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User evaluations of design complexity: The impact of visual perceptions for effective online health communication

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ABSTRACT

Objective: This paper highlights the influential role of design complexity for users' first impressions of health websites.

Method: An experimental design was utilized to investigate whether a website's level of design complexity impacts user evaluations. An online questionnaire measured the hypothesized impact of design complexity on predictors of message effectiveness.

Results: Findings reveal that increased design complexity was positively associated with higher levels of perceived design esthetics, attitude toward the website, perceived message comprehensibility, perceived ease of use, perceived usefulness, perceived message quality, perceived informativeness, and perceived visual informativeness.

Conclusion: This research gives further evidence that design complexity should be considered an influential variable for health communicators to effectively reach their audiences, as it embodies the critical first step for message evaluation via electronic platforms.

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1. Introduction

Evaluations of one's interest in online information are made quickly, within the first 50 ms, or less, and greatly impact how positively or negatively the viewer will judge the information presented [1,2]. As websites continue to become an influential, omnipresent mode for disseminating health information [3], health communication efforts should focus their attention on these initial evaluations. First impressions function as a critical point for access to online health

information by capturing users' interest and influencing decisions to stay on the website, as well as influencing perceptions of trust [4] and credibility [5,6]. The visual complexity of a website's design, interpreted through a holistic view of a homepage's visual information, embodies the initial impression of online health information and significantly impacts the user's evaluation [1,2,7,8]. Additionally, visual complexity influences evaluations that hold consistent over time, making the first impression a predictor of future use [1,2]. Given the importance of first impressions, there is a substantial need to determine what facets

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of visual complexity are most influential for impression formation.

Visual complexity, defined by the amount of visual variation displayed, impacts attention, appeal, attitude toward the message [2,9], as well as users' performance with online recognition and search tasks [10]. Visual complexity can be measured through either the amount of visual variation or through the amount *and* organization of visual variation in a display [9,11]; visual variation refers to any detectable change in color, saturation, or brightness that forms a visual "edge". The traditional measure of visual complexity is a calculation of the amount of variation, regardless of structure or organization. For example, a sheet of white paper has no variation and is therefore not visually complex. A sheet of paper with a 1" black and white checkerboard pattern has more variation and thus has more visual complexity. If the squares of this same checkerboard pattern were reduced to 1/4", then the paper would have even greater visual complexity, as there are more changes in color, edges, or visual variation in the display.

Design complexity, which differs from these traditional algorithmic measures, is defined by the organization and application of design principles, as well as amount of visual information [9]. Design complexity is a more subjective measure of structured variation, which aims to overcome the gaps of visual complexity approaches that only consider the amount of variation. This is a critical distinction as health communication strategies are not limited to simplistic stimuli such as checkerboards. Indeed, website design often incorporates the use of photographs, illustrations, typography, and a variety of other design elements. Visual complexity states that an edge exists each time there is a change in color, shade, or value – but individuals do not necessarily perceive it that way. For example, when individuals look at a photograph, they do not look at every pixel edge. Instead viewers perceive gradients, whole objects, or major outlines that subsume the visual variation from pixel to pixel. Therefore, a photograph may not be perceived as visually complex even though the algorithms of visual complexity tell us it is. With this conceptual turn, it is found that design complexity is more strongly correlated with increased attention, appeal, and attitude than traditional measures of visual complexity [9] and may be more likely to influence other cognitive processes involved with website evaluations. Design complexity research is needed to add to the body of knowledge regarding design features that are influential for online health communicators to effectively reach their audiences.

Theoretical knowledge about the role of design principles in perception must be considered to advance knowledge of communication practices for online health information. Previous studies that have utilized visual-based methods of communicating health information have conflicting results and implications for research and practice [12,13]. This is potentially attributable to the fact that research does not account for the role of design complexity in stimuli and intervention designs. Isolating and directly investigating the design complexity addresses this lack of attention to design's influential role for effective health communication. Using visual complexity theory, the Technology Acceptance Model (TAM), and information processing models as the basis for investigation, design complexity research will advance online health

communication by looking directly at the design layout factors that impact attention and evaluations of online health information.

This study utilizes an experimental design to investigate the influence of design complexity on users' evaluations of online health information, extending visual complexity theory to understand design complexity as the critical first step for favorable evaluations of online health communication. This paper extends the literature for visual complexity in three ways. First, it applies the more nuanced concept of design complexity, which was developed for consumer responses to print media, to online media; second, it demonstrates how viewers' perceptions are influenced by design complexity; and third, it identifies design complexity as a potential antecedent variable for technology acceptance and information processing theoretical models. In the remainder of this paper, relevant background on visual complexity theory, the Technology Acceptance Model, information processing models, the influence of creative training on perception patterns, and learning preferences is provided as rationale for hypotheses and research questions. This is followed by a description of study methods, report of results, and a discussion of the implications of these findings for advancing research and practice.

2. Theoretical framework

2.1. Design complexity

While design complexity is the central construct of this study, it is beneficial to begin with the theoretical underpinnings of visual complexity theory to give historical context. With a history that ranges from investigations of Gestalt principles to complex visuals encountered in mass media messages, visual complexity theory posits that the amount of visual variation influences user's perceptions, attitudes, evaluations, and behavior [9,11,14]. Visual variation is determined by the amount of visible edges or changes in color or level of brightness. Traditionally, visual complexity theory has focused on amount of visual variation, regardless of structure, that includes any change in hue, saturation, or value that can be determined through edge detection. Visual complexity has also been closely linked with visual esthetics, and more recently web esthetics, in the literature [1,10,11,14]. Berlyne's esthetic theory posits that visual variation or the increase of visual complexity influences arousal potential and hedonic evaluations [14]. These two factors combine to create an inverted U-curve, displaying a mid-range peak for positive evaluations. Limited visual variation, comprising low visual complexity, does not exhibit much arousal potential and may leave the viewer bored. Conversely, high visual complexity may have high arousal potential, but is often combined with negative hedonic evaluations that lead to aversive reactions. The mid-range peak is represented by a level of visual complexity that allows for the viewing experience to consist of some arousal coupled with pleasure or reward [14]. However, the reality of the current visual complexity landscape and inclinations that the amount of variation alone is not a good predictor for user evaluations has lead visual design research

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