VisAWI Manual

(Visual Aesthetics of Websites Inventory)

and the short form VisAWI-S
(Short Visual Aesthetics of Websites Inventory)

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(Visual Aesthetics of Websites Inventory - Short)

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Moshagen, M. & Thielsch, M. T. (2013). A short version of the visual aesthetics of websites inventory. *Behaviour & Information Technology, 32* (12), 1305-1311. doi: 10.1080/0144929X.2012.694910

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Overview

Today, the World Wide Web is an essential communication- and marketing channel. In empirical analyses of user experience, visual aesthetics represents an important factor. Visual aesthetics of websites can be defined as an immediate pleasurable subjective experience that is directed toward an object and not mediated by intervening reasoning (Moshagen & Thielsch, 2010). Aesthetics provide satisfaction and pleasure – based on the work of Fechner (1876), classical aesthetics research refers to „subjective pleasure".

Aesthetics not only fulfils the user's basic needs and can be a unique feature (see Thielsch, 2008, p. 36f. for an overview). Aesthetics further influences numerous factors and constructs, such as a user's first impression (cf. Lindgaard et al., 2006; Thielsch & Hirschfeld, 2012; Tuch et al., 2012), usability (Lee & Koubek, 2012; Moshagen, Musch, & Göritz, 2009; Sonderegger & Sauer, 2010), satisfaction (Cyr, Kindra & Dash, 2008; Lindgaard & Dudek, 2003), disposition to buy (Parboteeah, Valacich & Wells, 2009; Porat & Tractinsky, 2012) or intentions to revisit or recommend (Mahlke, 2002; Thielsch, Blotenberg & Jaron, 2014; Yoo & Donthu, 2001).

Accordingly, the adequate assessment of the aesthetic experience is of prime importance. In the majority of cases, the users are asked about their subjective rating. Other methods such as paired comparisons, checklist evaluations or cognitive walkthroughs are equally possible, but hitherto sparsely documented (see Thielsch, 2008, p. 53). Questionnaires are a popular method, easily implemented and consequently prevalent. However, judgements based on a single item (e.g. „how beautiful is this website?") can be distorted by measurement errors or response biases (see Schmidt & Hunter, 1996). It is therefore advantageous to ask several questions about aesthetics in form of a standardized questionnaire.

However, the few existing aesthetics questionnaires are yet partly developed scales for particular analyses, whose validities have not been verified and are thus questionable (Bargas-Avila et al., 2011). The instrument developed by Lavie and Tractinsky (2004) as well as the VisAWI (Visual Aesthetics of Websites Inventory; Moshagen & Thielsch, 2010 & 2013) constitute the exceptions. While the questionnaire of Lavie and Tractinsky (2004) comprises two factors, classic and expressive visual aesthetics, the VisAWI complements this model by assuming four facets: Simplicity, Diversity, Colorfulness and Craftsmanship.

Additionally, a shortened version of the VisAWI, the VisAWI-S, was created. Having four items, it measures solely a general aesthetics factor. The VisAWI as well as the VisAWI-S are described in detail in the following.

1. Background

1.1. Definition of visual aesthetics

Aesthetics can be regarded as an immediate, positively valued subjective experience that is directed toward an object (Reber, Schwarz, & Winkielman, 2004). An aesthetic impression occurs immediately at first sight, rather than being the result of a long lasting cognitive analysis (cf. Leder, Belke, Oeberst, & Augustin, 2004). Aesthetics provides satisfaction and pleasure and is thus positively valued. Classical aesthetics research refers to „subjective pleasure“ (cf. Fechner, 1876). Ultimately, an aesthetic judgment always refers to an external object. According to the interactionist approach, an aesthetic impression originates from the interaction of the object's - as well as from the observer's characteristics (cf. Moshagen & Thielsch, 2010). Prior research suggests that aesthetics evaluations are formed rapidly (cf. Lindgaard et al., 2006; Thielsch & Hirschfeld, 2012; Tractinsky et al., 2006).
The VisAWI follows the definition of website aesthetics as an „immediate pleasurable subjective experience that is directed toward an object and not mediated by intervening reasoning“ (Moshagen & Thielsch, 2010, p. 690, cf. Reber et al., 2004).

1.2. The interaction of content, usability und aesthetics

Content, usability and aesthetics are fundamental principles of the perceptual organization of a website (see Figure 1). Various studies investigate the relation between usability and aesthetics (cf. Hassenzahl & Monk, 2010), but only few include the perception of the content. In their study of E-Recruiting, Cober et al. (2003) showed that all three aspects are relevant for the perception of an organization. Thielsch (2008b) finds a relationship between all three constructs and the first – as well as the overall judgement of a website, while the highest correlations arise regarding the aesthetics. Schenkman and Jönnson (2000) also investigated the three constructs, of which aesthetics proved to be the most important predictor for the overall judgment. Similar results were provided in Tarasewitch et al. (2001), where the content and the usability yet proved to be more important.

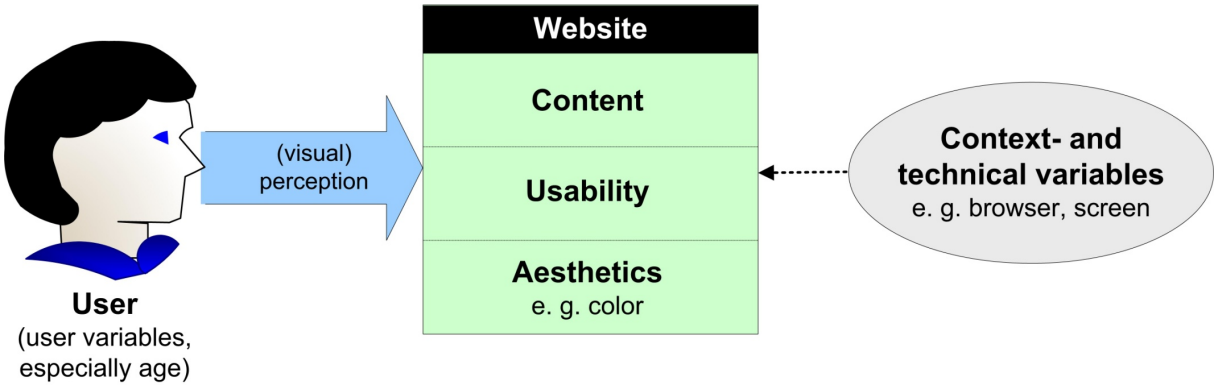

Figure 1: Essential variables of website perception (cf. Thielsch, 2008, p. 263).

A current study (Thielsch et al., 2014) that investigated websites from nine different contexts (see Table 4 for examples) yielded the following results: The first impression of a website is primarily influenced by the aesthetics judgement, while content and usability exert a considerable influence as well. All three constructs constitute the overall impression of a website; however solely the content plays an important role for the prediction of the user's intentions to revisit and recommend.
In conclusion: A web-user is attracted by the aesthetics of the web-design – and is bound by a high-quality content, which is presented in a user-optimized manner. The content is vital for the user's intentions to revisit and recommend a website, while the aesthetics operate as a form of visual reinforcement (Thielsch et al., 2014, cf. Figure 2).

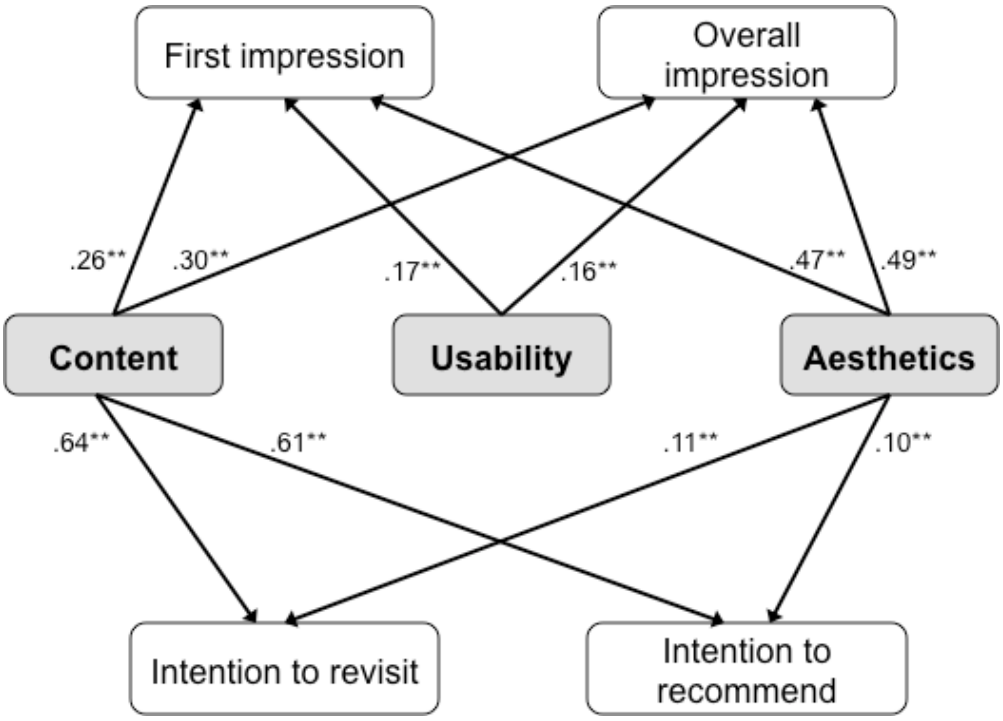

Figure 2: Influence of the perception of content, usability and aesthetics on first – and overall impression, or on intentions to revisit and recommend (from Thielsch et al., 2014; coefficients on the arrows represent coefficients of regression).

1.3. Measurement of visual aesthetics

There is a series of established methods to collect usability-ratings (cf. Gediga & Hamborg, 2002; Shneidermann & Plaisant, 2009). In this context, objective characteristics of a GUI (Graphical User Interface) and its subjective impressions are easy to separate from each other. However, the same is difficult regarding ratings of aesthetics: The critical variables have not yet been satisfactorily investigated to determine objective measurement methods. Consequently, data of aesthetics ratings mostly consist of the user's subjective impressions and judgments that are recorded via questionnaires.
Other survey methods and conventional methods of collecting data (such as paired comparisons, checklist evaluations or cognitive walkthroughs) are equally possible, but hitherto sparsely documented and thus less likely to be applied. Questionnaires are a popular meth-

od and easily implemented. In this context, there are three different procedures (see Thielsch, 2008, p. 53 ff., for a detailed overview):

1. Assessment of aesthetics via single items
2. Assessment of aesthetics via scales of questionnaires
3. Assessment of aesthetics via standardized questionnaires.

When gathering data via single items, there are problems concerning the accuracy of the measurements (reliability). They are prone to errors of measurement (Schmidt & Hunter, 1966) and distortions of answers (e.g. the tendency of respondents to agree with all the questions) and thus only provide a rough measurement comprising the complexity of a construct – they also may be comprehended differently by the respondents. These problems can be diminished considerably when using scales or standardized questionnaires. However, many of the applied ad hoc scales lack a precise definition of the construct, an examination of the psychometric properties and evidence of content validity. When measuring website aesthetics metrically, particular attention must be paid to the determination of validity, only few approaches have been developed so far.

2. The VisAWI

2.1. Description

The VisAWI is based on the assumption that users perceive a general higher order factor of aesthetics, which consists of four underlying facets, Simplicity, Diversity, Colorfulness and Craftsmanship (see Figure 3):

- The items measuring **Simplicity** ask how clearly and structured the layout of a website is perceived.
- The scale **Diversity** asks to evaluate the inventiveness and dynamic of the layout.
- **Colorfulness** comprises aspects of color composition, -choice and –combination.
- The fourth scale **Craftsmanship** refers to the topicality, sophistication and the professionalism of the design.

For each scale, statements regarding the design features of a website are presented (e.g. “The colors are appealing.”), on which the user indicates her level of agreement on a seven point scale ranging from 1 (disagree) to 7 (agree). Table 1 presents the items.

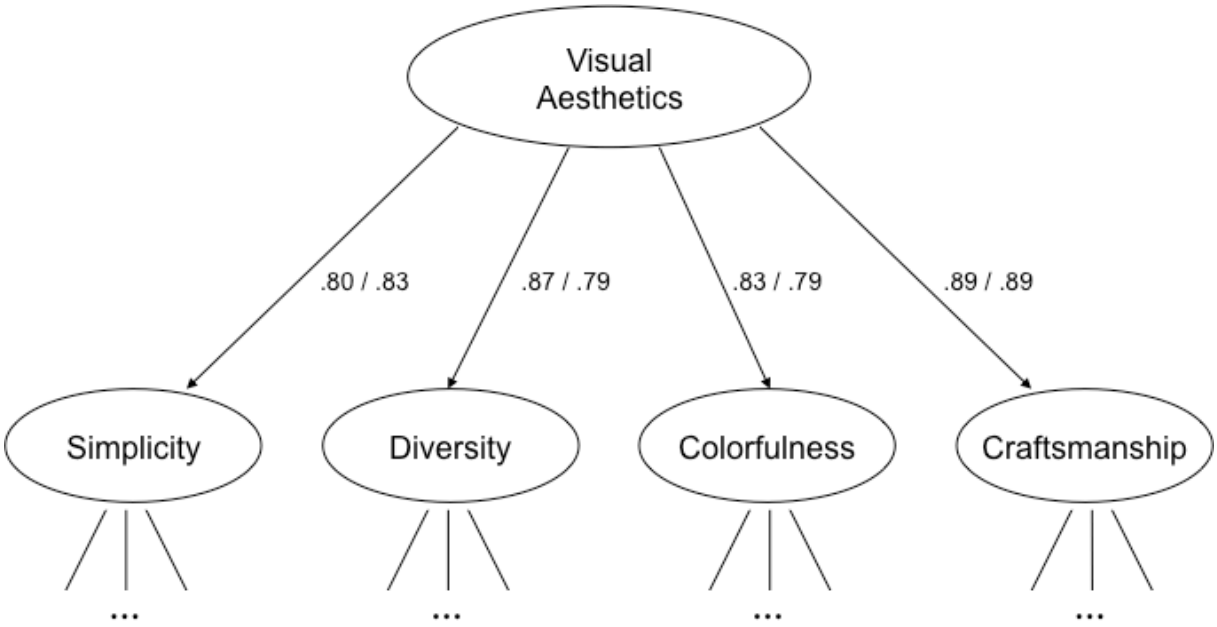

Figure 3. Structural model of the VisAWI. Second order factor loadings are presented as obtained in Moshagen & Thielsch (2010; study 3 / study 4).

2.2. Design

The design and the validation of the VisAWI relies on seven studies with a total sample of 2027 respondents (for a more detailed description see Moshagen & Thielsch, 2010). A preliminary version of the questionnaire, consisting of 96 items, was created based on an analysis of prior research on websites aesthetics as well as an expert survey. Several website tests and expert inspections led to a final version of the VisAWI with a total of 18 items (see Table 1), which were allocated between the four scales, each scale with four to five items. The factorial structure was determined via exploratory and confirmatory factor analyses. The result was a hierarchical factor model (see Figure 3), in which the four facets Simplicity, Diversity, Colorfulness and Craftsmanship are subordinated to a general higher order factor of visual aesthetics. This model was successfully confirmed for two independent samples and thus cross-validated.

2.3. Application

The VisAWI is mostly used online, although it can be applied in various ways, such as in the paper and pencil format. In the context of online testing, single items of the VisAWI can be displayed in one frame at the top of the screen, while the assessed website can be presented in the bottom section (with all items being completely randomized). Other forms of presentation are equally possible. When conducting a (live-) user test, there are likewise the possibilities to present all the items at once or the whole questionnaire in paper and pencil format. We recommend evaluating a website with at least 20 participants (in the case of a heuristic evaluation method, the sample size may be below 20 and the VisAWI can be used rather qualitatively). Completion times range between two and three minutes.

Furthermore, the VisAWI can be used to evaluate other graphical interfaces than websites. For software evaluation, the items should be revised by replacing words such as “site” or, if necessary, “layout” with terms that are easier to understand, such as “software”, “user interface” or “design”, in order to provide a better fit between the items and the subject of the evaluation (see Thielsch, Spieth et al., 2014).

To receive concrete suggestions for improvement (especially in formative assessment), the attachment of general or specific open-ended questions on the design of the evaluated interface is possible. Thielsch, Grobien and colleagues (2014), as well as Thielsch, Spieth and colleagues (2014) demonstrate several examples of the VisAWI’s practical application. These articles are available on www.VisAWI.de.

Table 1: Items of the VisAWI

	Item	Facet
(r)	The layout appears too dense.	Simplicity (α = .89)
	The layout is easy to grasp.	
	The layout appears well structured.	
(r)	The site appears patchy.	
	Everything goes together on this site.	
(r)	The design is uninteresting.	Diversity (α = .87)
	The layout is inventive.	
(r)	The design appears uninspired.	
	The layout appears dynamic.	
	The layout is pleasantly varied.	
	The color composition is attractive.	Colorfulness (α = .89)
(r)	The choice of colors is botched.	
(r)	The colors do not match.	
	The colors are appealing.	
	The layout appears professionally designed.	Craftsmanship (α = .85)
(r)	The layout is not up-to-date.	
	The site is designed with care.	
(r)	The design of the site lacks a concept.	

Note: Participants indicated their response in a seven-point likert scale (ranging from 1 „do not agree at all“ to 7 “do fully agree”). Negatively-keyed items are indicated by (r) and are reverse-scored. In parentheses the Cronbach’s alpha for each scale is given (Moshagen & Thielsch, 2010).

2.4. Analysis and Interpretation

The analysis starts with the recoding of the negatively-keyed items (see Table 1) by subtracting the actual score from 8. An example: If a participant indicates a value of 5 for the item 1 “The layout appears too dense”, the value of 5 is converted to a value of 8-5 = 3 (correspondingly:1 ↔ 7; 2 ↔ 6; 3 ↔ 5; 4 ↔ 4). Subsequently, overall means as well as means for each scale can be calculated, so that high scores represent a high value on the respective scale.

In order to calculate the means of each scale, the single values of each subscale are added up and the resulting sum is divided by the number of items of the respective subscale (e.g. the subscale “Simplicity” has the divisor: 5). The general factor, the overall mean of the questionnaire, can be calculated by adding all scale values and dividing them by the number of scales, that is 4.

If one wants to interpret the indicated values in the scales, it is essential to consider the subjective character of the evaluations. A high value on the scale “Colorfulness” does not indicate a particularly multicolored design, but a positive evaluation of the chosen color composition. This way of interpretation should be applied analogously for the other scales. Regarding the interpretation of the overall mean, a low value indicates a negative evaluation of the realized level of the design’s general aesthetics.

2.5. Objectivity and Reliability

For a standardized design, especially when it is carried out computer-based, the implementation objectivity can be easily achieved for the VisAWI. In the case of an automated analysis, this applies equally for the evaluation objectivity.

Research shows good to very good reliability scores, the internal consistency (Cronbach’s alpha) is $\alpha \geq .85$ (see Table 1) for all four scales and $\alpha = .94$ for the total value of the VisAWI (Moshagen & Thielsch, 2010).

2.6. Validity

The validity of the VisAWI was checked by using various strategies: The VisAWI’s hierarchic factorial structure was determined via exploratory and confirmatory factor analysis, successfully verified by two independent samples and thus cross-validated. Three studies demonstrated the convergent, divergent, discriminant and concurrent validities (see Moshagen & Thielsch, 2010). There were moderate to high correlations with related constructs and similar measuring instruments. For instance, the correlations with the measuring instrument of Lavie and Tractinsky (2004) range between .52 and .82 for the scale of classical aesthetics and between .52 and .82 for the scale of expressive aesthetics. There are also high correlations ($.60 \leq r \leq .80$) with the scale of attractiveness from the AttrakDiff 1 (see Hassenzahl, Burmester & Koller, 2003). This is an indication for convergent validity.

The VisAWI correlates lower with divergent constructs, such as with the scale of pragmatic quality from the AttrakDiff ($.41 \leq r \leq .77$), with a usability scale from Flavián, Guinalíu and Gurrea (2006, $.04 \leq r \leq .48$) or with an instrument for the evaluation of the content quality (Thielsch, 2008). But, it becomes apparent, that especially the VisAWI’s scale of Simplicity correlates highly with aspects of pragmatics or usability (see Moshagen & Thielsch, 2010, p. 700). Furthermore, there are partly medium and high correlations with divergent constructs. This can be put down to a variety of causes. Particularly in the focus of discussion are the mutual interactions (or halo effects) between the aesthetics and constructs such as usability. Web designers will try to optimize aspects such as the content, the usability and the aesthetics to the same extent. Consequently, it is unlikely for them to be completely inde-

pendent from each other. At this point, a close experimental examination is necessary to ensure the validity.

For this reason, two experimental validations were conducted. They indicated that, on the one hand, the different facets of the VisAWI respond to systematic variation of a website's layout. On the other hand, the facets react specifically to particular manipulations. A modification in the color scheme, for instance, affects the evaluations on the facet of Colorfulness, but not on the other facets. Furthermore, discriminant validity was found: The VisAWI is able to differentiate websites significantly regarding their aesthetics (in a MANOVA with the websites as independent variables and the VisAWI as dependent variable, see Moshagen & Thielsch, 2010, p. 700), even for large sets of real websites (in this case a pool of 42 websites from nine different content areas).

Moreover, the VisAWI reliably predicted the intention to revisit the site (as a measure of concurrent validity). The correlation of the general factor with a scale of the intention to revisit is .51, the subscales of the VisAWI correlate with the intention to revisit in the range of $.40 \leq r \leq .48$. These correlations are of high relevance, for the reason that other factors, such as the content, strongly influence the intention to revisit a website (cf. Thielsch et al., 2014).

2.7. Norms stratified by age and gender

The data of five studies were combined for the standardization of the VisAWI (see Thielsch & Moshagen, 2011). A total of 2843 participants (1742 women and 1096 men), ranging from 14 to 82 years of age (M = 26.95; SD = 9.68), evaluated 102 websites. The correlations between the VisAWI and **age** are low, but significant (General factor: r = .10; Simplicity: r = .12; Diversity: r = .08; Colorfulness: r = .07; Craftsmanship: r = .05). Previous analyses thus suggest that effects of age are negligible. However, a standardization according to age groups might be relevant for some projects – hence, it is to be found in Table 2.

Both in the standardization of Thielsch and Moshagen (2011) as well as in the analysis of Thielsch, Spieth et al. (2014), the VisAWI proved robust towards **gender effects**: For instance, there is only a small difference of 0.11 (M_{Men} = 4.02; M_{Women} = 4.13) between men and women in the General factors in the standardization of 2011 (Thielsch & Moshagen, 2011). Although this difference is significant because of the sample size ($F_{1,\ 2842}$ = 5.30, p = .02, η^2 < .01), the standardized mean difference effect size[1] of d = 0.08 indicates, that this gender effect has practically little to no relevance. There is no significant gender effect for the subscale Simplicity, the other three scales yielded small or very small effects ($d_{Diversity}$ = 0.18; $d_{Colourfulness}$ = 0.10; $d_{Craftsmanship}$ = 0.09).

A benchmark data analysis of 2014 (Thielsch, Spieth et al., 2014) yields comparable results. The difference in the VisAWI's General factor between men and women solely amounted to 0.08 points on the scale (M_{Men} = 4.46; M_{Women} = 4.54). Again, this difference is statistically significant as result of the large sample size ($F_{1,\ 2842}$ = 5.49, p = .02, η^2 < .01), but an effect size of d = 0.06 indicates a negligible effect. There is no significant gender effect for the subscale Simplicity, the other three scales also yield small or very small effects ($d_{Diversity}$ = 0.06;

[1] According to Cohen (1998), standardized mean differences of d = 0.2 are considered as small effects, differences of d = 0.5 are considered as medium effects and differences of d = 0.8 are considered as large effects.

$d_{Colourfulness}$ = 0.07; $d_{Craftsmanship}$ = 0.06). Consequently, gender effects can as well be disregarded on a scale level.

Table 2: Standardization of the VisAWI: Overall means and means for each scale as functions of the age group.

Age group		General factor	Simplicity	Diversity	Colorfulness	Craftsmanship
14-19 years	*M*	4.10	4.31	3.44	4.24	4.53
n = 194	*SD*	1.05	1.30	1.20	1.41	1.19
20-29 years	*M*	4.04	4.13	3.47	4.23	4.44
n = 2034	*SD*	1.22	1.47	1.30	1.57	1.43
30-39 years	*M*	4.15	4.29	3.58	4.38	4.45
n = 315	*SD*	1.24	1.57	1.36	1.51	1.45
40-49 years	*M*	4.24	4.52	3.60	4.44	4.49
n = 156	*SD*	1.28	1.48	1.45	1.60	1.45
50-59 years	*M*	4.53	4.82	3.94	4.51	4.95
n = 100	*SD*	1.38	1.56	1.63	1.59	1.41
60 years and older	*M*	4.55	4.85	3.89	4.91	4.63
n = 44	*SD*	1.44	1.59	1.63	1.48	1.73
Total sample	*M*	4.09	4.21	3.51	4.28	4.47
N = 2843	*SD*	1.23	1.49	1.33	1.56	1.43

Note: For the reason that gender effects are negligible due to their small size, the values for men and women are summarized (Thielsch & Moshagen, 2011).

2.8. Benchmarks and Threshold Values for the VisAWI

The following portrays the benchmarks for German-language websites and mobile apps, which were tested with the full version of the VisAWI (from Thielsch, Spieth et al., 2014); excluded were prototypes and Non-German language websites. There were n = 5766 remaining evaluations of m = 162 websites. 57.1 percent of the participants were women, with an age ranging from 14 to 83 years (*M* = 32.21, *SD* = 12.69). Greater differences appear when comparing the evaluated websites after sorting them by category (information on the categorization scheme can be found in Thielsch, 2008; p. 86f. and in Table 4). There are significant differences for the VisAWI General factor ($F_{9, 5753}$ = 60.51, $p < .01$, η^2 = .09), as well as for the subscales ($F_{36, 23012}$ = 41.04, $p < .01$, η^2 = .06) (effects of age and gender were controlled). A depiction of the benchmark values can be found in Table 3. For the first time, the evaluations

of mobile apps are specified, in which the VisAWI evaluations of different financial service providers are included.

Table 3: Benchmark of the VisAWI: Overall means as well as means for each scale as functions of a website category

Category	General factor		Simplicity		Diversity		Colorfulness		Craftsmanship	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Download & Software (m = 8; n = 96)	3.67	0.97	3.43	1.34	3.04	1.23	4.15	1.24	4.05	1.07
E-Commerce (m = 15; n = 194)	4.05	1.17	3.76	1.47	3.64	1.26	4.33	1.50	4.45	1.25
Entertainment (m = 7; n = 201)	3.90	1.15	3.86	1.42	3.64	1.23	3.70	1.47	4.40	1.40
E-Learning (m = 5; n = 70)	4.43	1.26	4.59	1.35	3.88	1.47	4.51	1.60	4.74	1.42
E-Recruiting & E-Assessment (m = 11; n = 241)	4.21	1.24	4.25	1.47	3.64	1.28	4.36	1.51	4.60	1.39
Information (m = 24; n = 628)	4.08	1.26	4.33	1.41	3.35	1.35	4.28	1.61	4.34	1.47
Portals (m = 10; n = 1505)	4.72	1.20	4.80	1.37	4.36	1.35	4.76	1.29	4.95	1.28
Presentation & Self-portrayal (m = 39; n = 1407)	4.47	1.15	4.42	1.40	3.81	1.35	4.72	1.41	4.95	1.26
Weblogs and Social Sharing (m = 12; n = 178)	3.81	1.23	3.64	1.44	3.43	1.31	4.14	1.50	4.01	1.42
Search engines (m = 12; n = 291)	4.02	1.13	4.54	1.29	3.13	1.28	4.22	1.49	4.19	1.34
Mobile Apps (m = 19; n = 955)	5.18	0.98	5.35	1.01	4.84	1.19	5.18	1.08	5.35	1.05
Total score (m = 162; N = 5766)	4.51	1.22	4.58	1.42	4.00	1.41	4.64	1.41	4.81	1.33

Note: *M* = mean, *SD* = standard deviation, m = number of evaluated websites in one category, n = number of participants. The VisAWI evaluations of different financial service providers are included in the mobile apps category.

Table 4: Explanation of the category system.

Category	Explanation	Example of websites
Download & Software	Websites, which provide content, programs or codes as free – or fee based downloads.	http://de.selfhtml.org, http://downloads.de, http://www.freeware.de, http://www.heise.de/software, http://www.java.de
E-Commerce	Websites, which focus primarily on purchase and sale.	http://www.amazon.de, http://www.ebay.de, http://www.golop.de, http://www.kelkoo.de, http://www.mobile.de
E-Learning	Online learning content and learning websites.	http://ihk.elearningspace.de, http://www.bildung.at, http://www.elearningeuropa.info, http://www.moodle.de, http://www.sgd.de
E-Recruiting & E-Assessment	Websites that are clearly intended for personal recruitment or –selection.	http://www.jobpilot.de, http://www.jobscout24.de, http://www.jobware.de, http://www.monster.de, http://www.stepstone.de
Entertainment	Websites, which have the primary goal of entertainment [this includes the passive use of social sharing websites].	http://de.youtube.com, http://www.myspass.de, http://www.promi-star.de, http://www.spiele-zone.de, http://www.wow-europe.com
Information	Websites of a purely informative nature [this includes blogs and passively used wikis (only reading)].	http://de.wikipedia.org, http://www.faz.net, http://www.n-tv.de, http://www.sueddeutsche.de, http://www.stern.de
Portals	Websites, which give an overview of various different topics and respectively provide information as well as affiliated links or services.	http://www.aol.de, http://www.freenet.de, http://www.gmx.de, http://www.t-online.de, http://www.web.de
Presentation & self-portrayal	The glossy brochure of organizations on the web – everything that purely serves corporate identity and self-portrayal.	http://www.bayer.de, http://www.bertelsmann.de, http://www.daimler.com, http://www.hochtief.de, http://www.rwe.de
Social software	Websites, which serve the objective of either a virtual chronological diary, a collaborative text editing, a direct networking or interaction with other users, or websites that allow the sharing of resources (e.g. pictures, link collections, videos etc.).	http://www.blog.de, http://www.facebook.com, http://jurawiki.de, http://www.lokalisten.de, http://www.xing.de
Search engines	Websites, which are intended for the search of other websites, products, services or similar.	http://www.de.altavista.com, http://www.bing.com/ http://www.fireball.de, http://www.google.de, https://www.ixquick.com

Occasionally, a website that has to be checked does not fit into the aforementioned benchmarking scheme. An **analysis of threshold values** of the VisAWI (Hirschfeld & Thielsch, 2015) indicates that participants usually experience websites as rather positive starting from an overall evaluation value of 4.5. Therefore, one possible objective for a website's redevelopment, for instance, would be to slightly exceed an evaluation of 4.5. In cases where the available resources are not sufficient to maximize the aesthetics, but the achieved value should be considered acceptable, such as in prototyping, this information may be useful.

3. The short version VisAWI-S

3.1. Description

There are various situations that require a very short questionnaire for the assessment of web aesthetics, such as situations with either different topics in the main focus or with a limited number of questions asked in general. In such contexts, the VisAWI with its 18 items appears exceedingly long. For this reason, the short version of the VisAWI, the VisAWI-S (Visual Aesthetics of Websites Inventory - Short; Moshagen & Thielsch, 2013) was created. However, the VisAWI-S solely assesses a general factor of aesthetics. If the interest lies in the individual facets, the application of the complete VisAWI is recommended.

3.2. Design

The VisaÁWI-S was developed and validated in three studies with a total of 1673 participants (for a detailed description see Moshagen & Thielsch, 2013). For the reason that the VisAWI-S is only assessing the general factor of aesthetics, the objective of the design was to represent every facet of the VisAWI with at least one item (see Table 5). Thus, the items were chosen on the basis of content-related criteria as well as of the factor loadings in the original VisAWI. A confirmatory factor analysis of the four chosen items shows both an excellent fit and indicates, that the items represent the latent general factor of website aesthetics.

Table 5: Items of the short version VisAWI-S.

Item	Facet
Everything goes together on this site.	
The layout is pleasantly varied.	g-factor aesthetics
The color composition is attractive.	(.76 ≤ α ≤ .81)
The layout appears professionally designed.	

Note: Participants indicated their response in a seven-point likert scale (ranging from 1 „do not agree at all“ to 7 “do fully agree”). In parentheses the Cronbach's alpha for each scale is given (Moshagen & Thielsch, 2010).

3.3. Application

The VisAWI-S is ideally suited to situations, in which a general assessment of aesthetics and the use of few items are desired. The possible forms of presentation are analogous to those of the VisAWI (see Section 2.3.). We recommend evaluating a website with at least 20 participants (in the case of a heuristic evaluation method, the sample size may be below 20 and the VisAWI-S can be used rather qualitatively). The duration of its completion is less than one minute.

Furthermore, the VisAWI can be used to evaluate other graphical interfaces than websites. For software evaluation, the items should be revised by replacing words such as “site” or “layout” with terms that are easier to understand, such as “software” or “user interface”, in order to provide a better fit between the items and the subject of the evaluation (see Thielsch, Spieth et al., 2014). To receive concrete suggestions for improvement (especially in formative assessment), the attachment of general or specific open-ended questions on the design of the evaluated interface is possible.

3.4. Analysis and Interpretation

For the reason that the VisAWI-S solely consists of four items, their values should be used for calculating a mean value: The single item values are summed and divided by four. This mean value represents the general factor of aesthetics that was found in the model of the VisAWI (see Figure 1). If one wants to interpret the indicated values of the single faces, the application of the complete version of the VisAWI is recommended. By analogy to the interpretation of the complete version of the VisAWI, it is equally essential for the VisAWI-S to consider the subjective character of the evaluations (see Section 2.4.).

3.5. Objectivity and Reliability

For a standardized design, especially when it is carried out computer-based, the implementation objectivity can be easily achieved for the VisAWI-S. In the case of an automated analysis, this applies equally for the evaluation objectivity.

The short version is sufficiently reliable for analyses at group level (each study $.76 \leq \alpha \leq .81$) and correlates highly with the complete version ($r = .91$, see Moshagen & Thielsch, 2013).

3.6. Validity

Similarly to the VisAWI, the validity of the VisAWI-S was checked by using various strategies: A confirmatory factor analysis indicated an excellent fit of the model – the VisAWI-S represents the general factor of website aesthetics. Exactly as the complete version, the short version possesses convergent, divergent and concurrent validities: On the one hand, there are high correlations with the scale of attractiveness from the AttrakDiff ($r = .72$). On the other hand, there are low correlations with divergent measurements such as Usability ($r = .54$), the scale of pragmatic quality from the AttrakDiff ($r = .53$) and with various content ratings from the WWI such as Favor ($r = .49$), Intelligibility ($r = .34$), or Quality and Use ($r = .41$). The

mood of the participants (assessed using the MDBF of Steyer et al., 1997) had no significant influence (cf. Moshagen & Thielsch, 2013), which is also an indication for divergent validity. The high correlation of the VisAWI-S with the intention to revisit (r = .52) serves as an indication for the concurrent validity. The latter is particularly remarkable, considering that further factors, such as the content, strongly influence the intention to revisit a website (cf. Thielsch et al., 2014).

3.7. Benchmarks and Threshold values for the VisAWI-S

For the VisAWI's short version, the benchmarks are equally portrayed for German-language websites only (from Thielsch, Spieth et al., 2014). Altogether, there are n = 6797 evaluations of m = 290 websites. 72.7 percent of the participants were women, with an age ranging from 14 to 88 years (M = 29.04, SD = 10.45). Like the VisAWI, the VisAWI-S shows no significant **gender effects**: The difference in the General factor between men and women solely amounted to 0.09 points on the scale (M_{Men} = 4.47; M_{Women} = 4.38). Again, this difference is significant because of the sample size ($F_{1, 2842}$ = 5.49, p = .02, η^2 < .01), but an effect size of d = 0.06 indicates a negligible effect. The correlations between the VisAWI-S and the age of the participants are significant, but very small (r = .05; p < .01).

The data of the VisAWI-S yield different results for different website categories ($F_{36, 6779}$ = 39.36, p < .01, η^2 = .05; effects of age and gender were controlled). A depiction of the benchmark values can be found in Table 6.

Table 6: Benchmarking of the VisAWI-S: Values of the short version as a function of the website category

Category	*M*	*SD*	*m*	*n*
Download & Software	3.63	1.30	29	441
E-Commerce	4.57	1.39	31	431
Entertainment	3.95	1.33	30	427
E-Learning	4.39	1.27	24	318
E-Recruiting & E-Assessment	4.46	1.28	30	416
Information	4.60	1.36	35	2005
Portals	4.17	1.36	35	515
Presentation & Self-portrayal	4.68	1.46	42	1370
Weblogs and Social Sharing	4.54	1.31	30	381
Search Engines	3.92	1.41	33	493
Total Sample	4.41	1.40	290	6797

Note: M = Mean, SD = Standard deviation, m = Number of evaluated websites in each category, n = Number of participants.

Equally as for the VisAWI, an **analysis of threshold values** of the VisAWI-S (Hirschfeld & Thielsch, 2015) indicates that participants usually experience websites as rather positive starting from an overall evaluation value of 4,5. Therefore, one possible objective for a web-

site's redevelopment, for instance, would be to slightly exceed an evaluation of 4,5. In cases where the available resources are not sufficient to maximize the aesthetics, but the achieved value should be considered acceptable, such as in prototyping, this information may be useful.

4. Language versions

The VisAWI as well as the VisAWI-S are currently available in both German and English (see Appendix). At present, further language versions are in preparation.

5. Conclusion

The development of the VisAWI and of the short version VisAWI-S, was a complex process. Both instruments are characterized by high objectivity, reliability and validity, as well as by an economic applicability. From the user's perspective, the VisAWI assesses a general factor of website aesthetics as well as the four facets Simplicity, Diversity, Colorfulness and Craftsmanship, whereas the VisAWI-S assesses solely the general factor. Both instruments are suited for formative as well as for summative website evaluations, especially the VisAWI-S is advisable here due to its shortness. Thus, the VisAWI-S provides an efficient screening of website aesthetics, especially in situations with different topics in the main focus or with a limited number of questions asked in general.

After both instruments have been designed, they were successfully implemented in various research- and practice-based projects of website evaluation (see http://scholar.google.com/scholar?cites=12037630614351493995 or Thielsch, Grobien et al., 2014; Thielsch, Spieth et al., 2014). We are able to provide initial comparative values for website evaluations. We hope that future users of the VisAWI and the VisAWI-S will support us in expanding the benchmarking. Moreover, the questionnaires have already been used to evaluate prototypes, apps, software or even other media products such as business reports or magazine covers. Hence in future, different scopes of application as well as the combination with different methods (particularly qualitative methods) are conceivable.

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Appendix and paper versions

Table A: Items of the VisAWI and the VisAWI-S in German and English.

	Item Deutsch	Item English
	Einfachheit | Simplicity (α = .89)	
(r)	Das Layout wirkt zu gedrängt.	The layout appears too dense.
	Das Layout ist gut zu erfassen.	The layout is easy to grasp.
	Das Layout erscheint angenehm gegliedert.	The layout appears well structured.
(r)	Die Seite erscheint zu uneinheitlich.	The site appears patchy.
	Auf der Seite passt alles zusammen. *	Everything goes together on this site. *
	Vielseitigkeit | Diversity (α = .87)	
(r)	Die Seitengestaltung ist uninteressant.	The design is uninteresting.
	Das Layout ist originell.	The layout is inventive.
(r)	Die Gestaltung wirkt einfallslos.	The design appears uninspired.
	Das Layout wirkt dynamisch.	The layout appears dynamic.
	Das Layout ist angenehm vielseitig. *	The layout is pleasantly varied. *
	Farbigkeit | Colorfulness (α = .89)	
	Die farbliche Gesamtgestaltung wirkt attraktiv. *	The color composition is attractive. *
(r)	Die Farben passen nicht zueinander.	The colors do not match.
(r)	Der Farbeinsatz ist nicht gelungen.	The choice of colors is botched.
	Die Farben haben eine angenehme Wirkung.	The colors are appealing.
	Kunstfertigkeit | Craftsmanship (α = .85)	
	Das Layout ist professionell. *	The layout appears professionally designed. *
(r)	Das Layout ist nicht zeitgemäß.	The layout is not up-to-date.
	Die Seite erscheint mit Sorgfalt gemacht.	The site is designed with care.
(r)	Das Layout wirkt konzeptlos.	The design of the site lacks a concept.

Note: Items marked with an asterisk (*) are included in the shortened VisAWI-S. Negatively-keyed items are indicated by (r) and are reverse-scored. : Participants indicated their response in a seven-point likert scale (ranging from 1 „do not agree at all“ to 7 “do fully agree”).

Paper versions of the VisAWI and the VisAWI-S

On the following pages you will find paper-pencil versions of the questionnaire in German and English.

VisAWI - Visual Aesthetics of Websites Inventory

Bitte beurteilen Sie auf einer Skala von 1 (stimme gar nicht zu) bis 7 (stimme voll zu), inwieweit Sie den folgenden Aussagen in Bezug auf die Ihnen vorliegende Website zustimmen. Vielen Dank!

	Stimme gar nicht zu	*Stimme nicht zu*	*Stimme eher nicht zu*	*neutral*	*Stimme eher zu*	*Stimme zu*	*Stimme voll zu*
1. Das Layout wirkt zu gedrängt.	①	②	③	④	⑤	⑥	⑦
2. Das Layout ist gut zu erfassen.	①	②	③	④	⑤	⑥	⑦
3. Das Layout erscheint angenehm gegliedert.	①	②	③	④	⑤	⑥	⑦
4. Die Seite erscheint zu uneinheitlich.	①	②	③	④	⑤	⑥	⑦
5. Auf der Seite passt alles zusammen.	①	②	③	④	⑤	⑥	⑦
6. Die Seitengestaltung ist uninteressant.	①	②	③	④	⑤	⑥	⑦
7. Das Layout ist originell.	①	②	③	④	⑤	⑥	⑦
8. Die Gestaltung wirkt einfallslos.	①	②	③	④	⑤	⑥	⑦
9. Das Layout wirkt dynamisch.	①	②	③	④	⑤	⑥	⑦
10. Das Layout ist angenehm vielseitig.	①	②	③	④	⑤	⑥	⑦
11. Die farbliche Gesamtgestaltung wirkt attraktiv.	①	②	③	④	⑤	⑥	⑦
12. Die Farben passen **nicht** zueinander.	①	②	③	④	⑤	⑥	⑦
13. Der Farbeinsatz ist nicht gelungen.	①	②	③	④	⑤	⑥	⑦
14. Die Farben haben eine angenehme Wirkung.	①	②	③	④	⑤	⑥	⑦
15. Das Layout ist professionell.	①	②	③	④	⑤	⑥	⑦
16. Das Layout ist nicht zeitgemäß.	①	②	③	④	⑤	⑥	⑦
17. Die Seite erscheint mit Sorgfalt gemacht.	①	②	③	④	⑤	⑥	⑦
18. Das Layout wirkt konzeptlos.	①	②	③	④	⑤	⑥	⑦

Originalveröffentlichung zum VisAWI - Visual Aesthetics of Websites Inventory: Moshagen, M. & Thielsch, M. T. (2010). Facets of visual aesthetics. *International Journal of Human-Computer Studies, 68*, 689-709. Weitere Infos: www.VisAWI.de

VisAWI-S - Visual Aesthetics of Websites Inventory: Kurzversion

Bitte beurteilen Sie auf einer Skala von 1 (stimme gar nicht zu) bis 7 (stimme voll zu), inwieweit Sie den folgenden Aussagen in Bezug auf die Ihnen vorliegende Website zustimmen. Vielen Dank!

	Stimme gar nicht zu	*Stimme nicht zu*	*Stimme eher nicht zu*	*neutral*	*Stimme eher zu*	*Stimme zu*	*Stimme voll zu*
1. Auf der Seite passt alles zusammen.	①	②	③	④	⑤	⑥	⑦
2. Das Layout ist angenehm vielseitig.	①	②	③	④	⑤	⑥	⑦
3. Die farbliche Gesamtgestaltung wirkt attraktiv.	①	②	③	④	⑤	⑥	⑦
4. Das Layout ist professionell.	①	②	③	④	⑤	⑥	⑦

Originalveröffentlichung zur Kurzversion des VisAWI - Visual Aesthetics of Websites Inventory: Moshagen, M. & Thielsch, M. T. (2013). A short version of the visual aesthetics of websites inventory. *Behaviour & Information Technology, 32* (12), 1305-1311. Weitere Infos finden sich auf www.VisAWI.de

VisAWI - Visual Aesthetics of Websites Inventory

Please judge the present website according to the following statements on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), thank you very much!

	Strongly disagree	*Disagree*	*Somewhat disagree*	*Neither agree nor disagree*	*Somewhat agree*	*Agree*	*Strongly agree*
1. The layout appears too dense.	①	②	③	④	⑤	⑥	⑦
2. The layout is easy to grasp.	①	②	③	④	⑤	⑥	⑦
3. The layout appears well structured.	①	②	③	④	⑤	⑥	⑦
4. The site appears patchy.	①	②	③	④	⑤	⑥	⑦
5. Everything goes together on this site.	①	②	③	④	⑤	⑥	⑦
6. The design is uninteresting.	①	②	③	④	⑤	⑥	⑦
7. The layout is inventive.	①	②	③	④	⑤	⑥	⑦
8. The design appears uninspired.	①	②	③	④	⑤	⑥	⑦
9. The layout appears dynamic.	①	②	③	④	⑤	⑥	⑦
10. The layout is pleasantly varied.	①	②	③	④	⑤	⑥	⑦
11. The color composition is attractive.	①	②	③	④	⑤	⑥	⑦
12. The colors do **not** match.	①	②	③	④	⑤	⑥	⑦
13. The choice of colors is botched.	①	②	③	④	⑤	⑥	⑦
14. The colors are appealing.	①	②	③	④	⑤	⑥	⑦
15. The layout appears professionally designed.	①	②	③	④	⑤	⑥	⑦
16. The layout is not up-to-date.	①	②	③	④	⑤	⑥	⑦
17. The site is designed with care.	①	②	③	④	⑤	⑥	⑦
18. The design of the site lacks a concept.	①	②	③	④	⑤	⑥	⑦

Reference for the VisAWI - Visual Aesthetics of Websites Inventory: Moshagen, M. & Thielsch, M. T. (2010). Facets of visual aesthetics. *International Journal of Human-Computer Studies, 68*, 689-709. Further information: www.VisAWI.de

VisAWI-S - Visual Aesthetics of Websites Inventory: Short version

Please judge the present website according to the following statements on a scale ranging from 1 (strongly disagree) to 7 (strongly agree), thank you very much!

	Strongly disagree	*Disagree*	*Somewhat disagree*	*Neither agree nor disagree*	*Somewhat agree*	*Agree*	*Strongly agree*
1. Everything goes together on this site.	①	②	③	④	⑤	⑥	⑦
2. The layout is pleasantly varied.	①	②	③	④	⑤	⑥	⑦
3. The color composition is attractive.	①	②	③	④	⑤	⑥	⑦
4. The layout appears professionally designed.	①	②	③	④	⑤	⑥	⑦

Reference for the VisAWI-S, the short version of the Visual Aesthetics of Websites Inventory: Moshagen, M. & Thielsch, M. T. (2013). A short version of the visual aesthetics of websites inventory. *Behaviour & Information Technology, 32* (12), 1305-1311. Further information: www.VisAWI.de