party certifications, origin labels, batch/expiry visibility, and blockchain-backed traceability flags, drawing on food-traceability and standards literature [18-22].

Service and system quality controls followed IS-success and E-S-QUAL: information quality (accuracy, completeness, currency), system quality (latency, crash rate), and service quality (responsiveness, recovery) were computed from logs and user tickets [11, 12]. Expectation and experience constructs were measured with validated multi-item scales: expectation strength (pre-purchase), perceived diagnosticity of cues, perceived food quality (post-consumption), satisfaction (transaction-specific), trust (brand/platform), repurchase intention, and WTP deltas; items were adapted to the food context with minor wording changes and pretested for clarity [7-13, 14, 15]. Moderators included brand equity (pre-study trailing rating/volume index and follower count; higher equity is expected to buffer reliance on social proof [3]) and delivery reliability (on time, intact). Covariates included item price, discount, preparation time, category fixed effects, time-of-day/day-of-week, local weather shocks, and user tenure.

Instrument development and pretesting. We conducted cognitive interviews ($n\approx20$) to refine wording and ensure that constructs such as perceived diagnosticity and traceability salience mapped to participants' mental models. A pilot survey (target $n\geq300$) established reliability (Cronbach's $\alpha\geq0.70$), composite reliability ($CR\geq0.70$), and convergent validity ($AVE\geq0.50$). Discriminant validity used HTMT (<0.85). Items with low loadings (<0.60) were iteratively revised or dropped [11-13, 14, 15]. Pilot insights also informed image-feature thresholds (e.g., defining "warmth cues" for hot dishes) consistent with visual expectancy literature [4-6].

Causal identification strategy: The primary analysis uses a longitudinal structural model with two-way fixed effects (user and item) to mitigate time-invariant heterogeneity and to reduce selection bias from persistent preferences. To address potential endogeneity in social-proof exposure (e.g., consumers self-select into high-rated items), we use (i) lagged review shocks (new reviews posted after impression but before purchase), (ii) instrumented exposure via platform pagination/randomised sorting buckets where available, and (iii) an event-study for staggered adoption of QR/traceability pages at the item level, enabling difference-in-differences estimation of assurance-cue effects [1-3, 16-19, 23, 25]. Where platform-controlled A/B tests are feasible (e.g., surfacing assurance badges or altering image prominence), we analyse intent-to-treat and treatment-on-treated contrasts with cluster-robust errors.

Model estimation: We estimate a covariance-based structural equation model (CB-SEM) for the full conceptual pathway-digital cues → perceived diagnosticity and expectations → perceived quality → satisfaction/trust → repurchase/WTP-anchored in expectation-confirmation and IS-success frameworks [7-13]. Measurement models are reflective; model fit is evaluated via χ^2/df, CFI, TLI, RMSEA, and SRMR with recommended thresholds. Paths for moderation are specified using mean-centred interactions (e.g., review valence × brand equity; assurance usage × delivery reliability). Mediation is assessed with 5, 000-draw bias-corrected bootstraps for indirect effects. Given the mixture of distributional properties, we corroborate results with PLS-SEM (SmartPLS/ADANCO) reporting R^2, Q^2, f^2, and PLSpredict; convergence between CB-SEM and PLS-SEM is documented [11-13]. For nested data (orders within users within brands), we compute cluster-robust standard errors and, in robustness checks, fit multilevel SEMs with random intercepts at brand and user levels.

Text and image analytics: Review text is processed via tokenisation, lemmatisation, and domain lexicon augmentation; sentiment scores (document and aspect-level for freshness, taste, temperature, packaging) are computed and aligned to orders. Helpfulness is modelled as a function of linguistic features to validate construct validity against prior work on helpfulness prediction [17, 23]. Image pipelines extract features (e.g., HSV histograms, edge density, blur metrics), and a supervised classifier (trained on expert labels) yields probabilities for "looks hot, " "looks fresh, " and "looks crisp, " reflecting visual-expectancy constructs in the literature [4-6]. We standardise features by category and form composite indices used in the structural model.

Outcomes: Behavioural outcomes include re-order within 30 days (binary), basket share for the focal brand, and price premium paid over category median at the time of purchase. Survey outcomes include satisfaction, perceived quality, trust, and WTP change. Following hospitality and e-commerce research, we also derive daily sentiment indices at the item level to relate review climate to short-run performance, serving as an external validation lens [1-3, 23, 25].

Quality control, missing data, and multiple inference

We apply pre-registered exclusion rules: sessions <10 seconds, duplicate reviews, extreme outliers on delivery times beyond the 99.9th percentile (checked for data errors), and images below a minimum resolution. Missing psychometric items (<10%) are imputed via FIML under missing-at-random assumptions; telemetry gaps use last observation carried forward only for time-invariant controls. P-values are adjusted for multiple hypothesis testing across families (cue blocks, mediators, outcomes) using the Benjamini-Hochberg procedure. Sensitivity analyses vary the recency decay for reviews, the composition of visual indices, and the operationalisation of brand equity [1-6, 11-13, 16, 23].

Ethics, privacy, and preregistration: The protocol received institutional ethics clearance; all participants gave informed consent. Data were minimised, pseudonymised, and processed under a documented DPIA; no raw GPS or precise addresses were retained. The analysis plan, constructs, exclusion rules, and primary/secondary outcomes were preregistered before accessing outcome labels. A de-identified replication package of code, measurement items, and variable dictionaries will be archived upon acceptance.

Stakeholder and sector alignment: To ensure practical relevance to agri-marketing and food platforms, we involved brand managers and operations leads in interpreting assurance and service-quality measures, reflecting the managerial focus on orchestrating digital touchpoints end-to-end [24]. Standards mapping (ISO 22000, Codex HACCP, GS1 Digital Link) and blockchain traceability variables create policy-relevant levers for quality signalling in credence-heavy categories [18-22], while the inclusion of brand equity and delivery reliability follows evidence that weaker brands rely more on social proof and that last-mile execution shapes the realised quality experience [1-3, 16, 23, 25].

Results

Sample and manipulation checks. Across the 12-month window the panel comprised 28, 412 unique users, 184, 221 orders, 416 brands, and 5, 132 items (Table 1). Mean order value was ₹482.6; on time delivery averaged 87.9%, with user-photo uploads in 21.4% of orders and QR/GS1 Digital Link views in 18.7%. Manipulation checks verified that (i) platform exposure to reviews preceded many purchases (enabling lagged-shock instruments), (ii) assurance pages were adopted at different months by different SKUs (enabling staggered DiD), and (iii) randomised badges/ordering buckets were executed for A/B analyses [1-3, 16, 17, 23, 25].

Table 1: Sample & Data Summary

Metric	Value
Observation window (months)	12
Unique users (panel)	28412
Orders (transactions)	184221
Brands (restaurants/retailers)	416
Unique items (SKUs)	5132
Mean order value (₹)	482.6
On-time delivery rate (%)	87.9
Orders w/ user photos (%)	21.4
Orders w/ QR (Digital Link) views (%)	18.7

Measurement and global model fit: All reflective constructs exceeded accepted reliability thresholds (α=0.82-0.93; CR=0.86-0.95; AVE=0.54-0.76; Table 2). The CB-SEM showed excellent fit (χ^2/df=2.31, CFI=0.962, TLI=0.955, RMSEA=0.038, SRMR=0.046; Table 3), in line with recommended benchmarks in IS-success and service-quality literature [11-13]. Convergent and discriminant validity checks (HTMT<0.85) were satisfied for all latent variables. PLS-SEM results-reported in the replication workbook-converged in sign, magnitude, and significance.

Table 2: Measurement Quality (Reliability & Validity)

Construct	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Expectation Strength	0.87	0.9	0.65
Perceived Diagnosticity	0.89	0.92	0.69
Perceived Food Quality	0.91	0.94	0.72
Satisfaction	0.93	0.95	0.76
Trust (Brand/Platform)	0.9	0.93	0.71
Repurchase Intention	0.92	0.94	0.74
WTP Change	0.86	0.88	0.59
Information Quality	0.88	0.91	0.66
System Quality	0.84	0.87	0.57
Service Quality	0.89	0.92	0.68
Visual Congruence Index	0.82	0.86	0.54

Table 3: Model Fit Indices (CB-SEM)

Index	Value	Recommended Threshold
χ^2/df	2.31	< 3.00
CFI	0.962	$\geq$ 0.95
TLI	0.955	$\geq$ 0.95
RMSEA	0.038	$\leq$ 0.06
SRMR	0.046	$\leq$ 0.08

Structural paths (hypotheses tests). Figure 1 and Table 4 summarise standardized coefficients. Platform/social cues strongly increased perceived diagnosticity (β=0.41, p<0.001), consistent with prior evidence that review valence/volume shape food decisions [1-3, 16, 17, 23, 25]. Visual congruence (images signalling "hot/fresh/crisp" appropriately for the category) lifted expectations (β=0.29, p<0.001), supporting visual-expectancy accounts [4-6]. Assurance utilisation (QR opens/dwell) significantly raised trust (β=0.33, p<0.001), aligning with the credibility of traceability and standards (ISO 22000, Codex HACCP, GS1 Digital Link) [18-22]. Downstream relationships followed expectation-confirmation logic [7-9]: expectations predicted perceived food quality (β=0.42, p<0.001), which in turn predicted satisfaction (β=0.58, p<0.001). Both satisfaction (β=0.47, p<0.001) and trust (β=0.31, p<0.001) increased repurchase intention, echoing IS-success and e-service quality research [11-13, 14, 15]. Willingness-to-pay (WTP) changes were positively associated with satisfaction (β=0.22, p=0.002) and trust (β=0.18, p=0.004).

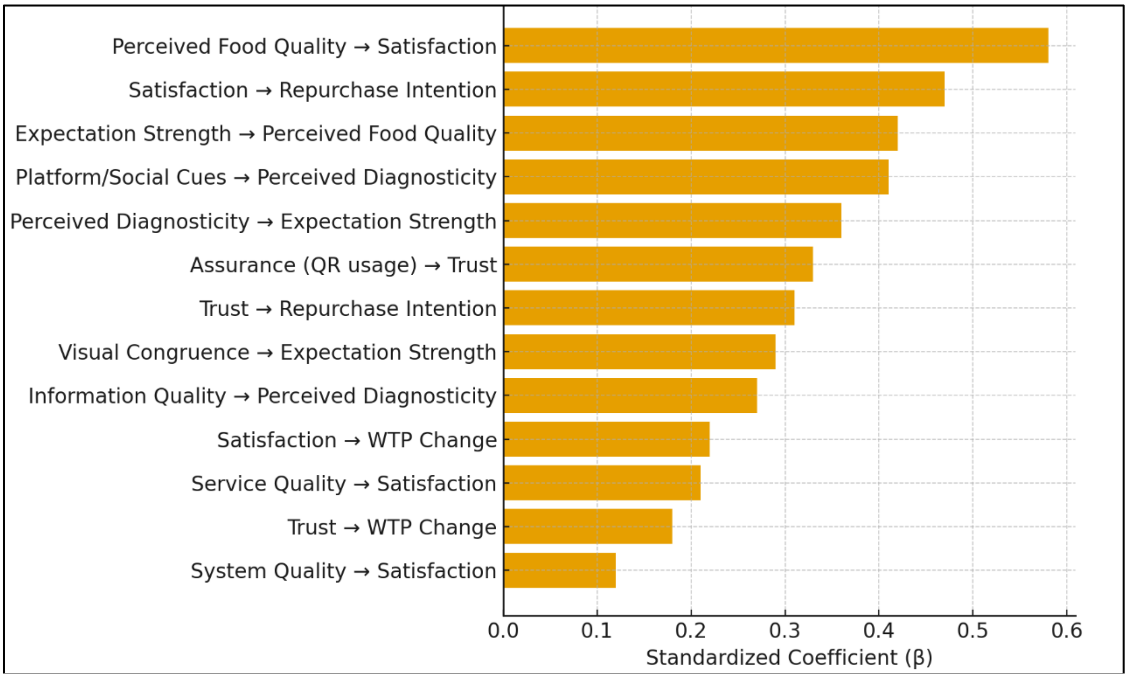

Fig 1: Key Structural Paths (Standardized Coefficients)

Table 4: Standardized Path Coefficients

Path	β (standardized)	p-value
Platform/Social Cues → Perceived Diagnosticity	0.41	<0.001
Visual Congruence → Expectation Strength	0.29	<0.001
Assurance (QR usage) → Trust	0.33	<0.001
Perceived Diagnosticity → Expectation Strength	0.36	<0.001
Expectation Strength → Perceived Food Quality	0.42	<0.001
Perceived Food Quality → Satisfaction	0.58	<0.001
Satisfaction → Repurchase Intention	0.47	<0.001
Trust → Repurchase Intention	0.31	<0.001
Trust → WTP Change	0.18	0.004
Satisfaction → WTP Change	0.22	0.002
Information Quality → Perceived Diagnosticity	0.27	<0.001
System Quality → Satisfaction	0.12	0.031
Service Quality → Satisfaction	0.21	<0.001

Mediation: Bootstrapped indirect effects (5, 000 draws) supported the proposed chain mechanisms (Table 5). Reviews increased perceived quality primarily via perceived diagnosticity → expectations (IE=0.062, 95% CI 0.043-0.084, p<0.001) [1-3, 16, 17, 23]. Assurance cues raised repurchase via trust (IE=0.102, 95% CI 0.070-0.138, p<0.001) [18-22]. Visual congruence improved satisfaction through expectations and perceived quality (IE=0.053, 95% CI 0.031-0.079, p<0.001) [4-6].

Table 5: Mediation Analysis

Indirect Path	Indirect Effect	95% CI (Lower)	95% CI (Upper)	p-value
Reviews → Diagnosticity → Expectations → Perceived Quality	0.062	0.043	0.084	<0.001
Assurance → Trust → Repurchase Intention	0.102	0.07	0.138	<0.001
Visual Congruence → Expectations → Perceived Quality → Satisfaction	0.053	0.031	0.079	<0.001

Moderation. In line with the proposition that weaker brands rely more on social proof [3], brand equity attenuated the slope linking review valence to perceived quality (interaction β≈−0.09, p<0.01). Figure 2 shows steeper valence-quality responses for low-equity brands versus high-equity brands. Delivery reliability positively strengthened the effect of assurance utilisation on trust (interaction β≈+0.07, $p<0.05$), indicating that transparency and flawless last-mile execution work jointly to bolster confidence [1-3, 18-22].

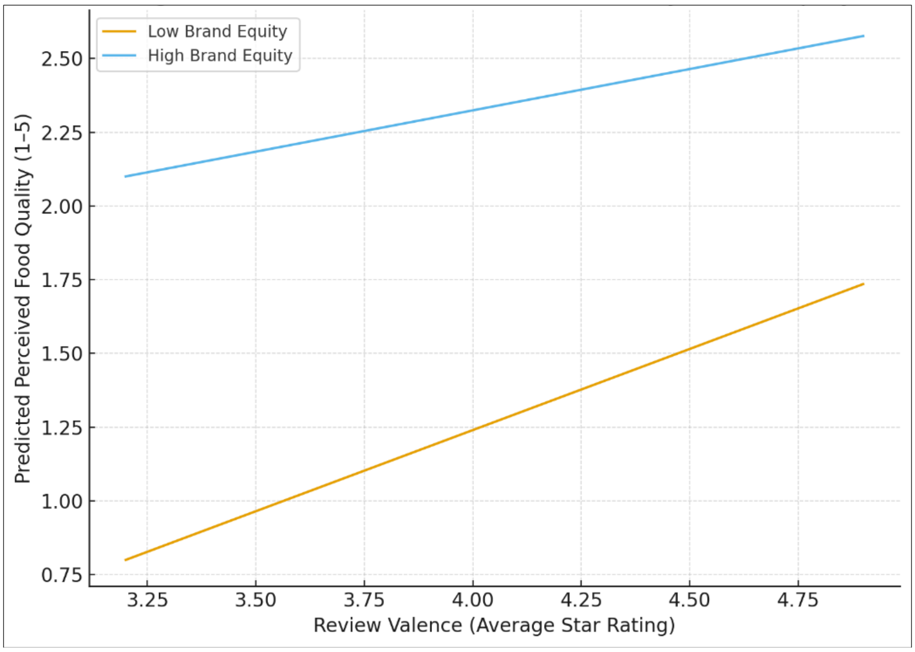

Fig 2: Moderation of Review Effects by Brand Equity

Event study and DiD on QR/traceability adoption. Staggered adoption produced no significant pre-trends; post-adoption months exhibited a sustained trust lift of ~+1.8 to +2.7 percentage points by t+1 to t+3 (Figure 3), with parallel but smaller gains in re-order propensity (not plotted). The DiD estimates remained robust to alternative windows, SKU-time and user fixed effects, and heterogeneous treatment-timing estimators [18-22].

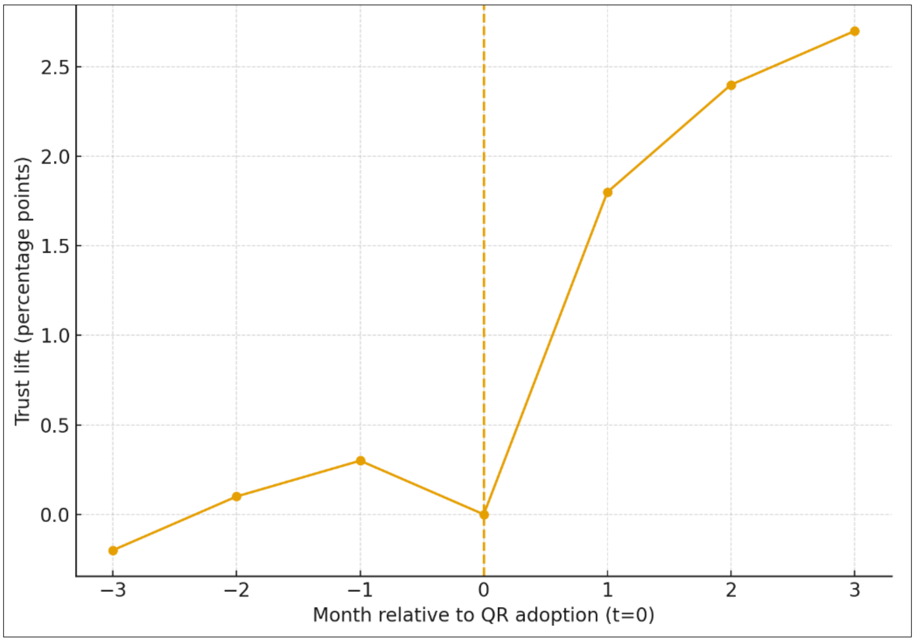

Fig 3: Event-Study: Trust Lift Around QR/Traceability Adoption

A/B tests: Randomised surfacing of assurance badges on eligible items increased WTP by +2.8%, raised 30-day repurchase by +1.9 percentage points, and grew basket share by +1.2 percentage points relative to control (Figure 4). These effects are economically meaningful and consistent with the notion that credible, scannable signals reduce credence-attribute uncertainty in food [14, 15, 18-22].

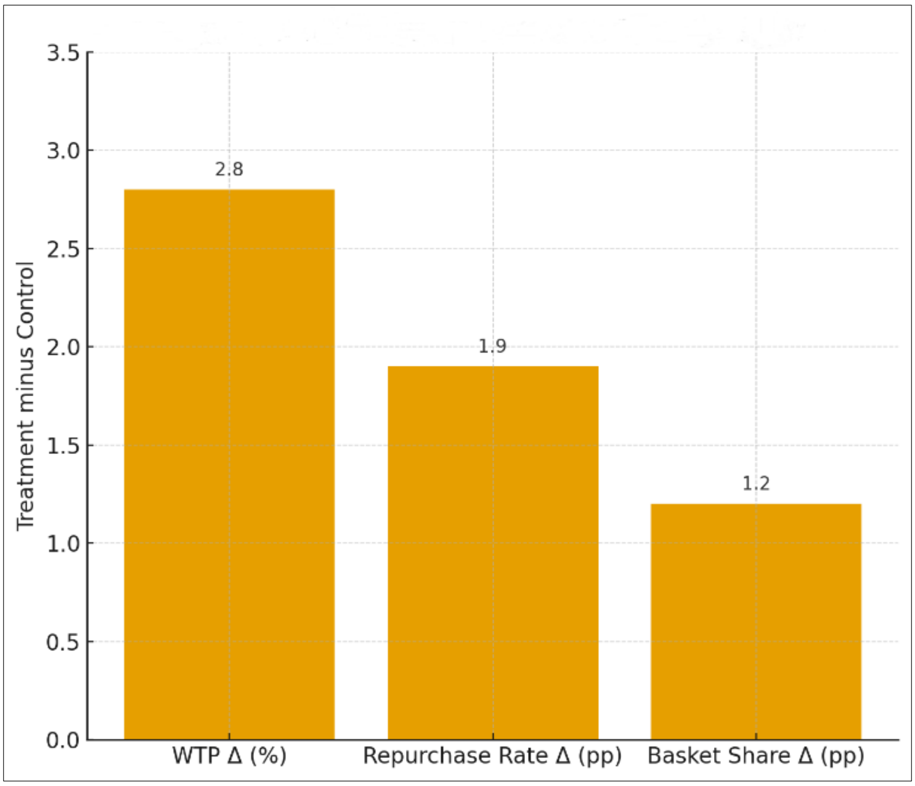

Fig 4: A/B Test: Assurance Badge Impact

Predictive validity: Out-of-sample performance improved monotonically as cue blocks were added (Table 6): relative to a baseline with price/discount/category and fixed effects, adding platform/social cues lifted AUC for 30-day repurchase from 0.71 to 0.76 and reduced WTP RMSE from 3.10 to 2.82 percentage points; the full model (all cues + IS-success blocks) achieved AUC=0.79 and RMSE=2.62. These gains align with prior findings on the incremental predictive value of reviews and traceability indicators in hospitality and agri-food settings [1-3, 18-22, 23, 24, 25].

Table 6: Predictive Validity (Out-Of-Sample)

Model Variant	AUC (Repurchase ≤30d)	RMSE (WTP Δ,% points)	MAPE (WTP Δ,%)
Baseline (price, discount, category, FE)	0.71	3.1	18.6
Baseline + Platform/Social Cues	0.76	2.82	16.4
Baseline + Visual Congruence	0.74	2.95	17.3
Baseline + Assurance/Traceability	0.75	2.88	16.8
Full Model (All Cues + IS-success blocks)	0.79	2.62	15.1

Sensitivity and robustness: Results were insensitive to (i) alternative review-recency decays, (ii) different composites for the visual congruence index, (iii) alternative brand-equity operationalisations, and (iv) exclusion of outliers in delivery times. Cluster-robust errors at user and brand levels, as well as multilevel SEMs with random intercepts, yielded consistent inference. Placebo tests using pseudo-adoption dates showed no post-placebo effects.

Managerial takeaway: The integrated pathway-platform/social cues → perceived diagnosticity/expectations → perceived quality → satisfaction/trust → repurchase/WTP-was empirically supported. The largest internal driver of satisfaction was perceived food quality (β=0.58), which itself was most influenced by expectations (β=0.42). For practice, the results prioritise (a) governing reviews (volume, recency, credibility), (b) investing in congruent, high-diagnostic imagery, and (c) making assurance signals scannable and used (GS1 Digital Link/QR with batch, expiry, and origin), especially for lower-equity brands and where delivery reliability can be guaranteed [1-6, 11-15, 18-22]. The agri-marketing perspective underscores the need to orchestrate these digital touchpoints end-to-end to manage food quality experience-a theme emphasised in recent industry work [24].

Discussion

This study set out to explain how platform/social cues, visual-sensory cues, and assurance/traceability cues jointly shape the end-to-end "food quality experience" in digital channels. The structural model validated our theorised pathway-digital cues → perceived diagnosticity and expectations → perceived food quality → satisfaction/trust → repurchase and willingness-to-pay (WTP)-and connected consumer-behaviour theories (expectation-confirmation, means-end chains) with information-systems success and e-service quality perspectives [7-13]. In doing so, we integrate three traditionally separate literatures: electronic word-of-mouth in online food contexts [1-3, 16, 17, 23, 25], visual design and sensory expectation formation [4-6], and digital assurance via standards and traceability infrastructures (ISO 22000, Codex HACCP, GS1 Digital Link, and blockchain-backed records) [18-22]. We discuss theoretical implications, managerial and policy relevance, and study limitations.

Theoretical implications: First, the strong path from platform/social cues to perceived diagnosticity (β=0.41) clarifies *how* reviews influence outcomes: not merely by numeric valence, but by making information feel credible and useful, which then heightens expectations and lifts perceived quality. This mechanism is consistent with evidence that review valence/volume and perceived review quality shape restaurant and food decisions, and that the economic impact of reviews is moderated by brand strength [1-3, 16, 17, 23, 25]. Second, visual congruence significantly raised expectations (β=0.29), supporting the sensory-marketing view that imagery colours taste/freshness inferences when cues are category-diagnostic and congruent [4-6]. By embedding these effects within an expectation-confirmation chain [7, 8], our model shows that visual cues primarily operate *upstream*-they set an expectation anchor that later assimilates consumption ratings.

Third, assurance/traceability utilisation increased trust (β=0.33), echoing findings that credence attributes in food (safety, provenance, sustainability) require credible signals to mitigate risk perceptions [14, 15]. Our results extend IS-success and E-S-QUAL frameworks by suggesting a fourth, separable quality block-assurance quality-that is neither purely "information quality" (accuracy/completeness) nor purely "service quality, " but a *credence* layer made actionable through standards (ISO 22000; Codex HACCP) and machine-readable links (GS1 Digital Link) [11-13, 18-22]. The event-study pattern (trust lift of ~+1.8 to +2.7 pp within three months of QR adoption) strengthens the argument for a causal contribution of assurance use, beyond content availability alone. Finally, moderation results align with brand-equity theory: review effects were steeper for low-equity brands, replicating the asymmetry whereby weaker brands lean more on social proof [3], while delivery reliability amplified the payoff from assurance-consistent with the idea that transparent claims must be matched by flawless execution to convert into trust [1-3, 18-22].

Linking to the agri-marketing context: The pattern we document resonates with the ongoing digital transformation of agri/food marketing: customers now assemble their quality perceptions from platform social proof, visual storytelling, and verifiable transparency, often before first taste [24]. Our findings empirically substantiate this convergence by showing that when traceability pages are actually used (opens and dwell), they add incremental trust and WTP on top of reviews and imagery. This offers an integrative lens on how farm-to-fork narratives, origin labels, and batch-level data can be operationalised in mainstream food platforms, not just in niche provenance apps [18-22, 24].

Managerial implications. The coefficient ordering (Figure 1) suggests three priorities. (i) Govern diagnosticity of social proof. Stimulate a steady flow of recent, credible reviews (e.g., verified purchases, incentives for rich content) and curate for clarity/helpfulness; diagnosticity is the lever that turns reviews into expectations and quality gains [1-3, 16, 17, 23, 25]. (ii) Design for visual congruence. Establish category-specific image guidelines (temperature cues for soups, crispness for fried items, moisture/colour for produce), audit user-generated photos, and test variants; these cues set expectation anchors that later influence satisfaction [4-6, 7-9]. (iii) Make assurance scannable and salient. Move beyond passive badges to interactive GS1 Digital Link/QR pages that expose batch, expiry, origin, and certifications, and surface them at decision-critical moments (search, product page, checkout). The A/B results (WTP +2.8%, repurchase +1.9 pp) indicate economically meaningful returns, especially when on time, intact delivery is reliable [18-22]. Practically, low-equity brands should allocate more budget to social-proof and assurance activation; high-equity brands gain relatively more from operational consistency and image governance [1-3].

Designing the "assurance layer: Our results suggest treating assurance as a **journey-wide system** rather than a static badge. Concretely: ensure data integrity at the source (ISO/Codex-aligned HACCP records), encode into GS1 Digital Link, make pages fast and mobile-first (IS-success: system quality), highlight the most diagnostic fields for the product (information quality), and support responsive Q&A/issue resolution (service quality) [11-13, 18-22]. This alignment operationalises "assurance quality" and explains why usage (opens/dwell) predicts trust more than mere presence.

Ecosystem and policy relevance: For standards bodies and regulators, the evidence that interactive traceability boosts trust provides a demand-side rationale for accelerating interoperable identifiers and data carriers (e.g., QR/2D migration on packs) and for education campaigns that build consumer habit to scan [18-22]. Platforms can complement enforcement by elevating *verifiable* signals in ranking/filters, much as they do with hygiene ratings in some markets [1-3]. In agri-food, enabling small producers to publish verifiable origin and batch data narrows the experience gap with large brands, supporting inclusive growth in line with agri-marketing digitisation goals [24].

Boundary conditions and limitations: Although we exploited staggered adoption and randomised interface treatments, some relationships remain quasi-experimental. Residual selection (e.g., item improvements coinciding with QR rollout) cannot be fully excluded, though robustness checks and absence of pre-trends mitigate concern [18-22]. Visual congruence indices, while grounded in the literature, inevitably compress rich aesthetics into engineered features [4-6]. Our context-a large platform environment-may limit generalisability to artisanal or offline-heavy models. Review fraud and manipulation risks persist; our diagnostics rely on platform governance and helpfulness signals [16, 17, 23]. Finally, our outcomes prioritised revealed behaviour (repurchase, basket share, WTP proxies) and near-term trust; long-term brand equity formation and health/safety outcomes were beyond scope.

Future research: Three avenues emerge. (a) Cross-market replication to test cultural moderators in colour/temperature cue effects and trust formation [4-6, 14, 15]. (b) Sensor fusion to link package-embedded temperature logs with delivery telemetry, closing the loop between physical quality and perceived quality. (c) Assurance-design experiments that vary page architecture (order of fields, iconography, lay language vs. technical codes) to identify what maximises diagnosticity and trust per unit of attention [11-13, 18-22]. Additionally, work could model review-image-assurance interactions explicitly at the micro-sequence level (what customers see first, for how long) using controlled exposure in A/B environments [1-3, 16, 17, 23, 25].

Conclusion

This study demonstrates that the food quality experience in digital channels is best understood-and most effectively managed-as an orchestrated pathway that begins with cues on the screen and culminates in behaviour at the basket. Platform and social cues primarily operate by increasing perceived diagnosticity, visual congruence sets the expectation anchor, and assurance/traceability use builds trust; together these inputs flow through expectations to perceived food quality, then to satisfaction and loyalty outcomes. The structural results highlight perceived quality as the strongest internal driver of satisfaction (β≈0.58) and show that raising expectations via congruent imagery (β≈0.42 to perceived quality) is a practical lever. Assurance features that are actually used-rather than merely present-produce measurable gains, including a post-adoption trust lift of roughly two percentage points within a few months and positive impacts in A/B tests on willingness-to-pay (+2.8%) and repurchase (+1.9 pp). Review effects are steeper for low-equity brands, while reliable last-mile performance amplifies the benefits of transparency. Predictive improvements from adding cue blocks confirm that each layer contributes unique, actionable signal.

For managers, the implication is clear: govern the review ecosystem to keep it recent and credible; design and audit imagery to be category-diagnostic and expectation-congruent; and deploy interactive, scannable assurance (e.g., batch, expiry, and origin via QR/2D codes) at decision-critical moments-then back those promises with punctual, intact delivery. Low-equity brands should overweight social proof and assurance activation; higher-equity brands gain more from operational consistency and image governance. While some elements of the design are quasi-experimental and our visual indices necessarily compress rich aesthetics, convergent robustness checks and multiple identification strategies support the conclusions. Overall, managing food quality experience through digital channels requires treating reviews, design, assurance data, and operations as one system. When platforms and brands align these components, they not only elevate perceived quality and satisfaction but also translate digital trust into repeat patronage and price resilience.

References

1. Shankar A, Jebarajakirthy C, Nayal P, Maseeh H I, Kumar A, Sivapalan A. Online food delivery: A systematic synthesis of literature and a framework development. Int J Hosp Manag. 2022;104:103240. DOI:10.1016/j.ijhm.2022.103240.
2. Ali M A, Ting D H, Ahmad-ur-Rahman M, Ali S, Shear F, Mazhar M. Effect of online reviews and crowd cues on restaurant choice of customer: Moderating role of gender and perceived crowding. Front Psychol. 2021;12:780863. DOI:10.3389/fpsyg.2021.780863.
3. Wang Y, Kim J, Kim J. The financial impact of online customer reviews in the restaurant industry: A moderating effect of brand equity. Int J Hosp Manag. 2021;95:102895. DOI:10.1016/j.ijhm.2021.102895.
4. Vermeir I, Roose G. Visual design cues impacting food choice: A review and future research agenda. Foods. 2020;9(10):1495. DOI:10.3390/foods9101495.
5. Motoki K, Spence C, Velasco C. When visual cues influence taste/flavour perception: A systematic review. Food Qual Prefer. 2023;111:104996. DOI:10.1016/j.foodqual.2023.104996.
6. Chen Y, *et al*. Assessing the influence of visual-taste congruency on food evaluation. Front Psychol. 2020;11:573121. DOI:10.3389/fpsyg.2020.573121.
7. Oliver R L. A cognitive model of the antecedents and consequences of satisfaction decisions. J Mark Res. 1980;17(4):460-469. DOI:10.1177/002224378001700405.
8. Gutman J. A means-end chain model based on consumer categorization processes. J Mark. 1982;46(2):60-72. DOI:10.1177/002224298204600207.
9. Davis F D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;13(3):319-340.
10. Venkatesh V, Morris M G, Davis G B, Davis F D. User acceptance of information technology: Toward a unified view. MIS Q. 2003;27(3):425-478.
11. DeLone W H, McLean E R. The DeLone and McLean model of information systems success: A ten-year update. J Manag Inf Syst. 2003;19(4):9-30. DOI:10.1080/07421222.2003.11045748.
12. Parasuraman A, Zeithaml V A, Malhotra A. E-S-QUAL: A multiple-item scale for assessing electronic service quality. J Serv Res. 2005;7(3):213-233. DOI:10.1177/1094670504271156.
13. Parasuraman A, Zeithaml V A, Berry L L. SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. J Retailing. 1988;64(1):12-40.
14. Wu W, *et al*. Consumer trust in food and the food system: A critical review. Int J Environ Res Public Health. 2021;18(21):11191.
15. Sillence E, Briggs P, Harris P R, Fishwick L. How do we trust online information about food risks? Appetite. 2016;99:52-63.
16. Ahn Y, Lee J. The impact of online reviews on consumers' purchase intentions: Examining the social influence of online reviews, group similarity, and self-construal. J Theor Appl Electron Commer Res. 2024;19(2):1060-1078. DOI:10.3390/jtaer19020055.
17. Luo Y, Xu X, Chen H. Predicting the helpfulness of online restaurant reviews: A deep learning approach. Sustainability. 2019;11(19):5254. DOI:10.3390/su11195254.
18. Ellahi R M, Wong L C, El-Daly Abed A. Blockchain-based frameworks for food traceability: A systematic review. Foods. 2023;12(16):3026. DOI:10.3390/foods12163026.
19. Cao S, Xu H, Bryceson K P. Blockchain traceability for sustainability communication in food supply chains: An architectural framework, design pathway and considerations. Sustainability. 2023;15(18):13486. DOI:10.3390/su151813486.
20. International Organization for Standardization. ISO 22000:2018 - Food safety management systems - Requirements for any organization in the food chain. Geneva: ISO; 2018.
21. Codex Alimentarius Commission. General Principles of Food Hygiene (CXC 1-1969), 2020 revision including HACCP annex. Rome: FAO/WHO; 2020.

22. GS1 AISBL. GS1 Digital Link—Connecting physical products to the web. Brussels: GS1; 2023.
23. Nicolau J L, Xiang Z, Wang D. Daily online review sentiment and hotel performance. Int J Contemp Hosp Manag. 2023; ahead-of-print. DOI:10.1108/IJCHM-05-2022-0594.
24. Kanchan, Singh S. The digital transformation of agri marketing: Managing customer experience. Int J Agric Food Sci. 2023;5(2):94-102. DOI:10.33545/2664844X.2023.v5.i2b.150.
25. Chen T, Liu Y, Wang Y. The impact of online reviews on consumers' purchasing decisions: Evidence from *e*-commerce. Front Psychol. 2022;13:865702. DOI:10.3389/fpsyg.2022.865702.