Are De-Facto Standards a Useful Guide for Designing Human-Computer Interaction Processes? The Case of User Interface Design for Web Based B2C Product Configurators

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Abstract

In order to assess the usefulness of de-facto design standards as a guide for designing human-computer interactions, this case study attempts to identify if and which kind of design standards exist for web-based product configurators – systems that allow consumers to design their own products, and are characterized by a particularly high level of interactivity. Using the world’s largest configurator database in combination with a grid-classification of different user interface designs, 126 such configurators in three different industries (electronics, apparel, automotive) are examined and made comparable. The case study reveals more differences than similarities, placing the usefulness of de-facto standards as a design guideline for human-computer interactions into question.

1. Introduction

Developers of interactive systems emphasize that system success depends on an appropriate, user-friendly interface [19]. In developing design guidelines for such systems, researchers more often than not emphasize the importance of de-facto standards. The world-wide web in particular has seen a rapid emergence of web-specific conventions and standards for designing websites and e-commerce environments. This results in users expecting a certain type of user-interface and developing specific habits of use [3] – covering even such details as the placement of login fields, shopping baskets, help buttons and other web objects.

At present, however, no research has been undertaken to identify design standards for user-interfaces used in web based Business-to-Consumer (B2C) product configurators – complex online systems that allow consumers to design and purchase their own, personalized products. Such configurators pose a particular challenge to system designers, and the available research dealing with product configurators

has primarily focused on testing their usability, use-value and overall desirability [18].

The present case study seeks to bring together the research on design guidelines and configurator usability by examining the user interfaces of 126 configurators in the automotive, electronics and apparel industries in terms of design standards. Using a grid classification of user interface designs, it becomes possible to identify standards within and across industries, shedding light both on actual design practice and the usefulness of de facto standards as design guidelines for human-computer interactions.

The sample for this case study was assembled using the world’s largest configurator database (www.configurator-database.com), which was made available online in 2007 by the authors and presently covers over 500 configurators in 28 industries, listing 80 attributes for each entry.

2. Review of literature

2.1. Configuration systems for mass customization

The ‘new consumer’ as described by Lewis and Bridger [9] is an active, well-informed and independent individual seeking authenticity. These new consumers are anti-conformist and seek agency in the production and consumption process.

Companies can respond by pursuing a strategy of mass customization. The aim of mass customization is to offer diverse, customer-centric products and services, at prices comparable to conventional mass production. Ideally, it offers a means for guaranteeing that every customer is served with a product corresponding exactly to her needs.

A wide range of large corporations, including the likes of Audi and Adidas, have attained remarkable results in implementing this approach [14]. Müller-Seegers foresees a future in which mass customization is of an importance comparable to e-commerce [10]. While the strategy is currently most widely deployed in...
North America, Sailer finds significant potential for its application in Europe [16].

Where mass customization has been put into practice, a configurator usually functions as the principle interface between the company and its customers [6]. It allows customers to choose between all the different product features, options and technically viable combinations, thus providing a potent tool for creating one’s own product [7].

2.2. User interface design und usability for configurators

Dockenfuß introduces us to the importance of simplicity and facility in designing user interfaces for configurators when he writes that “a user who creates her own products expects a graphic design that is easy to interpret and use, and employs a familiar terminology” [5]. By simplifying the configuration process, a configurator compensates for consumers’ lack of technical expertise.

In this way, the user interface of a web-based configurator becomes a decisive criterion for customer satisfaction. It is the single most important point of contact between a company and its customers, and must persuade the latter to make a purchase in spite of significant insecurities, as identified by Totz and Riemer [20]:

- General insecurities of online purchasing and paying online.
- Customer doubts encountered during the design process.
- Unknown nature and quality of a product that does not yet exist and cannot be fully anticipated.

Salvador and Forza suggest that these insecurities are best counteracted by a strategy of simplification [17]. For example, the complexities of a configuration process can be reduced from the users’ point of view by using a language and tone appropriate to the target group. Thus, product components might be described either in intuitive, emotional or strictly technical terms.

Rogoll und Piller expand on this approach by offering a combined set of usability guidelines for designing a successful configurator [15]:

**Usability and intelligibility:** Users should be able to use a configurator intuitively and experience success in doing so. Guidance is a key factor in achieving this. For example, the configuration process should be coherently structured along clear navigation paths.

**Orientation:** The configurator should put all its functions and options at users’ fingertips. Users often have no exact idea what a configurator allows them to do. Therefore, the entire process must be made transparent and accessible, providing easy orientation.

**Information design:** Since every user perceives and processes information differently, it is important that a configurator is also able to present information in different ways. This ensures that users can absorb information in the way most suitable for them. For example, information can be predominantly textual or visual, organized numerically, alphabetically, or in countless other ways.

**Loading speed:** Websites in general should not waste users’ time and be quick to load. In particular, configurators with a strong emphasis on visualization need to ensure that loading times stay within reasonable limits.

**Support:** Configurators should offer a relevant level of support that does not flood users with unnecessary information. A help function is useful only in so far as it is capable of giving specific support for specific problems.

The importance of guidelines for configurator design is drastically highlighted by Nielsen, who argues that while improving usability of conventional e-commerce sites might increase turnover by up to 100%, a well-designed configurator that excels in terms of usability can potentially increase a company’s turnover by up to 500% [11].

2.2.1. The significance of web standards. What design guidelines are in theory, design standards are in practice. Nielsen suggests that users have already become accustomed to a wide range of web elements and have developed specific expectations concerning their form and function. Web standards thus emerge by default [12]. They can be categorized into three different types.

If a given web-element is designed in the same way on 80% and more of websites, they are described by Nielsen and Loranger [13] as a ‘de-facto standard’. Users expect these elements to be designed the same way on any new website they might visit, since the same elements are also present on all other websites.

Web elements that are similarly designed on 50-79% of all websites are termed a ‘convention’ by Nielsen, that is to say a guideline [12]. Users visiting new websites expect such conventional elements to be located in specific places and to offer similar functionalities, corresponding to what is experienced on most other websites.

However, there are also web elements whose design is similar on only 49% or less of all websites. These designs are based on a plurality of methods and approaches, defying users habits and expectations. While they might be an important source of future innovations, their immediate impact is usually to confuse users; unsurprisingly, Nielsen and Loranger see no case for adopting such designs [13].
Overall, there exists a vast number of ‘de-facto’ standard web-elements. Many of these are documented in the literature, for example:

- It is advisable to place a logo on the left-upper corner of the screen, and to use this as a link to the homepage [1].
- Underlined words on a website usually refer to clickable links and serve as a means for typographic differentiation within normal text [2].
- When a link has been clicked once, its color should change to remind the user that it has already been used. The color change also allows users to rapidly identify links that have not yet been used [2].
- The check-out button on an e-commerce website is usually located on the bottom edge of a website, since customers usually revise an order from top to bottom. It follows that the check-out button should only appear at the very end of the sales process [13].

2.3. The significance of web object placement

The development of the internet has not only led to expectations and standards concerning web elements – the underlying design structures of websites have also gravitated towards specific standards that shape users’ expectations. If certain kinds of information or buttons are not positioned in the usual places, they are liable to be overlooked or cause confusion [13].

Thus the placement of web elements on the user interface is as significant as their design. In a characteristic experiment, Nielsen replaced the term ‘shopping cart’ on an e-commerce website with ‘shopping sledge’. Although half of the users questioned could not understand the meaning of the new term and thus ignored it, the other half was able to deduce its meaning and function because it was placed in the standard ‘shopping cart’ position. In this way, users are able to identify different ‘shopping cart’ buttons as such, irrespective of design or name, since they are all located in the same place [4].

The downside of this ‘reading by position’ is that deviations from the standard placement can quickly create insurmountable obstacles in an e-commerce user interface, leading to stalled or cancelled sales processes [3].

3. Empirical analysis of web based product configuration systems

3.1. Research aims

Following the themes set out by the literature review, the present case study focuses on identifying if and which kind of web-standards exist for configurators, based on an empirical analysis of the automobile, electronic and apparel industries. Particular attention is given to the placement of web-objects within user interfaces (such as buttons, menus, text fields, etc), but other attributes of web-based configurators such as degree of integration, visual feedback, and overall configuration logic are also taken into consideration as appropriate.

3.2. Method

The present study is based on a sample of 126 web-based Business-to-Consumer (B2C) configurators in the automobile, electronic and apparel industries. The sample was assembled with aid of the free online configurator database www.configurator-database.com, provided by cyLEDGE Media GmbH, Vienna, Austria. Based on the literature review, the following, universally employed web objects were selected for analysis:

- Logo
- Help-Button
- Horizontal navigation bar
- Product image(s)
- Selection box(es) used for the configuration process
- Prices and/or price tables
- Back- and forward-buttons
- Shopping cart
- Order-button

Then, following the grid-based method set out by Bernard (See appendix 2 for further detail), the exact placement of these web-objects was recorded for each of the configurators in the sample [3]. Thus, a 8-by-7 grid as shown in fig. 1 was superimposed over the configurators’ user interfaces as they appear in the web browser (adjusted to a standard 800-by-600 pixel window).
Figure 1. The 8-by-7 analysis grid allows web objects to be classified and compared according to their position on the screen. For example, a web object in the bottom-right corner is assigned the co-ordinates 7,8.

A screenshot of the user interface with the superimposed grid was taken, as shown in fig. 2. The screenshot was saved and the numerical results documented in an MS Excel file. Where a user interface included several (different) screens or used a scroll-down screen, one screenshot was taken for every further screen.

Figure 2. A screenshot of a user-interface used by a web-based t-shirt configurator, with the analytical grid superimposed. The web-object, in this case a shopping cart (77,78) is color-coded and its co-ordinates documented. Note that the grid only covers the user-interface, not the entire webpage.

Once a screen-shot of all configurator user-interfaces had been taken and the coordinates of their web objects recorded, a numerical analysis was performed to detect the frequency with which given web objects appear in certain positions. A color coded table was drawn up for each of the web objects under examination, revealing whether or not there exists a standard (≥50%) placement for a given web object (see fig. 3). Tables were calculated both for the individual industries and for the combined sample.

Figure 3. Exemplary table of results, showing the placement of the web object ‘product picture’ in the electronics industry (n=30). Only 16 configurators make use of a product picture. 100% of product pictures are placed in the upper third of the user interface, 80% of which occupy the top-left corner.

4. Key findings

The analysis of web-based B2C configurator user interfaces within and across three sample industries reveals that the theoretical insecurities of configuring products online postulated by Totz and Riemer [20] are mirrored in practice: the user interfaces differ greatly from industry to industry, pre-empting the emergence of the universal norms and design standards that users require in order to feel secure.

4.1. Inner-industry standards

In part, the absence of standards is due to the differing requirements for configurators from industry to industry. For example, while the use of a product image is rather uncommon in the electronics industry, it constitutes the centerpiece of configurators in the apparel and automotive industries, where products are judged primarily by appearance. This is also reflected in vast differences in the average product image size, as shown in figure 4.
The average size of product images across industries does not gravitate towards a standard. However, even in the case of apparently similar user interfaces such as those used for shirt and t-shirt configurators within the apparel industry, only the most basic standards such as a ‘forward and backwards’ navigation-principle are discernable. For the web objects studied here, the identifiable standards employed are utterly different depending on configurator type.

**Identified standards (≥50%) for t-shirt-configurators (n=30):**
- Use of a real product-image (100%)
- Visual feedback showing choices and alterations made (90%)
- Different perspectives and viewpoints of the product image (83%)
- Price shown and updated during the configuration process (80%)
- Configuration takes place on a single screen (77%)

**Identified standards (≥50%) for shirt-configurators (n=30):**
- Process-based, step-by-step configuration (57%)
- Visualization of product parts, such as shirts and collars (50%)

This pattern is repeated in the electronics industry. In the case of PC configurators, for example, standards are less related to specific web objects than to the overall configuration logic.

**Identified standards (≥50%) for PC-configurators (n=30):**
- Configuration takes place on a single screen (90%)
- Selection via dropdown menus (53%)
- Price shown and updated during the configuration process (87%)
- Automatic completion of users’ configurations with required product component (73%)
- Rule- and decision-based configuration structure (87%)

This suggests that standards for user interface design hinge less on industry than on product type. It is therefore worth noting that within the automotive industry, where the products offered for configuration are homogenous and comparable (cars), standards are readily discernible:

- Use of a real product image (100%)
- Visual feedback showing choices and alterations made (100%)
- Price shown and updated during the configuration process (92%)
- Process navigation – configuration is a forward-backward process using different screens (89%)
- Print and login buttons provided (83%)
- Automatic completion of users’ configurations with required product component (83%)

### 4.2. Cross-industry standards

The diversity of products and thus user interfaces between industries raises the question if the ‘logic of standards’ postulated notably by Nielsen [12] offers guidance for a specific situation and its design challenges. Once we turn to identifying standards that might be universally applicable to configurator user interfaces, both the grid-based analysis of specific web objects and the survey of overall design attributes only reveal patterns common to websites and e-commerce environments in general.

**Identified standards (≥50%) for web-objects used in configurators across all industries (n=126):**
1. Logo in the top-left corner
2. Help button in the bottom right-corner
3. Horizontal process navigation along the top edge of screen
4. Product image beneath the process navigation
5. Choice fields next to and/or beneath product-picture
6. Price to the right or left of choice fields
7. Back button in the lower-left region
8. Forward button in the lower-right region
9. Shopping cart, order button and total price shown in lower-right region

**Identified standards (≥50%) for configurators across all industries (n=126):**
- The selected product components are summarized at the end of the configuration process.
- The configurator is integrated into the company website and does not appear in a separate pop-up or browser window.
- Products available for configuration are presented as images.
- Process navigation, if available, is structured on a horizontal plane.
5. Conclusion

The available literature on design standards for online user interfaces either prescribes universal design guidelines or emphasizes the need for adhering to such guidelines, in order to make users feel secure and increase efficiency of use. In particular, the placement of web objects ‘according to the norm’ is seen to enhance the legibility and functionality of online user interfaces.

However, an examination of the specific case of web-based product configurators shows that in practice such universal standards do not exist. Standards could only be found once the sample was broken down by industry and product type. For example, in the placement of web-objects there is a clear distinction between shirt and t-shirt configurators, and a standard design pattern is readily identifiable (fig.5).

Figure 5. The standard (≈50%) placement of five different web objects used by t-shirt configurators.

Across industries, only the general design-framework is standardized – for example, the company logo in the top-left corner and the integration of the configurator into a company’s website. Even within an industry, differences between product type are too marked to be effectively covered by a single ‘standard user interface’ – and the configurator database used for this study lists 28 industry-types.

The present study thus concludes that in the specific case of online product configurators, the theoretical recommendation to design online user interfaces according to de-facto standards cannot readily be put into practice, as no such standards are available. Under these circumstances at least, the literature’s emphasis on standard user interfaces appears to be only of limited use.

One conclusion to be drawn from this is that online product configuration constitutes a relatively recent form of human-computer interaction that might not yet be widespread enough to be amenable to standardization. Therefore, just as consumers feel insecure where there are no standards, companies seeking to enter this field face considerable risks, which in turn is a brake to progress. However, blindly following standards in any field is only possible at the peril of ignoring technological innovation.

A more constructive conclusion is to inquire what alternatives exist for companies seeking to design practical and commercially viable human-computer interactions. While following ‘de-facto standards’ may indeed be a way of conforming to users ‘de-facto preferences’ (as opposed to designers’ or companies’ preferences), it is by no means the only one. Case-studies or general frameworks such as the one for t-shirt configurators presented here can be refined with user-testing. User feedback and participation in the design process could also be encouraged by pre-releasing and marketing so-called ‘beta –versions’ – a way of opening the design process itself to the potential inherent in human-computer interaction.

6. References


