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Analyzing the User Experience Structure of Websites With Visual Elements

Koki Takashima and Masato Takanokura

Graduate School of Engineering, Kanagawa University, Yokohama, Kanagawa 221-8686, Japan

ABSTRACT

User experience (UX) plays an important role in the design of websites and digital services. Although many studies have examined usability and satisfaction, fewer have investigated how visual elements influence different stages of UX. This study explores the structure of UX by comparing user evaluations of websites with static and dynamic visual elements. Static elements include layouts and icons, whereas dynamic elements include animations and transitions. Six Japanese websites were selected, including three primarily static sites and three dynamic sites. Fifteen participants evaluated all six websites using 12 questionnaire items related to attention, comprehension, emotion, and behavior. The collected data were analyzed using exploratory factor analysis. The results revealed a two-factor structure of UX. The first factor reflected functional and cognitive aspects, such as clarity, ease of use, and comfort. The second factor reflected emotional and aesthetic aspects, such as visual appeal, trust, and impression. Although both static and dynamic websites showed a similar overall structure, static websites tended to score higher in clarity and operability, whereas dynamic websites tended to score higher in visual appeal and content richness. These findings suggest that UX is organized around two broader dimensions rather than four clearly separated stages, and that static and dynamic visual elements influence these dimensions differently. The study contributes to a better understanding of how visual design shapes UX and offers implications for website design.

Keywords: User-centered design, User interface, Factor analysis, Emotional engagement

INTRODUCTION

Background: In the present digital society, users often interact with information through interfaces, such as websites and applications. It is widely recognized that "first impressions" and "ease of understanding" in these contexts significantly influence subsequent information-seeking behavior and decision-making. Consequently, user experience (UX) has been increasingly emphasized as a critical evaluation metric. Among the various factors shaping UX, visual elements, such as icons and animations, have gained particular attention as key components (Garett, Chiu, Zhang and Young, 2016).

However, challenges remain in assessing the impact of these visual elements on UX. Specifically, existing evaluations often lack clarity regarding the objects being assessed and the temporal or structural stages in which the impacts manifest. Notably, a paucity exists of explicit comparisons and

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structured analyses concerning how static elements (e.g., icons and color schemes) and dynamic elements (e.g., animations and transitions) influence UX, and how their effects emerge across different UX phases: attention, comprehension, emotion, and behavior.

Purpose: Previous studies suggest that visual user interface (UI) elements such as icons and animations in websites or applications influence UX. However, few studies have evaluated these effects in a stage-wise and structured manner, clarifying the UX phases (attention, comprehension, emotion, and behavior) that are affected and how UX is evaluated in its phase.

This study aims to elucidate the impact of static and dynamic visual UI elements in digital interfaces on each phase of UX. This study seeks to deepen the understanding of UX alternation processes and offer practical implications for visual design strategies by quantitatively assessing the influence of static and dynamic UI designs on UX evaluations (e.g., impressions, clarity, trust, and usability).

RELATED WORKS

Claros (2022) discussed the increasing importance of UX in web design, particularly in the context of the proliferation of responsive design and multidevice compatibility, following the widespread adoption of HTML5 and CSS3. The UX components highlighted in this study include visual appeal, enjoyment, smooth interaction, and users' sense of growth or learning. The author emphasized the need for a holistic UX design that encompasses not only aesthetics but also the entirety of user interaction (Claros, 2022).

Cnattingius (2021) conducted experimental research on the impact of animation types and smoothness in mobile application UIs on UX. Participants were presented with different screen transition conditions (e.g., ease-in, ease-out, and none) and asked to evaluate their experience using a ten-item AttrakDiff Short scale (seven-point semantic differential (SD)). The study identified a four-stage UX transformation: (1) **Attention:** Animations attract user gazes and influence initial impressions. (2) **Comprehension:** Motion facilitates the understanding of UI structures and changes. (3) **Emotion:** Natural transitions contribute to perceived appeal and comfort. (4) **Behavior:** These experiences impact satisfaction with operations and future preferences (Cnattingius, 2021).

Ozok et al. (2010) proposed usability guidelines for interface design in recommendation systems based on the usability criteria conceptual model. In their study, participants evaluated 14 UI components (e.g., product name, images, price, layout, quantity, and promotional display) on a five-point Likert scale. The researchers then analyzed the relationship between these UI components and the UX ratings. Their findings also suggested that excessive information display can deteriorate UX (Ozok, Fan and Norcio, 2010).

OVERVIEW OF THE EXPERIMENT

This study employed an experimental approach using six existing Japanese websites that included both static and dynamic visual UI elements. These websites included Mercari, Cookpad, Rakuten Travel, Apple, YouTube, and Uniqlo. Each site was selected based on its distinct usage of static (e.g., number, semantic clarity, and placement of icons) and dynamic (e.g., image

transitions and hover animations) elements. The static websites were Mercari, Cookpad, and Rakuten Travel, whereas the dynamic websites were Apple, YouTube, and Uniqlo.

The participants were instructed to engage with each site in a manner similar to normal usage, such as browsing product pages, searching for information, or navigating through categories. This design aimed to simulate realistic usage scenarios to evaluate the influence of visual elements on UX under naturalistic conditions.

UX EVALUATION METHOD

Following the task, the participants were asked to complete a web-based questionnaire using Microsoft Forms. The questionnaire comprised 12 items designed to evaluate UX across multiple dimensions, including impression, understanding, comfort, usability, consistency, reliability, emotional appeal, operational intuitiveness, and behavioral intention.

The questionnaire items were developed with reference to previous UX evaluation studies, including Claros (2022), Cnattingius (2021), and Ozok et al. (2010). Cnattingius (2021) used a seven-point semantic differential (SD) scale, whereas Ozok et al. (2010) employed a five-point Likert scale. Based on insights from these studies, the items in the present study were reorganized according to four phases of UX transition: attention, comprehension, emotion, and behavior (Table 1). All 12 items were evaluated using a five-point Likert scale.

In addition to the quantitative items, an open-ended response section was provided to collect qualitative insights into user impressions, frustrations, and satisfaction factors that were not captured by the fixed-response items. The combination of quantitative and qualitative data was intended to support a multifaceted interpretation of UX transitions resulting from static and dynamic UI elements.

Table 1: UX evaluation items.

UX Phase	Evaluation Item	Question Format
Attention	Strength of impression	Did the website leave a strong first impression?
	Visual appeal	Did the website have a visually attractive design?
	Saliency	Were there many elements that drew your attention?
Comprehension	Visual clarity of information	Was the information visually easy to see?
	Ease of understanding	Could you understand the meaning of the information quickly?
	Consistency of display	Was the information and layout consistent?
Emotion	Comfort	Did the website feel comfortable overall?
	Familiarity	Did you feel a sense of familiarity with the site?

(Continued)

Table 1: Continued.

UX Phase	Evaluation Item	Question Format
	Trust	Did you trust the content and structure shown?
Behavior	Sense of conviction	Did you feel confident in your selection?
	Sense of autonomy	Did you feel that you chose based on your own will?
	Reuse intention	Would you want to use this website again?

RESULTS

The exploratory factor analysis (EFA) of the UX evaluation data consistently revealed a two-factor structure across all conditions: overall, static, and dynamic website types. The extracted factors are summarized as follows:

- **Factor 1:** Comprised of items related to usability, clarity, and operability, reflecting the functional and cognitive aspects of UX.
- **Factor 2:** Captured emotional and aesthetic impressions, including visual appeal, trust, and saliency.

This two-factor structure appeared robust across all three datasets (Table 2–4). The overall model (Table 2) showed moderate-to-strong loadings for usability-related items (e.g., comfort: –0.857, clarity of information: –0.819) on Factor 1, and emotional items (e.g., visual appeal: 0.509, saliency: 0.497) on Factor 2.

Table 2: Factor loadings of UX evaluation items – all elements (two-factor solution).

Evaluation Item	Factor 1	Factor2
Strength of impression	–0.299	0.375
Visual appeal	–0.474	0.509
Saliency	–0.472	0.497
Visual clarity of information	–0.819	0.471
Ease of understanding	–0.495	0.214
Consistency of display	–0.429	0.113
Comfort	–0.857	0.162
Familiarity	–0.612	0.310
Trust	–0.478	0.304
Sense of conviction	–0.853	–0.100
Sense of autonomy	–0.806	–0.249
Reuse intention	–0.727	0.360

Similarly, the static elements model (Table 3) followed the same pattern, with usability and comprehension items exhibiting high negative loadings on Factor 1 (e.g., visual clarity: –0.897), whereas emotional appeal (e.g., trust: 0.354) was reflected in Factor 2.

Table 3: Factor loadings of UX items – static elements only (two-factor solution).

Evaluation Item	Factor 1	Factor2
Strength of impression	–0.481	0.087
Visual appeal	–0.611	0.079
Saliency	–0.681	–0.084
Visual clarity of information	–0.897	–0.679
Ease of understanding	–0.553	–0.337
Consistency of display	–0.361	–0.123
Comfort	–0.752	–0.193
Familiarity	–0.508	–0.386
Trust	–0.397	0.354
Sense of conviction	–0.655	0.307
Sense of autonomy	–0.478	0.097
Reuse intention	–0.732	–0.168

Interestingly, the dynamic elements model (Table 4) exhibited even stronger loadings on Factor 1, particularly for comfort (–1.004), conviction (–1.075), and autonomy (–1.070), suggesting that dynamic websites intensified the cognitive and operational experience. However, emotional and visual items also had considerable loadings (e.g., visual clarity: –0.590, visual appeal: –0.396), though slightly less than in static sites, implying a different balance in user perception.

Table 4: Factor loadings of UX items – dynamic elements only (two-factor solution).

Evaluation Item	Factor 1	Factor2
Strength of impression	–0.329	–0.243
Visual appeal	–0.629	–0.396
Saliency	–0.603	–0.437
Visual clarity of information	–0.920	–0.590
Ease of understanding	–0.532	–0.134
Consistency of display	–0.604	–0.363
Comfort	–1.004	–0.170
Familiarity	–0.753	–0.165
Trust	–0.787	–0.540
Sense of conviction	–1.075	0.189
Sense of autonomy	–1.070	0.398
Reuse intention	–0.767	–0.333

Descriptive statistics and qualitative responses supported these findings. Static websites such as Mercari, Cookpad, and Rakuten Travel were rated higher on clarity, consistency, and ease of use, possibly because of their simpler layout structures. Participants described them as "easy to navigate," "visually clear," and "less overwhelming." These responses were aligned with the high clarity and comprehension loadings of the static models.

By contrast, dynamic websites such as Apple and YouTube were rated higher in terms of visual appeal and content richness. Their animations likely boosted engagement, but also introduced challenges in usability. Some users mentioned these sites felt "modern" and "fun to explore," whereas others expressed difficulty in locating information, suggesting a trade-off between visual richness and functional clarity.

Notably, items such as familiarity and trust did not exhibit significant differences between static and dynamic websites, suggesting that these impressions may depend more on users' prior experiences or brand associations than on specific interface design features.

Taken together, these results support the idea that UX evaluations can be decomposed into two primary dimensions, functional/operational clarity and emotional/visual engagement, and that static and dynamic visual elements influence the balance between them differently.

DISCUSSION

This study investigates the influence of static and dynamic visual UI elements in websites on different stages of UX, particularly attention, comprehension, emotion, and behavior. The EFA revealed a robust two-factor structure that emerged consistently across the entire dataset and within the separate analyses of static and dynamic websites.

Factor 1 captured usability-related aspects, such as visibility, readability, operability, and comfort, which are elements primarily associated with early- to mid-stage UX. Factor 2 encompassed emotional and evaluative items, including trust, satisfaction, and intention to reuse, corresponding to the later stage or affective UX dimensions. This suggests that users may not perceive UX stages as distinct, sequential phases, but instead form holistic impressions structured around cognitive-functional and emotional-evaluative dimensions.

When static and dynamic websites were analyzed separately, unique factor loading patterns emerged. Static websites (e.g., Cookpad and Rakuten Travel) exhibited stronger loadings for items related to clarity and comprehension, such as visual clarity of information, ease of understanding, and consistency. These sites generally featured simpler layouts and fewer animated elements, supporting ease of navigation and interpretability. By contrast, dynamic websites (e.g., Apple and YouTube) exhibited stronger loadings for items related to engagement and emotional appeal, such as comfort, conviction, and reuse intention. Their use of animations and interactive transitions may have enhanced users' emotional responses and behavioral intentions, albeit at the potential cost of information clarity.

Interestingly, some affective items such as trust and familiarity exhibited moderately stable loadings across both website types, suggesting that these

impressions may be less influenced by visual presentation and more influenced by prior brand recognition or expectations.

Taken together, these findings imply that, although static and dynamic UI elements influence UX in different ways, they do not align neatly with the traditionally assumed four UX phases. Instead, they appear to influence broader, intertwined clusters of perceptions. From a design perspective, these results emphasize the need to balance clarity-enhancing static elements with emotionally engaging dynamic components, particularly in environments where both co-exist. UX evaluation models may need to shift toward more integrated, context-sensitive frameworks that account for the overlapping nature of functional and affective experiences. These initial insights lay the groundwork for future experimental studies using controlled website prototypes. Follow-up research should aim to validate the two-factor structure across diverse user populations and task contexts.

CONCLUSION

This study explored the influence of static and dynamic visual elements in website interfaces on different aspects of UX. Through EFA of user evaluations across six websites, two primary UX dimensions were identified: (1) cognitive-functional clarity, and (2) emotional-evaluative engagement. Although the relative contribution of each item varied according to the visual presentation style, these factors were consistently observed across both the static and dynamic website types.

Static websites tended to support comprehension, operability, and clarity, whereas dynamic websites enhanced visual appeal, engagement, and reuse intention. These results suggest that UX is not experienced in isolated stages (e.g., attention, comprehension, emotion, and behavior), but as integrated perceptions shaped by the interaction of usability and emotional resonance.

These findings underscore the importance of designing user interfaces that balance functional clarity with affective engagement. Designers should consider how static and dynamic elements can be combined or weighted, depending on the user's task context and desired outcomes. Additionally, UX evaluation frameworks may benefit from the adoption of multidimensional models that reflect the integrated structure.

Future work should involve controlled experiments using purpose-built static and dynamic websites to further examine the causal relationships and generalize the findings across broader user groups. This study contributes to a nuanced understanding of how interface design holistically influences UX, thereby offering implications for both academic modeling and practical applications in UI/UX design.

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