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### Original Research Article

## The Relation between the Objective Aspects and the Aesthetic Perception of Web Pages Case Study: The Website of Iranian Newspapers in the Year 2019\*

Roya Rouzbahani<sup>1</sup>, Reza Afhami<sup>\*\*2</sup>, Neda Abdolvand<sup>3</sup>

1. Ph.D. Candidate Art Research, Faculty of Art, Tarbiat Modares University, Tehran, Iran.
2. Associate Professor, Department of Art Research, Faculty of Art, Tarbiat Modares University, Tehran, Iran.
3. Associate of Information Technology Management, Department of Management, Faculty of Social and economic sciences, Alzahra University.

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### Abstract

**Problem statement:** The visual aesthetic design of a website, as an inseparable part of human experience in interaction with technology, is capable of meeting the needs of emotional and multi-sense experiences. The identification of components that raises the quality of visual attraction for the user has become the prime concern in the design of webpages. For this reason, this study focuses on understanding the aesthetic quality of webpage and attempts to answer the question of how can the visual components strengthen the users' appreciation of aesthetics.

**Research objective:** This Research have two aims. The first aim is to evaluate the impact of visual components of webpage design on the user's subjective evaluation of aesthetics in the websites of the newspapers. The second aim is to discover the relation between the objective factors of design and the aspects of aesthetic perception.

**Research method:** From a practical point of view and approach, this study is of descriptive – analytical category. The method of data collection is based on study of documents and findings from questionnaires.

**Conclusion:** The research's findings highlight the significant impact of the objective design components on the general perception of webpage aesthetics. The three factors of unity, variety and dynamism are instrumental in strengthening the aesthetic values when designing websites. Unity is the only factor involved in all the aspects of subjective perception of aesthetics. It also has a great impact on the two aspects of classical and expressive aesthetics through its impact on simplicity and craftsmanship. The factor of variety has a negative relation with all the dimensions of subjective aesthetics. According to results, websites that established the ideal balance between visual unity and variety, have gained the highest position in the general ranking of aesthetics. In the end, practical solutions to enhance the aesthetic quality of webpages through visual design have been proposed.

**Keywords:** *Visual aesthetics, visual design, newspaper website, webpage aesthetics.*

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& Dr. Neda Abdolvand" and advisement of Dr. "Mehdi Keshavarzafshar" the Faculty of Art, University in Tarbiat Modares. \*\* Corresponding author: afhami@modares.ac.ir, +989126753800.

## Introduction

From the early eighties, the Human Computer Interaction (HCI) was mainly focused on the performance and the use of computer system's capabilities; but in the recent two decades, the new wave of studies and research has highlighted the importance of aesthetic aspects in HCI and the design of websites. The new studies have demonstrated that the components of visual aesthetics of a website can play a great role in improving user experience. It was further established that the webpage aesthetics constitute not only an important part of user experiences in meeting his/her essential needs in interaction with computers, but also have a great impact on different aspects such as usability (Sonderegger, Sauer & Eichenberger, 2014); satisfaction (Cyr, Kindra & Dash, 2008), the user's first impressions (Thielsch & Hirschfeld, 2012), desire for revisit (Thielsch Iris, Blotenberg & Jaron, 2014), trust and credibility (Cyr, Head & Larios, 2010), desire to purchase (Parboteeah, Valacich & Wells, 2009) and the perception, acquisition and the use of products (Huang, Sun & Wan, 2020).

Discussions about aesthetics have mainly subjective implications, where the users express them in an emotional frame. This reaction originates from the different visual features hidden in the design of webpages. Since the user's subjective judgment is the result of the objective design of pages, understanding the relation between subjective aesthetics and the different objective factors used in design can help the designers of different website to accomplish the expected outcomes in design and to enhance interaction with the user. In spite of the many studies on the objective factors and the subjective aspects of the web users, there are very few studies on the combined objective and subjective approaches or attempts to show their reciprocal relations. On one hand many researchers have processed only one or a limited number of objective factors (Coursaris, Swierenga & Watrall, 2008; Tuch, Bargas-Avila & Opwis, 2010; Cai

& Xu, 2011), and on the other, there are studies, which have reviewed a number of objective factors, while using only a single criterion for subjective aesthetic (Wu, Chen, Li & Hu, 2011; Purchase, Freeman & Hamer, 2012; Reinecke, Yeh, Miratrix & Mardiko, 2013; Reinecke & Gajos, 2014). Therefore, through a holistic approach, the present study addresses the reciprocal relation between the different visual components and determines their role in achieving an aesthetic experience for the user with the objective of filling the scientific gap in this field.

In this context, with the objective of reviewing the relation between the visual components of webpage design and the different aspects of subjective aesthetic perception of the newspapers' websites and by combining the objective and subjective approaches, this study attempts to address the questions of which visual components of design are in relation with the user's subjective perception of the page's aesthetics and how the visual aesthetics of the website's pages can be improved?

From an empirical point of view, the identification and extraction of these factors can be a step towards clarification of the aesthetic experience, and at the same token, provide an insight into its impacts on the objective and methodology. Furthermore, it will be a tool at the disposal of programmers, designers and the stakeholders of websites, aiding them in the selection of the different elements of visual design.

## Literature review

The increased importance of the aesthetic aspects of HCI in the design of websites led to numerous studies in this field. Some of the relevant literature available in this field are presented in the following section.

The review of the past studies on the design elements effective on objective aesthetics underlines two different approaches. The first is the one based on the relation between the details of webpage design, their arrangements and the users' perception of objective aesthetics. This approach

addresses the fundamental elements of design such as symmetry, colorfulness and the number of elements. For instance, Bauerly & Liu (2008) applied the algorithms of calculated quantitative aesthetics based on balance, symmetry and the quantity of website elements and have attributed them to the degrees of subjective aesthetics. The outcomes of this research and others have led to the identification of 15 objective factors effective in the aesthetic design of webpages. These are shown in table 1.

The other method consists of a subjective approach using a questionnaire to assess the users' understanding of visual aesthetics. This group of studies have greater psychologic or mental dimensions. Examples of these studies are: the study of the level of prototypicality or novelty conducted by Tuch et al. (Tuch, Presslaber, Stocklin, Opwis & Bargas-Avila, 2012); unity in diversity by Post et al. (Post, Nguyen & Hekkert, 2017) and simplicity or complexity undertaken by Moshagen and Thielsch (2010). In another instance,

Moshagen and Thielsch introduced four scales to assess the objective aesthetics of websites on the basis of studies conducted by Lavie & Tractinsky (2004) and determined that these scales have an effect on the aesthetic attraction. Their standard questionnaire called "Visual Aesthetics Website Inventory (VisAWI) was created to measure the perceived visual beauty of the websites. The VisAWI questionnaire is based on the assumption that users understand the high factor of aesthetic regulation, which includes the four main dimensions of simplicity, diversity, colorfulness and craftsmanship. These criteria measure simplicity, evaluate the clarity and the structure of the arrangement of the webpage design. Different scales evaluate the novelty and dynamism of the design. Colorfulness includes the aspects of color combination and its selection. The fourth scale, craftsmanship, evaluates the professionalism of the design (Moshagen & Thielsch, 2013).

In addition to these two approaches, there are very few studies that have addressed the relation

Table 1. The objective aesthetics of websites as extracted from available literatures. Source: authors.

Factor	References
1 Simplicity	(De Angeli, Sutcliffe & Hartmann, 2006); (Lavie & Tractinsky, 2004); (Möttus, Lamas, Pajusalu & Torres, 2013); (Schmidt, Liu & Sridharan, 2009); (Altaboli & Lin, 2011b)
2 Balance	(Möttus et al., 2013); (Bi, Fan & Liu, 2011); (Altaboli & Lin, 2011b); (Bauerly & Liu, 2008); (Zheng, Chakraborty, Lin & Rauschenberger, 2009); (Lai, Chen, Shih, Liu & Hong, 2010); (Lavie & Tractinsky, 2004);
3 Symmetry	(Altaboli & Lin, 2011b); (Möttus et al., 2013); (Bauerly & Liu, 2008); (Bi et al., 2011); (Lai et al., 2010); (Lavie & Tractinsky, 2004); (Zheng et al., 2009)
4 Harmony	(Kim, Lee & Choi, 2003); (De Angeli et al., 2006); (Hassenzahl, 2004); (Lavie & Tractinsky, 2004); (Thielsch, 2008);
5 Complexity	(Tuch, Bargas-Avila, Opwis & Wilhelm, 2009); (Pandir & Knight, 2006); (De Angeli et al., 2006)
6 Uniformity	(Möttus et al., 2013); (Tarasewich, Daniel & Griffin, 2001); (Kim et al., 2003)
7 Proportion	(Bauerly & Liu, 2008); (Möttus et al., 2013)
8 Color	(Moshagen & Thielsch, 2010); (Coursaris et al., 2008); (Cai & Xu, 2011); (Cyr et al., 2010); (De Angeli et al., 2006); (Tarasewich et al., 2001); (Sutcliffe & De Angeli, 2005); (Thielsch, 2008)
9 Movement	(Rau, Gao & Liu, 2007); (Tarasewich et al., 2001); (Sutcliffe & De Angeli, 2005); (Lavie & Tractinsky, 2004)
10 Homogeneity	(Möttus et al., 2013); (Kim et al., 2003); (Tarasewich et al., 2001)
11 Rhythm	(Möttus et al., 2013); (Altaboli & Lin, 2011b); (Lavie & Tractinsky, 2004)
12 Order	(Bauerly & Liu, 2006); (Kim et al., 2003); (Tarasewich et al., 2001); (Möttus et al., 2013)
13 Grouping	(Bhandari, Ting-Ting Chang, & Neben, 2019); (Schrepp, Held & Laugwitz, 2006); (Bauerly & Liu, 2008); (Lavie & Tractinsky, 2004); (De Angeli et al., 2006); (Thielsch, 2008); (Schmidt, Liu & Sridharan, 2009)
14 Regularity	(Kim et al., 2003); (Tarasewich et al., 2001);
15 Equilibrium	(Bi et al., 2011); (Altaboli & Lin, 2011a) (B); (Lavie & Tractinsky, 2004); (Zheng et al., 2009); (Lai et al., 2010)

between these two aspects by focusing on a number of objective factors. The results of these studies are shown in [table 2](#).

The review of the above cases demonstrates the limited attempts to establish the systematic relation between the different objective factors or their combination with the users' perception. Wang and

Lin (2019) have only reviewed the impact of the change in complexity while others have evaluated the relation of a single element such as symmetry on the different dimensions of aesthetic perception (Altaboli & Lin, 2011a; Altaboli & Lin, 2011b & Mõttus, et al., 2013). However, the inconsistency of the results cannot establish a holistic view

Table 2. Studies undertaken on the combination of the two approaches in the perception of visual aesthetics. Source: authors.

References	Design	Objective factors	Subjective factors	Main results
(Wang & Lin, 2019)	Experimental	Visual Complexity	VisAWI	Aesthetics priority of webpages with medium, low and high complexity
(Lazard & King, 2019)	Experimental	Visual Complexity	VisAWI	Websites with more visual information organized according to design principles are ratedThe higher attraction of webpages containing more visual data, organized according to principles of designing
(Wecksell, 2015)	Correlational	Number of images, Number of visual objects and the average RGB-value	VisAWI	No correlations were found between the objective characteristics and the subjective ratings, with the exception to the average RGB-values
(Seckler, Opwis & Tuch, 2015)	Correlational	Structural factors: vertical symmetry, visual complexity and objective color, hue, saturation, brightness	VisAWI	Structural factors compared to color factors have a manifold and greater impact on the different facets of subjective aesthetic perception than the color factors. Both structural factors have a great impact on simplicity, diversity and craftsmanship whereas the color factors have a great impact especially on colorfulness.
(Lin, 2013)	Experimental	Balance, Contrast, Rhythm, Harmony, Variety	Classical Aesthetics	A positive correlation between classical aesthetics and the objective factors
(Mõttus et al., 2013)	Correlational	Balance; simplicity; rhythm; regularity; unity; cohesion; sequence; symmetry; proportion; density; homogeneity; equilibrium	- Classical & Expressive Aesthetics - VisAWI	No significant correlations for any of the factors with classical and expressive aesthetics or VisAWI facets
(Altaboli & Lin, 2011a)	Correlational	Balance; unity; sequence	- Classical & Expressive Aesthetics - VisAWI	Only unity highly correlates with the questionnaire measures
(Altaboli & Lin, 2011b)	Correlational	Symmetry; balance; unity; sequence; simplicity; density; rhythm; lack of objects; lack of objects of different sizes of objects; jpeg file size; lack of different font types; lack of images	- Classical & Expressive Aesthetics - VisAWI	Positive correlation between classical aesthetics and unity, simplicity; No sign. correlation between expressive aesthetics and any of the objective measures; Positive correlation between the simplicity facet and unity; lack of objects and lack of of different sizes ; no correlation between color and objective factors; positive correlation between the construction and unity, simplicity, lack of objects and lack of objects of different sizes

about the impact of each element or their relation on the different aspects of the perception of objective aesthetics. A search on the background of these studies in Iran showed no record of such undertaking in this field. For this reason, and in addition to processing the mentioned relation, the current study reviews the subject in the Iranian culture with the intention of clarifying the more accurate aspects of the Persian website design.

### Theoretical principles

For a deeper understanding of the subject matter, this section addresses the views, concepts and theories that form the basis of this research.

The subject of aesthetics processes the phenomena of beauty, its concept and how it is understood. The pundits of this field are divided into the two separate groups of objectivists and subjectivists. Ontologists such as Plato and Aristotle considered it as obvious and universal phenomenon, which can be described or even measured accurately (Plato, 2001). Epistemologists such as Hume (1757) and Kant (1914) the great philosopher of aesthetics, imagined it as a mental subject. Today, most philosophers of aesthetics are somewhere between objectivity and subjectivity, and consider beauty as an objective and worldly and up to a point subjective matter. Most consider the aesthetic judgment as a subjective process, which needs a degree of objectivity for a joint concord (Hartmann, Sutcliffe & De Angeli, 2008).

The term “visual aesthetic” includes concepts such as “beauty”, “attraction” and “visual attraction”, which allude to the pleasant appearance and the visual attractiveness of a product (El-Darwish, 2019, 961). Its application involves the selection of elements and techniques, which establish a balance between expression and message or content, adding to its effect (Zettl, 1999).

Most research on aesthetics in the field of HCI focus on the decomposition of the understanding of beauty into the different elements, which make up its entirety. The best method of measuring

the objective aesthetic of webpages include its two principal dimensions of “classical” and “expressive”. The classical aesthetics include the traditional and historical concepts of aesthetics such as order, regularity, ratio, harmony, symmetry, clarity, cleanness, etc. (Lavie & Tractinsky, 2004). It aims at increasing the understanding of the users’ interface and the reduction of ambiguity in the users’ interaction with them (Oyibo, Adaji, Orji & Vassilva, 2018, 579). Moreover, in addition to reliance on objective concepts, it correlates with the perceived application (Oyibo & Vassileva, 2016). The expressive aesthetics stress creativity and originality (Altaboli & Lin, 2011b, 38). They address the user’s view on creativity, complexity, attractiveness, visual signs, originality of design and the designer’s ability in breaking the design conventions, and includes the analyses of features, which, beyond the classical principles, are understood and considered as originality and the attraction of a design (Lavie & Tractinsky, 2004).

### Research method

From the aspect of practical applications, this qualitative and quantitative study is in the descriptive – analytical category, and based on the defined objectives, it was undertaken in three stages. The first consists of providing a description, the procedure and the method of analysis in each study. There are established methods for collection and classification of the usability of web. In this context, the visual features of the graphic user interface and the subjective perceptions can be easily separated. Nevertheless, this would be difficult during the aesthetic classification of a website. Since the definite variables have not been reviewed in a satisfactory manner to determine the visual methods, the data for aesthetic classification are mostly the subjective interpretation and judgment of the user recorded through a questionnaire. Of course, other surveys and conventional methods of data collection, such as the paired comparison, evaluation of checklist or cognitive steps are as

adequate as a questionnaire. However, they have rarely been documented and are therefore of less use. Questionnaire is a popular and easily applied method and it has been chosen for this reason in the present study.

As websites are very dissimilar stimulants, this study has concentrated on a number of specific ones for its purpose. The selection of the group of websites in this study is based on the studies conducted by Roth and his associates (Roth, Schmutz, Pauwels, Bargas-Avila & Opwis, 2010). Furthermore, the research was limited to the newspaper websites to prevent users becoming influenced by the content in their evaluation, because, studies in this field are very few and the contents of the newspaper websites are relatively similar. In addition, actual websites were selected for the purpose to ensure the high ecological validity<sup>1</sup> of the research. In this context, the home pages of 10 national newspaper websites including, Hamshahri, Donya-e-Eqtasad, Iran, Khabarevarzeshi, Jam-e-Jam, Khorassan, Etefaat, Keyhan, and Aftab-e-Yazd<sup>2</sup>, published on 26/11/2019 were selected for review according to the research's process (Figs. 2-8).

The first stage was undertaken to address the first question, i.e. identification of the visual elements of design that are related to the subjective perception of webpages' aesthetics by users. As in this stage, the ordinary users may not be able to evaluate the elements of visual aesthetics according to similar definitions (Moshagen & Thielsch, 2010, 9), 20 graphic experts in the field of web design were asked to participate in this study. After becoming acquainted with the research objectives and studying the definitions of visual concepts, which were incorporated at the beginning of the questionnaire in the frame of short sentences, the experts evaluated individually a collection that included ten newspaper home pages on the basis of objective factors extracted from the research background. The mentioned experts included the lecturers of art, graphic artists and web designers holding Masters or PhD degrees. 55% of these

experts were females and 45% were males of an average age of 39 and with an average professional experience of 9 years.

For the purpose of analyzing the answers of experts and after ensuring the reliability of the questionnaire, the internal correlation of scale of 0.92 and higher than 0.7 was obtained through Cronbach's Alpha method. The Exploratory Factor Analysis was applied through analysis of the main factor and the Varimax Rotation to identify the structure of elements.

The second stage was undertaken with the aim of studying the relation between the objective factors of webpage design with the different factors of subjective aesthetic perception. Since the subjective perception of websites can be measured by a standard and reliable questionnaire (Hirschfeld & Thielsch, 2015), the standard questionnaire called VisAWI was used in this stage. The questions were aimed at measuring the users' views on simplicity, diversity, colorfulness and craftsmanship. The previous studies have demonstrated that these four factors had the highest impact on aesthetic preferences of webpage users. Moreover, according to Lavie and Tractinsky (2004), simplicity was related to classical aesthetics, while diversity was related to expressive aesthetics.

A total number of 145 individuals participated in this study. 46 percent of the participants were females and 54 percent males of 26 years of age on average. They held Bachelors' or Masters' degrees and had experiences of working with different websites with an average of 2.38 hours of active daily use of internet. Based on the images of the 10 website homepages, they were asked to express their level of agreement to the 18 statements of the questionnaire, according to the Likert scale of 1 (fully disagree) to 7 (fully agree). In the end only 124 participants were able to fill the questionnaire completely and without any omission. This survey was conducted in the course of 6 weeks.

The Cronbach Alpha test was conducted to confirm the reliability of the scales. The figures obtained were 0.89 for simplicity, 0.87 for diversity, 0.89 for

colorfulness and 0.85 for craftsmanship. As these figures are above 0.7, the mentioned questionnaire's reliability was determined as valid and in the next step the data were analyzed by SPSS 25 software. The questionnaire's analysis was conducted after changing the values of negative items by calculating the total and the micro scale averages (Moshagen & Thielsch, 2013, 8).

As the existence of outliers in the analysis can influence the outcomes, the domain distribution method was applied to review and to delete them. The box plot was used for the purpose. This plot method reflects situation, dispersion and skewness of the data and uses the abundance to identify the outliers (Reimann, Filzmoser & Garrett, 2005). In this plot, data smaller than Q1 and larger than Q3 are considered as outliers. Fig. 1 shows the box plot of the research's data. According to this chart, the newspapers of Hamshahri, Etelaat and Khorassan were eliminated from the process of analysis (Fig. 1). In the third stage and to review the impact of objective factors of the design on the aspects of subjective aesthetic perception as well as the means

of improving the quality of the objective aesthetics of websites, the convergence relation of the data from the two questionnaires were interpreted using the Pearson correlation method.

**Research findings**

Based on the outcomes of evaluation and classification of experts of the seven website home pages of the newspapers on the basis of visual aspects, the Jam-e-Jam website obtained the highest ranking and the website of Khabarevarzeshi obtained the lowest ranking of aesthetics.

The data obtained from this stage of research were reviewed using the Exploratory Factor Analysis. First, the possibility of undertaking the factor analysis on research sample was reviewed using the Bartlett Test and the sample adequacy index (KMO) (Table 3). The descriptive method was applied to sample the adequacy values of the variables. Based on the results of table 3 on KMO values and the significance level of Bartlett test, the process of analysis can be undertaken on research data.

The hidden elements were extracted through the

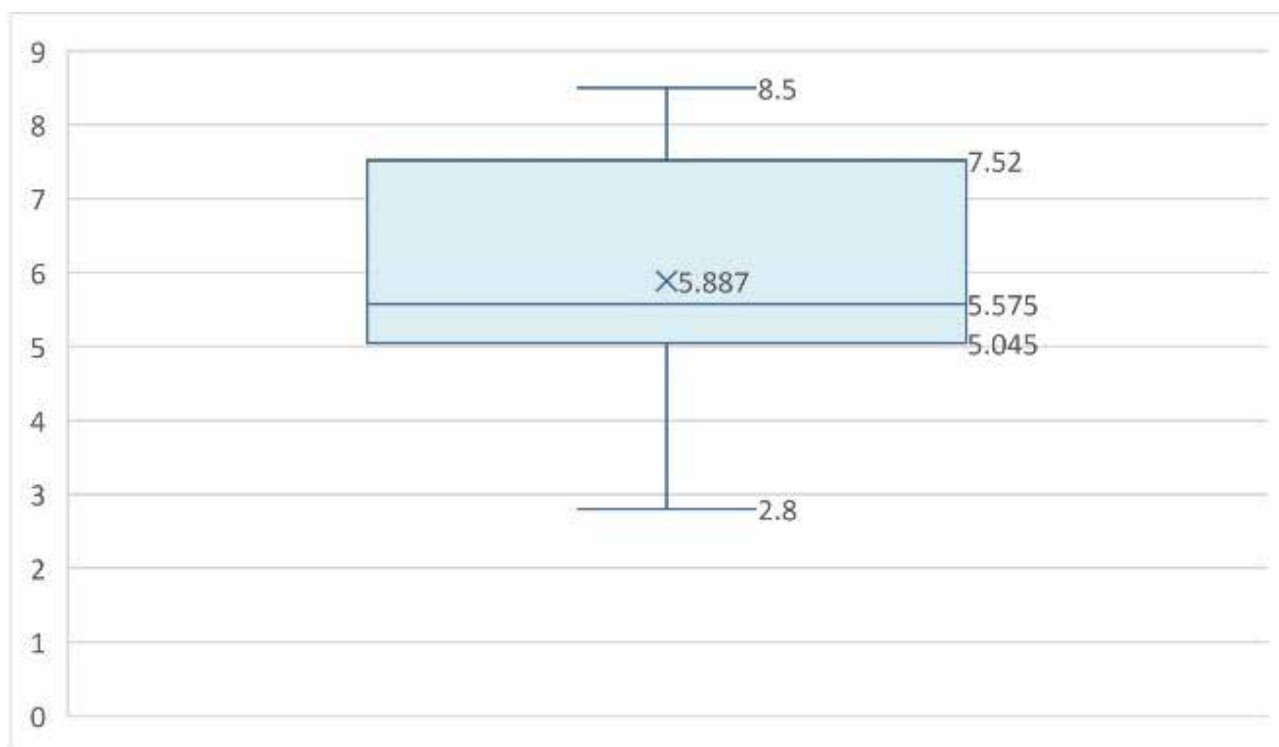


Fig. 1. The box plot of research data to determine the outliers. Source: authors.

analysis of the main components and the Varimax rotation. The data reduction in SPSS was used to discover the important components that boost the aesthetic values in the visual design of web, meaning that if the value of extracted variable is 0.5, it will be evaluated as low and must be excluded from the analysis. The results of this stage showed the three elements of unity, dynamism and variety as higher given their special values. Table 4 shows the correlation between the variables and the three extracted components. In the next stage, VisAWI was used to evaluate the perceived objective aesthetics. The descriptive data of the four aspects of VisAWI and the rankings of the general perception of subjective aesthetics, which demonstrates the regularity of websites with their aesthetic values, established that participants

perceived the Jam-e-Jam having the highest and the Khabarevarzeshi website as having the lowest objective aesthetic value. The review of the results shows that the participants and the experts had the same evaluation.

The Pearson correlation method was applied for the final analysis and testing how the visual aspects of webpage can affect the subjective perception of the web’s aesthetics, and to find the relation between the objective and subjective components of web aesthetics. Table 5 shows the coefficients of correlation between the visual aspects and the subjective dimensions of the seven websites studied. Accordingly, the discovered visual aspects had a significant impact on the overall perception of the subjective aesthetics. Based on this table, the prominent effect of the visual unity must be noted.

Table 3. The Bartlett test and the sample adequacy index. Source: authors.

KMO		Bartlett’s Test of Sphericity	
0.919		Approx. chi-square	1102.357
		df	78
		sig	0.000

Table 4. Matrix of the main components. Source: authors.

Rotated Component Matrix			
Component			
Variety	dynamism	Unity	
		0.873	Harmony
		0.839	Uniformity
		0.808	Proportion
		0.764	Simplicity
		0.750	Homogeneity
		0.737	Balance
		0.678	Symmetry
	0.885		Movement
	0.768		Rhythm
	0.748		Color
	0.687		Equilibrium
	0.656		Regularity
0.954			Complexity
Extraction Method: Principal Component			

Table 5. The correlation between the objective components and the subjective dimensions of the studied websites. Source: authors.

Experts Evaluation			Unity	VisAWI
Variety	dynamism			
-.761*	0.268	.953**	Simplicity	
-0.333	.791*	0.696	Diversity	
-0.487	0.656	0.742	Colorfulness	
-0.446	0.674	.771*	Craftsmanship	

\*. Correlation is significant at the 0.05 level (2-tailed).  
 \*\*. Correlation is significant at the 0.01 level (2-tailed).

The results underline the high correlation and the strong relation of the visual aspect of unity.

**Discussion**

The results of table 5 demonstrate that there is a very strong and significant relation (0.953) at a





Fig.2. Jamejam Website. Source: <http://jamejamdaily.ir/?nid=5534&type=0>



Fig. 6. Iran Website. Source: <http://www.irannewspaper.ir/Newspaper/Page/7213>.



Fig. 3. Donya-e-eqtasad Website. Source: <http://donya-e-eqtasad.com/4761>.



Fig. 7. Shargh Website. Source: <http://sharghdaily.com/fa/main/Page/5015/1>.



Fig. 4. Kayhan Website. Source: <http://kayhan.ir/fa/publication/1726/20609>



Fig. 8. Khabarvarzeshi Website. Source: <https://www.khabarvarzeshi.com/fa/news/237323>.



Fig. 5. Aftabeyazd Website. Source: <http://aftabeyazd.ir/index.php?year=1398&month=09&day=05&category=1&>

significance level of 0.<sup>01</sup> between the simplicity intended by the users and the unity intended by experts, and a negative relation between simplicity and variety intended by experts at a significance level of 0.05. The diversity intended by users has a correlation with the dynamism intended by experts at a significance level of 0.05, while the craftsmanship intended by users, has a positive and significant relation at 0.<sup>05</sup> with unity intended by experts.

The findings of Mottus and his associates do not show a significant relation between unity and each dimension of VisAWI (Mottus et al., 2013). Whereas, based on this research and previous studies (Altaboli & Lin, 2011a) it can be claimed that visual unity is the predictor of aesthetic judgments. The unity's craftsmanship had the highest impact on VisAWI dimensions, to the extent that it has a positive relation with all the dimensions of subjective perception of aesthetics. Among all the objective factors and in addition to the positive impact on all dimensions, unity has the highest effect on simplicity (classical aesthetics) and craftsmanship (expressive aesthetics), as well as on the overall perception of subjective aesthetics. The previous studies did not address the effects of the objective factors of dynamism and variety on the subjective dimensions of aesthetics. The present undertaking shows the relation between dynamism and the diversity dimension of VisAWI. Diversity, which is the product of juxtaposition and the rhythm of elements such as form, texture, color, etc., has a high correlation with dynamism, whereas, variety has the lowest correlation with simplicity. This means that the dimension of diversity signifies the correct and sufficient use of objective factors and the avoidance of complexity and excessive use of elements, because dynamism or movement reduces the simplicity related uniformity of design, leading to the subjective perception of aesthetics. The results also reflect the negative relation between variety and simplicity.

Another outcome is the existence of negative correlation between the objective factor of variety and VisAWI dimensions (simplicity, diversity, colorfulness and craftsmanship). The objective factor of variety, which can include the difference in the size of images and objects, the difference in the type of used fonts, the various colors and ... has a negative relation with all the subjective dimensions of aesthetics. Another result of this study is that there is no significant correlation whatsoever between the objective factors and the

dimension of colorfulness. The lack of correlation between objective factors and colorfulness is consistent with the results of previous studies conducted by Altaboli & Lin (2011a).

The ranking of objective factors of aesthetics by the experts and the participants' evaluations based on subjective dimensions demonstrate how our perceptions of webpage aesthetics is derived from the understanding of the essential elements of visual design. It can be concluded from these findings that unity and variety are the most influential elements in the classification of aesthetics. Unity is the understanding of an entirety, order and integrity between features and elements (Post, Blijlevens & Hekkert, 2017), whereas variety points to the number and the intensity of differences between the subjective features and elements (Berlyne, 1972). Based on the results, it can be deduced that the aesthetic perception of the page depends on the proper balance between the unity and the variety of the website. The components of the craftsmanship of the visual design make up the foundation of these two opposite aspects. The scientific literatures in this field have shown that the components of balance, harmony (Alsudani & Casey, 2009)<sup>7</sup> and integrity (Lu, Tan & Wang, 2013) are effective in achieving the unity of webpage. Some studies have considered the availability of balance and harmony as the minimum requirement for achieving the unity of design (Alsudani & Casey, 2009). One way of achieving harmony is the use of grid in webpage design (Ch'ng & Ngo, 2003). As symmetry helps in the perception of balance in the page (Bauerly & Liu, 2008); it can be claimed that the use of symmetrical grid can be effective in creating a greater balance and harmony and consequently in enhancing the perception of aesthetics. The structural comparison of the two websites of Jam-e-Jam and Khabarevarzeshi underlines the existence of the mentioned elements in the former's webpage and the neglect of the discussed issues in the latter's. Moreover, the elements of colorfulness (Davis, 2007) and symmetry (Altaboli & Lin,

2012) can independently affect the degree of unity and variety. Color can on one hand, lead to the variety and consequently the understanding of the complexity of the page, and on the other, result in its harmony. The comparison of colorfulness in the two websites of Jam-e-Jam and Khabarevarzeshi shows the combination of colors to be limited in the former and quite varied in the latter. Through harmony and similarity in elements, the limited number of colors in Jam-e-Jam has created a balance between unity and variety, whereas in Khabarevarzeshi, the dissimilarity of elements through increased color has resulted in the increase of variety and decrease of unity at the same time.

As mentioned, the review of the structural grid of Jam-e-Jam newspaper highlights the page's design on the basis of symmetry. The increased symmetry has led to the proximity of special elements in the page, and in this way, it has affected its overall unity. Whereas the grid network is not seen at any of the horizontal or vertical axes of the Khabarevarzeshi's webpage. This is another factor in upsetting the balance between unity and the variety of the webpage. In most cases, symmetry is considered as a necessary element in creating unity and in achieving a beautiful design. It must be noted however, that a complete symmetry is not always desirable, because the perception of the page depends on the overall balance of the design and the emotional response to it (Lauer & Pentak, 2012).

Another component, which has a simultaneous effect on the unity and on the variety of the webpage, is the number of used fonts. Studies have shown that different fonts have a considerable relation with the amount of variety (Altaboli & Lin, 2011b). Furthermore, the fonts' harmony highlights the similarity of the shape and aids in creating unity in the page (Lu et al., 2013). These can clearly be seen in the considered webpages. The fonts used in the Jam-e-Jam page are limited and the difference does not lie in the type of font, but in the style and the grouping of text. Whereas, the webpage

of Khabarevarzeshi has greater number of fonts, which may affect the evaluation of variety and unity of the page. Studies have shown the number of objects and the number of different sizes as the parameters of the form's unity (Altaboli & Lin, 2012), in such a way that the level of form's unity increases with a drop in the number of objects and their sizes. The review of Jam-e-Jam newspaper and Khabarevarzeshi underlines the great variety in forms and in the number of different sizes in the Khabarevarzeshi website, while this variety is subdued in Jam-e-Jam. This issue can explain one of the reasons for the ranking of unity and variety in these two websites by the experts and the users. The assessment of VisAWI results showed that the element of unity is not only effective on the overall perception of the subjective aesthetic of the webpage, but has the highest level of impact on the dimensions of simplicity and craftsmanship. Simplicity is one of the most important components of user interface in the strengthening the perceived objective aesthetics. Accordingly, the studies of HCI have underlined repeatedly the importance of simplicity in the aesthetic perception of websites (Bi et al., 2011, Lavie & Tractinsky, 2004), (Thielsch & Hirschfeld, 2012). In the aesthetic evaluation of websites, simplicity is defined as an aspect that facilitates the understanding and the processing of a design (Moshagen & Thielsch, 2010). Through the theory of processing, we can understand the mechanism between simplicity and aesthetic perception. The theory of processing demonstrates that aesthetic pleasure is a function of the dynamic processing of stimulants by the user (Reber, Schwarz & Winkielman, 2004). It means that the more users process the interface's stimulants, the more positive will be their aesthetic evaluation; because through error and lesser reliability, users can be more successful in identifying and processing them. As the user's processing determines the aesthetic evaluation, simple designs with appropriate unity can be processed quickly and will therefore benefit from

a positive evaluation. The clear and balanced arrangement of graphics and texts, as well as the structural elements such as the number of menus, images, word and the sections of the page are related to the simplicity of the webpage and can affect the user's perception of the webpages' aesthetics. These factors can be clearly seen in both the websites in question and can explain why the participants have judged the Jam-e-Jam website as being simpler to understand. The results further clarified that variety has a negative relation with all the dimensions of VisAWI, including simplicity. The way webpage's visual complexity is perceived also affects variety (Davis, 2007). On the other hand, the manipulation of complexity is effective in the perception of simplicity. In other words, the perception of simplicity has a positive relation with the reduction of complexity and variety (Seckler, Opwis & Tuch, 2015), (Choi & Lee, 2012). Therefore, the avoidance of complexity and great variety in webpage can boost its simplicity and subsequently plays a great role in its evaluation. Craftsmanship is considered as the skillful integration and consistency in all the dimensions of the design (Moshagen & Thielsch, 2010). It also points to the prevalence, maturity and the professionalism of the design (Moshagen & Thielsch, 2013). Wang and Lin are of the opinion that craftsmanship is related to the skill and care in placing the webpage elements next to each other (Wang & Lin, 2019). The results of this research showed that by affecting the craftsmanship, unity will lead to a positive evaluation of the webpage. Creating unity in the design of the webpage will affect the users' judgment of skillfulness and professionalism of the design.

### Conclusion

By combining the objective and subjective approaches, the research showed which objective factors in the design of Iranian newspapers' webpage can affect the users' subjective perception of aesthetics. 15 components of aesthetics

were evaluated in this study. Although all the identified elements have a prominent role to play in the aesthetics of the websites, the study was seeking the ones most relevant to the aesthetics of webpages, and therefore, the three main elements were selected. Unity, dynamism and variety were determined as the main elements involved in improving the aesthetic quality of websites.

The results indicate that the identified elements of visual design have a significant effect on the overall perception of subjective aesthetics, and can be used for the overall evaluation of the objective aesthetics of websites. The research demonstrated that websites with a proper balance between visual unity and variety gained the highest general ranking in aesthetics. In addition, the data highlighted that structural elements had a greater effect than color on the subjective perception of aesthetics. The structural factor of unity had a great impact on both the classical and the expressive aspects of aesthetics through its effect on the dimensions of simplicity and craftsmanship. However, it is only unity that affects all the dimensions of the subjective perception of aesthetics. Variety has a negative relation with all the dimensions of subjective perception of aesthetics, and dynamism has a positive relation only with the dimension of diversity.

In addition to a better insight of the website's visual aesthetics, the practical accomplishments of this study can be useful in the initial stages of the design. Moreover, they can guide the web designers and developers in selecting the different aspects of design. In continuation, some practical guidelines are provided for the visual design and enhancing the quality of webpages' visual aesthetics:

Maintaining simplicity: to accomplish simplicity, the website designer must consider two important points. First creating a visual unity among the elements of the page and second avoiding excessive variety and complexity of elements to achieve a balance between unity and variety of the page.

Creating unity in the objective factors of the

website to improve its aesthetic quality and to achieve the highest level of aesthetics requires the strengthening of the visual unity among the elements of the webpage, which is realized by attention to juxtaposition, resemblance, harmony, integrity, continuity, balance, regularity and symmetry.

Avoidance of excessive variety of elements: by manipulating the amount of content, avoiding the use of diverse fonts, avoiding the different sizes of objects and images, and avoiding the use of numerous colors, the visual complexity resulting from the variety of elements can be reduced. To avoid creating a tedious page at the time of increasing unity, variety must also be increased through the different means of design. This will be achieved by establishing an appropriate balance between these two factors and will lead ultimately to the visual attraction of the webpage.

Maintaining dynamism: to prevent monotony in the visual appearance of the page following simplicity and avoidance of variety, its dynamism can be accomplished by the use of elements such as rhythm, color, movement and proper composition. It should be noted that since the research was limited to webpages, its findings can only be applied for the visual aesthetics of websites. The extension of these findings to other user interfaces and screens requires further studies.

### Endnote

1. Ecological validity in psychology is the criterion to measure the method for predicting the test of behaviors in an actual environment, i.e. how many processes appearing in the test exist in the actual daily life. In the research the ecological validity of a study means that procedures, material and the arrangements of the study must be as close to the real world as possible (Brewer, 2000)
2. Selected on the basis of newspapers' ranking by the Directorate General of Publications and Internal News Agencies, Ministry of Culture and Islamic Guidance, as mentioned in the Ministry of Culture and Islamic Guidance's website (press.farhang.gov).

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