Jurnal Ilmu Komputer Agri-Informatika

Tersedia secara daring di:
https://jurnal.ipb.ac.id/index.php/jika

Volume 12 Nomor 2 halaman 189 – 199
eISSN: 2654-9735, pISSN: 2089-6026

Modular UX Evaluation of a Cultural Narrative Feature in a Food Recommender System

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Abstract

This study designs and evaluates a cultural narrative feature in a food recommender system to enhance emotional engagement and cultural relevance while preserving usability. The feature uses progressive disclosure and is implemented as a modular interface component that embeds local food stories within recommendation cards. Fifteen users participated in a task-based, triangulated UX evaluation (usability testing, heuristic evaluation, and thematic analysis). Although only 25% of participants interacted with the narrative element, those who did spent more than twice as long engaging with the content. Heuristic findings indicated issues in system-status visibility and visual transition, while thematic insights showed curiosity, emotional recall, and cultural identification. The results suggest that optional, contextual narratives can enrich recommender-system UX and can be integrated as maintainable modular components for iterative refinement.

Keywords: contextual interface, food recommender system, modular UX design, progressive disclosure, usability evaluation.

INTRODUCTION

Food recommender systems have become essential tools on digital platforms that assist users in navigating increasingly complex culinary choices. Most existing systems employ collaborative filtering or content-based filtering techniques that leverage behavioral patterns and historical preferences to improve accuracy and efficiency (Steck *et al.* 2021). However, these techniques often overlook particularly in domains shaped by cultural and emotional factors. Few studies have operationalized culturally grounded User Experience (UX) components at the interface level.

There is increasing recognition of the need to design recommender system interfaces that integrate contextual and cultural elements alongside functional usability. Prior research has emphasized the importance of tailoring digital interactions not only to functional needs but also to symbolic and affective dimensions (Falconnet *et al.* 2023; Sandu *et al.* 2025). Cultural narratives offer strong potential to enhance digital engagement through meaning-making mechanisms (Vijayaraghavan and Chattaraj 2024; Kitromili *et al*. 2025). Despite their potential, such elements are rarely implemented in a modular and interactive manner. Many existing designs remain conceptual or linear, offering limited user agency and failing to support optional or progressive engagement strategies.

This study addresses the gap by designing and evaluating a feature called cultural narrative cards within a mobile-based food recommender system. These cards embed local food stories and are presented through a progressive disclosure. Instead of modifying the recommendation engine itself, the proposed design introduces a supplementary layer that users may choose to engage with. This approach preserves interface and transactional efficiency for users uninterested in cultural content (Callea *et al*. 2022; Sinha & Dhanalakshmi 2022).

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The study adopts a modular UX design approach that treats the narrative card as an independently testable unit. The feature was evaluated through triangulated UX methods, comprising usability testing (Lewis & Sauro 2021), heuristic analysis (Krawiec and Dudycz 2020), and thematic analysis (Braun & Clarke 2021; White & Cooper 2022). The findings contribute a practical and replicable approach for integrating narrative-driven features into food recommender systems through scalable and maintainable modular interfaces.

METHODOLOGY

Research Design

This study adopted the Design Science Research Methodology (DSRM) as a conceptual framework to guide the iterative design and evaluation of a contextual UX feature in a food recommender system emphasizing the construction and validation of artifacts in real-world settings (vom Brocke *et al.* 2020). To address the cultural and situational complexity inherent in food-related decision-making, the DSRM process was adapted into six modular stages: (1) Identify - problem identification and motivation, (2) Focus - define the objectives for a solution, (3) Rank - design and development, (4) Apply - demonstration, (5) Measure - evaluation, and (6) Expose - communication.

Each stage functioned as a distinct UX activity. This allowed the design and evaluation of the narrative feature to proceed incrementally, without altering the overall recommendation system. The modular structure supports isolated testing, refinement, and integration of a single interface component, ensuring that system functionality and recommendation efficiency remain unaffected. This approach aligns with established iterative design principles commonly adopted in user-centered design, design thinking, and lean UX, which emphasize real-world usability, contextual relevance, and rapid feedback (Henriksen & Ejsing-Duun 2022; Tellioğlu 2022; Lermen *et al*. 2023).

Modularity was supported through an explicit output-to-input connection between stages, in which the output of each stage served as structured input for the subsequent stage. UX pain points identified in the identify stage were translated into contextual feature scopes in the focus stage and prioritized during the rank stage. This structured linkage enhanced workflow clarity and methodological traceability.

The integration of modularity into both design and evaluation workflows enabled clear segmentation of responsibilities and traceability of decisions across stages. The sequential structure of the six stages is illustrated in Figure 1 and provides a visual summary of the iterative flow. A detailed summary of each UX stage, including implemented activities, generated outputs, and methodological references, is summarized in Table 1. The table enhances structural clarity and traceability, supporting systematic evaluation of the cultural narrative feature as a discrete module.

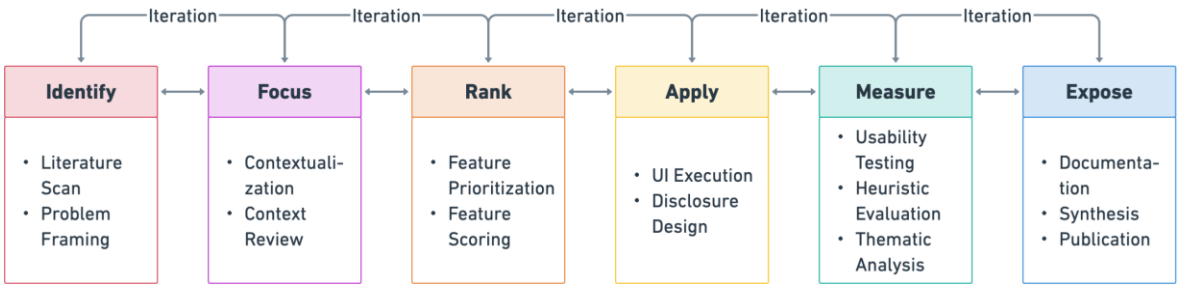

Figure 1 Adapted modular flow of DSRM for UX design

Table 1 Modular UX mapping of design and evaluation stages

UX Stage	Key Activities	Output Produced	Methodological References
Identify	Literature scan, user problem framing	UX pain points, design opportunity	(vom Brocke *et al.* 2020)
Focus	Contextual review, cultural UX framing	Feature scope, user context alignment	(Shaw & Nickpour 2022; Tellioğlu 2022)
Rank	Feature scoring, prioritization	Selection of narrative feature	(Falconnet *et al.* 2023)
Apply	Card refinement, disclosure design	Refined modular card UI	(Tidwell *et al.* 2020)
Measure	Usability testing, heuristic analysis, thematic analysis	UX metrics, severity ratings, themes	(Albert & Tullis 2022; Braun & Clarke 2021)
Expose	Modular synthesis, interface update	Table synthesis, design reflection	(Albert & Tullis 2022)

Usability Testing Procedure

Usability testing was conducted to evaluate user interaction with the proposed cultural narrative feature within a task-based food selection scenario. The procedure followed standard guidelines for exploratory UX evaluation in interactive systems (Albert & Tullis 2022), focusing on user behavior and feature discoverability. The test environment simulated a mobile food recommender interface featuring a narrative card that could be accessed optionally via a "View Story" button.

A total of fifteen participants were asked to select a traditional food item using the interface without explicit guidance to engage with the narrative feature. During each session, observers recorded behavioral metrics including click-through rate (CTR), exploration duration, and hesitation at the point of entry. Interaction events were also captured through basic UI logging, which stored timestamps for card activation and exit to support calculation of exploration duration. The interface recorded tap events, scroll gestures, and dwell time in the narrative section to support the assessment of engagement depth. Screen recordings and observer field notes complemented automated logs by documenting micro-interactions during narrative exploration.

Quantitative data were analyzed to compare exploration duration between users who interacted with the narrative and those who did not. Post-task reflections were collected immediately after interaction to capture perceived usefulness and subjective impressions of the narrative feature. The usability testing protocol was deliberately focused on the narrative card as a modular component, enabling isolation of user responses while maintaining realistic end-to-end interaction in the food selection context.

Heuristic Evaluation Setup

A heuristic evaluation was conducted to identify usability issues related to the cultural narrative feature that may not be captured through user testing alone. This expert-based method involved three independent UX professionals who evaluated the interface using Nielsen's ten usability heuristics (Krawiec & Dudycz 2020). The assessment focused on interaction flows associated with the "View Story" entry point, the narrative card display, and transition from the main recommendation screen to the narrative view.

Each evaluator reviewed the prototype independently and rated heuristic violations on a severity scale from 0 (no issue) to 4 (critical usability problem), following standard evaluation protocols (Albert & Tullis 2022). Key criteria of interest included visibility of system status, recognition rather than recall, and alignment with users' mental models.

After initial scoring, a consensus session was conducted to reconcile discrepancies in severity ratings and synthesize the most critical usability issues. This process ensured inter-rater reliability while preserving the independence of initial assessments. Particular attention was given to feature discoverability, clarity of system feedback upon activation, and visual continuity during interface transitions. The results of this evaluation were used to inform interface refinement decisions and are directly connected to visual and structural adjustments documented in Section 3.4.

Thematic Analysis Approach

The thematic analysis complemented behavioral and expert-based evaluations by examining user reflections collected through post-task interviews. This approach captured experiential dimensions of interaction that are not fully represented by quantitative usability metrics. The method was informed by UX evaluation practices that emphasize user narratives as indicators of interaction quality (Albert & Tullis 2022).

Immediately after each session, participants were asked a set of semi-structured questions designed to elicit spontaneous responses to the cultural narrative feature. Verbal responses were recorded, transcribed, and segmented into meaning units. These segments were then coded inductively into thematic categories, focusing on the subjective value users associated with the narrative content. The coding process was performed independently by two researchers using an iterative approach. Discrepancies were resolved through discussion to ensure analytical consistency and shared interpretation.

Analytical consistency was maintained through independent thematic coding by two researchers, with final theme alignment achieved through collaborative discussion following established best practices (Braun & Clarke 2021). To enhance reproducibility and procedural clarity, the three UX evaluation methods were consolidated into an integrated workflow summarizing their respective inputs, processes, and outputs. Figure 2 illustrates how the three evidence streams converge into a triangulated synthesis before informing the design refinement stage.

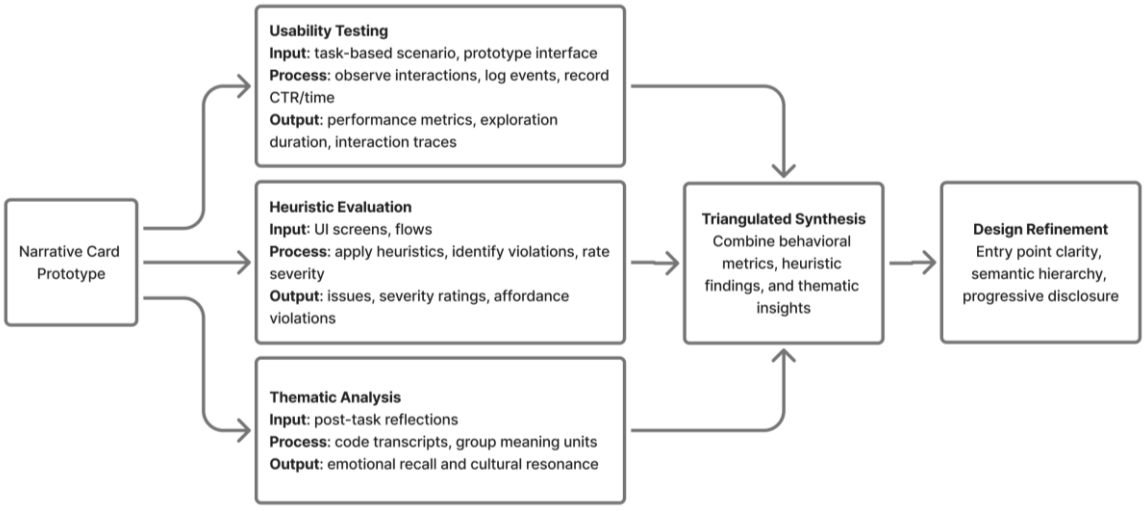

Figure 2 Workflow of the UX measurement methods

Participant Profile and Data Collection

A total of fifteen participants (N=15) were recruited through purposive sampling to ensure variation in age, digital literacy, and familiarity with traditional foods. This sample size aligns with established recommendations for exploratory usability evaluations focusing on specific interface components (Albert & Tullis 2022). Data collection consisted of three primary streams: (1) screen recordings of interaction events, (2) observer notes capturing hesitation and click behavior, and (3) structured post-task interviews used for thematic analysis. This triangulated approach supported cross-verification across behavioral, observational, and reflective data. Demographic attributes, including gender, age, digital literacy, and cultural familiarity, were collected using a short pre-task questionnaire, with digital literacy and cultural familiarity self-reported on a 5-point Likert scale. The demographic breakdown of participants is presented in Table 2.

Table 2 Demographic profile of participants

Code	Gender	Age	Cultural Familiarity (1-5)	Digital Literacy (1-5)
P1	Female	28	5	5
P2	Male	31	3	3
P3	Male	33	4	4
P4	Female	38	2	5
P5	Male	34	3	3
P6	Female	32	4	5
P7	Male	44	3	4
P8	Female	35	2	5
P9	Female	30	3	3
P10	Male	41	5	3
P11	Female	29	3	2
P12	Male	39	3	3
P13	Female	45	5	5
P14	Male	36	2	3
P15	Female	33	5	5

RESULTS AND DISCUSSION

This section presents the findings from the UX evaluation of the cultural narrative card feature, organized according to three triangulated evaluation methods: usability testing, heuristic evaluation, and thematic analysis (Flick 2023). Results are reported in separate subsections corresponding to behavioral observation, expert critique, and post-task interpretation, and are synthesized in a final table to identify cross-method consistencies and design implications.

Usability Testing Results

Usability testing involved fifteen participants who completed a simulated food selection task using the mobile prototype. The purpose was to observe real-time user behavior and surface-level interaction metrics related to discoverability, engagement, and perceived usefulness of the cultural narrative feature. Although the narrative card was implemented as an optional component, only 25% of participants actively interacted with it. Among participants who accessed the narrative card, the average exploration time reached 28.4 seconds, indicating a relatively high level of attention and cognitive engagement compared to non-interacting users.

Despite the overall task completion remaining unaffected, several participants hesitated or failed to recognize the “View Story” button due to limited visual salience. The button was not distinct enough in shape, placement, or semantics to signal its functionality, especially for users with lower digital literacy scores such as P11 and P14. Conversely, participants with higher digital literacy (e.g., P6 and P13), accessed the feature smoothly and described the interaction as meaningful. This pattern suggests that while the progressive disclosure strategy successfully minimized intrusion, it may have inadvertently reduced discoverability for users without prior motivation or contextual interest (Ding *et al.* 2020).

Quantitative metrics gathered during the sessions reinforce this pattern. Users who did not click the narrative feature still lingered for an average of 14 seconds on the card, indicating that some level of visual attention was captured. The perceived usefulness rating was notably higher among those who interacted with the feature (mean score: 4.0) compared to non-clickers (mean score: 3.0), suggesting that once discovered, the feature was valued. Importantly, all users completed the main task without disruption, indicating that the presence of the optional narrative layer did not negatively affect score transactional usability. These results support the design hypothesis that cultural enrichment can be integrated into recommender interfaces without compromising efficiency, provided that entry-point visibility is appropriately balanced. A summary of key usability metrics is presented in

Table 3.

Table 3 Usability performance metrics

Metric	Result	Interpretation
Click-through Rate (CTR)	25%	Selective engagement with the narrative feature.
Avg. Exploration Time	28.4 seconds	High engagement depth for those who clicked
Avg. Passive Time (No Click)	14 seconds	Initial visual attention even among non-engagers
Perceived Usefulness Score	4.0 (clicked), 3.0 (not clicked)	Positive perception among active users
Task Disruption	None observed	Narrative card did not interfere with primary task performance

Heuristic Evaluation Results

The behavioral findings were complemented by a heuristic evaluation conducted by three independent UX practitioners. Each expert assessed the cultural narrative feature using Nielsen's ten usability heuristics to identify design violations that may not be visible through user testing alone (Krawiec & Dudycz 2020). The evaluation examined how the feature integrated with the overall interface, with attention to entry-point clarity, visual transition, and alignment with user expectations.

The evaluators consistently highlighted three key issues. First, the interface lacked clear feedback when transitioning from the food card to the narrative screen. The absence of a state-change indicator or visual confirmation violated the principle of system status visibility, leaving users uncertain whether the interaction had registered. Second, the iconography and button label used to trigger the narrative feature were vague and insufficiently contextualized, violating the heuristic of recognition over recall. Lastly, the narrative icon failed to match real-world metaphors or user expectations. For first-time users, the icon appeared ambiguous and did not clearly suggest storytelling or cultural content, causing uncertainty about its function.

Despite these issues, the evaluators also noted strengths in the modular and non-intrusive nature of the narrative card. The design adhered to minimalist interface principles by avoiding disruption to the core food selection task. The optional nature of the feature preserved transactional fluidity, ensuring that users could proceed without engagement if they preferred. These expert insights reinforce the need for improved affordance and transitional feedback, without requiring structural overhaul of the narrative architecture. The severity ratings and heuristic categories of the identified issues are summarized in Table 4.

Table 4 Heuristic evaluation summary

Heuristic Violated	Description	Severity
Visibility of System Status	No visual transition between card and narrative screen	Moderate
Recognition rather than Recall	Button label and narrative title were not clearly linked	Moderate
Match Between System and Real World	Narrative icon lacked intuitive meaning for first-time users	Minor

Thematic Analysis Results

Deeper emotional and cognitive responses were examined through thematic analysis conducted on post-task interviews following the prototype interaction. This qualitative approach enabled interpretation beyond observable behavior or interface-level assessment by capturing participants' subjective reflections on meaning, memory, and usability. The analysis followed Braun and Clarke's six-phase methodology and focused on latent patterns related to cultural resonance, interface clarity, and experiential affect (Braun & Clarke 2021).

Four primary themes emerged from the coding process. The first was *emotional recall*, where users who engaged with the narrative content described memories associated with family meals or childhood experiences. For example, P6 stated, "This kind of story reminded me of my grandmother's kitchen," indicating that the narrative feature was capable of triggering autobiographical reflection. The second theme was *cultural curiosity*, characterized by participants expressing interest in learning about unfamiliar dishes. P9 remarked, "I didn't know this food had a background story. That was interesting," suggesting that the card stimulated exploratory engagement.

The third theme was *identity reinforcement*. Participants who shared cultural ties with the dish narratives described feelings of validation and pride. For instance, P13 commented, "It

made me feel seen. Like, this is part of my life, and now it's in an app." This suggests the feature's potential in supporting inclusive and personalized UX. The final theme, *affordance confusion,* captured instances where participants failed to recognize the narrative card as an interactive element or misunderstood its purpose. P4 admitted, "I thought it was just decoration. I didn't know I could click it," indicating a breakdown in interface clarity despite the progressive disclosure mechanism.

These themes highlight the emotional depth offered by cultural narratives while underscoring the need for clearer visual affordances to reduce missed engagement. Table 5 summarizes the themes with representative quotes that reflect the range of user interpretations.

Table 5 Thematic analysis findings

Theme	Description	Representative Comment
Emotional Recall	Users connected narratives to personal or family memories	"This reminded me of my grandmother's kitchen."
Cultural Curiosity	Interest in background stories of unfamiliar dishes	"I didn't know this food had a background story."
Identity Reflection	Recognition and pride in culturally relevant content	"It made me feel closer to the food from my own culture"
Affordance Confusion	Misunderstanding of the card's purpose or clickability	"The button wasn't appealing, I didn't think it was clickable"

Interface Refinement and Visual Transition

Based on the triangulated UX findings, a set of interface refinements was implemented to improve usability and increase the discoverability of the cultural narrative feature. The primary modification involved transforming the original static narrative presentation into a modular, card-based structure that supports progressive user engagement. This decision was directly informed by usability testing results, particularly user hesitation at the entry point, and expert feedback highlighting deficiencies in visual feedback and semantic affordance.

In the initial prototype, the cultural story was passively embedded beneath the recommendation card, without a clear visual hierarchy or state transition. This design resulted in a low click-through rate and violated key usability heuristics, including visibility of system status and recognition rather than recall (Albert & Tullis 2022). From a design systems perspective, the absence of a modular structure and insufficient semantic clarity reduced user's ability to recognize the narrative card as an interactive component (Tidwell *et al.* 2020).

The refined interface addressed these issues by introducing a distinct "View Story" button placed directly within the food recommendation card. The button was redesigned to be visually prominent and semantically descriptive. Upon activation, it opened a scrollable sequence of illustrated narrative segments containing cultural stories related to the selected dish. Each narrative unit follows the principles of progressive disclosure, enabling users to explore contextual content incrementally without disrupting the primary task (Lewis & Sauro 2021).

This design solution was aimed at achieving three key UX goals simultaneously. First, maintaining transactional efficiency for users who were not interested in cultural content. Second, enhancing engagement for users who exhibited cultural curiosity. Third, ensuring the feature remained modular, optional, and minimally intrusive. The user flow model in Figure 3 illustrates this branching interaction logic between exploratory and transactional behavior paths.

Figure 3 outlines the decision pathway from keyword search to either direct menu selection or optional narrative exploration. Users may bypass the story element entirely or choose to engage with the cultural content before returning to the ordering task, thus supporting flexible entry and exit without loss of state or continuity.

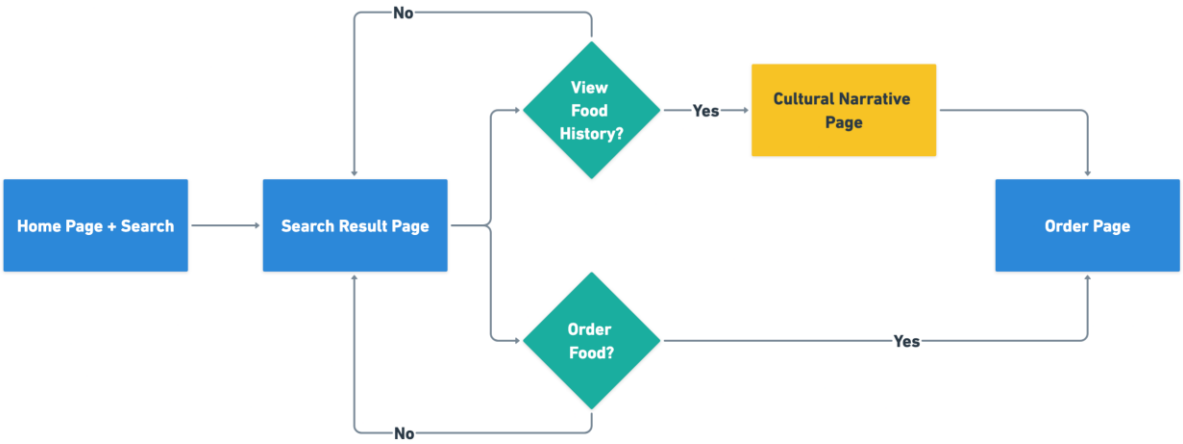

Figure 3 User flow for modular cultural narrative exploration

In parallel, the refined user interface applies this logic to an interactive narrative sequence, as shown in Figure 4. The illustrated segments, accessed through progressive disclosure, allow users to delve into localized food stories while preserving continues access to the recommendation interface.

These two figures collectively support the modular UX refinement process by visually mapping the interaction logic and the interface transformation. They reinforce the role of progressive disclosure as an effective method to preserve usability while embedding optional cultural engagement pathways.

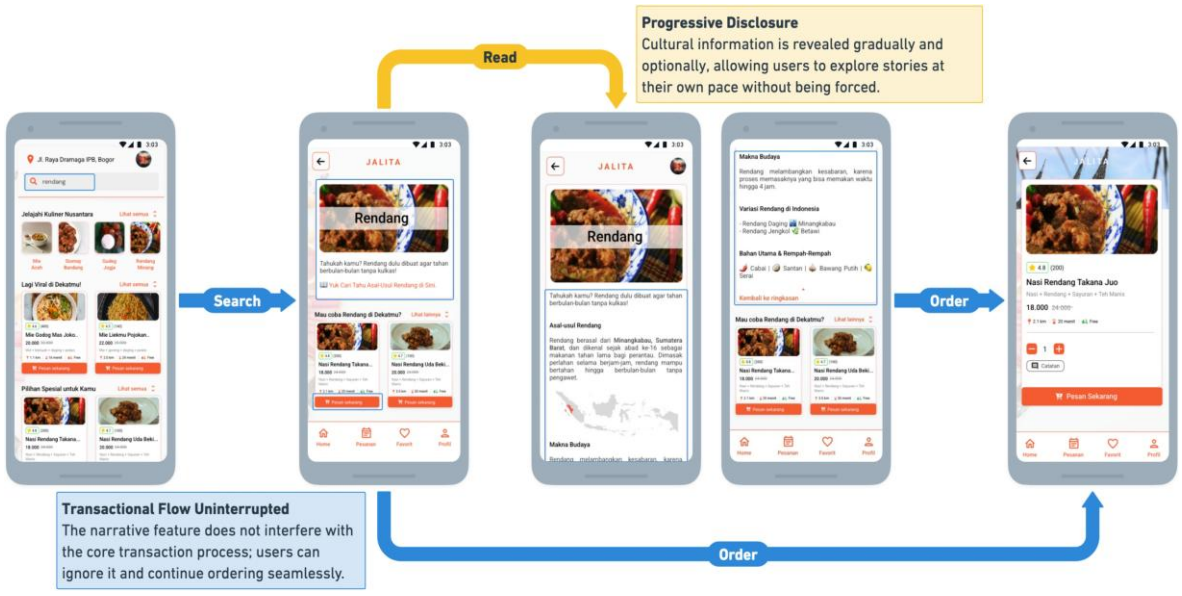

Figure 4 Interface visualization of progressive narrative disclosure

Cross-Method Synthesis

The triangulated evaluation revealed consistent patterns across behavioral metrics, expert assessments, and user perceptions, all pointing to the same challenge: the cultural narrative feature provided emotional and contextual value but suffered from weak initial discoverability (Lewis & Sauro 2021). Usability testing showed that only a quarter of users interacted with the feature, yet those who did demonstrated higher engagement and longer interaction durations. Heuristic evaluation validated these findings by identifying visibility and affordance violations, particularly around the transition from the food card to the narrative layer. Thematic insights highlighted emotional recall and identity resonance, alongside recurring confusion regarding the feature's purpose and activation mechanism.

The analysis of discoverability issues was expanded by incorporating UI event logging to trace tap locations, hover delays, and dwell patterns around the narrative entry point. These logs

generated simple click-distribution insights that resembled heatmap patterns. The results supported expert concerns by showing that many users hovered near the narrative card without activating it, indicating suboptimal trigger clarity. The automated evidence complemented qualitative findings and directly informed refinements to visual hierarchy and semantic signaling.

The combined findings supported a redesign strategy focused on entry-point clarity, semantic hierarchy, and modular storytelling. The cultural narrative was restructured into a discrete, progressively disclosed sequence that users could access voluntarily. This approach preserves task efficiency while allowing contextual enrichment for users seek deeper engagement.

The alignment between empirical evidence and subsequent design adaptation highlights the value of treating UX features as modular and independently testable components. Instead of modifying the underlying recommendation algorithm, this study demonstrates that cultural depth can be effectively integrated at the interface level through optional, narrative-driven cards. The approach supports isolated evaluation, iterative refinement, and scalable deployment, which are hallmarks of modular UX design (Tellioğlu 2022). A summary of identified issues and corresponding design responses is presented in Table 6.

Table 6 Summary of UX refinements based on triangulated evaluation

UX Issue Identified	Source of Evidence	Design Response Implemented
Low feature discoverability (25% CTR)	Usability Testing	Introduced high-contrast "View Story" button within card layout
Lack of visual transition or state feedback	Heuristic Evaluation	Applied clearer visual separation and state changes to signal content transition
Icon ambiguity and weak semantic clarity	Heuristic + Thematic	Replaced icon with labeled CTA using clearer metaphors
User confusion about narrative function	Thematic Interviews	Reframed narrative as scrollable sequence with modular story units
Emotional engagement only upon discovery	All three methods	Adopted progressive disclosure to surface meaning without friction

CONCLUSION

This study designed and evaluated a cultural narrative feature embedded in a food recommender system interface, focusing on its usability, emotional impact, and modular integration. Using a triangulated UX evaluation method comprising usability testing, heuristic analysis, and thematic analysis, the results showed that although the feature had low discoverability (25% click-through rate), users who engaged with it reported stronger affective involvement and spent more time interacting with the content. Observational data confirmed that the feature did not disrupt the core selection task, while expert assessments identified usability issues related to feedback visibility and semantic clarity. Thematic findings revealed emotional recall, cultural curiosity, and identity resonance as core experiential outcomes.

The findings support embedding cultural storytelling within digital systems through modular interface components. Rather than altering the recommendation algorithm, this study introduced an optional narrative layer using progressive disclosure. The feature was implemented as an independent UX module that enabled discrete testing, refinement, and reuse. This modular strategy contributes to informatics by offering a scalable design pattern for culturally enriched interfaces that support both usability and engagement.

Several limitations should be acknowledged. The sample size (N=15) limits generalizability and statistical inference. A high proportion of participants scored high on cultural familiarity, which may have amplified the feature's perceived relevance. The progressive disclosure technique, while effective in preserving interface simplicity, may have contributed to discoverability issues due to its subtle entry design.

Future research may explore the longitudinal impact of narrative UX elements and test their integration across domains such as health, heritage tourism, or education. Expanding the approach to include adaptive or personalized narratives driven by user models or machine

learning could further enhance relevance. The study contributes a replicable modular UX strategy for embedding cultural meaning in recommendation systems.

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