Beyond De-Facto Standards for Designing Human-Computer Interactions in Configurators

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Abstract
A web configurator is an application that allows its users to tailor a customizable product to their own needs by specifying their requirements through a graphical user interface. Configurators have been successfully applied to tangible products (e.g., cars, mobile phones) as well as intangible products like software (e.g., operating systems, ERPs) and services (e.g., insurance). A configurator user faces multiple decisions until she has addressed all the characteristics to be retained in the final product. In order to enable users to make the right decisions, with as low effort as possible, HCIs in configurators must be thoughtfully designed. Researchers have previously identified guidelines for HCI design by conducting empirical studies of existing configurators. In this vision paper we propose to draw HCI guidelines through a different approach, which consists in framing theories from the HCI community into the context of configuration models.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation: User Interfaces]: graphical user interfaces (GUI), standardization.

Introduction
In many sectors, companies rely more and more on mass-customization strategies with the aim of providing their customers with products that meet their individual needs. When growing their distribution at large scales, these com-

panies have to create product lines of highly variant solutions. This shift from mass production of identical products to mass customization of variant products has brought to light important technological challenges related to sales processes as it has become essential to help customers determine their own products. To this end, companies often rely on web configurators, which provide automated support for customizing products. Configurators offer a controlled environment that allow their users to gradually specify the characteristics to be retained in the final product.

Configurators and recommender systems (RS) can be seen as similar technologies as they both aim at helping their users navigate large solution spaces. While the solution space of a RS is made of a set of items, the solution space of a configurator is defined by the set of all possible product variants that can be derived through the configuration process. From the customerâĂŹs perspective, navigating the solution space of an RS consists in browsing through the different items, whereas within a configurator it consists in selecting the characteristics that will eventually define the final product. For both types of systems, it is crucial for HCIs to be carefully designed so that the solution search is both effective and efficient.

Configurators often have to cope with many product characteristics and components, as well as business rules and technical constraints. This complexity can create a decrease in customer value as users become exposed to an overwhelming set of configuration choices to resolve. Complex co-design processes can make vendors undesirable for customers [4]. It can also cause users to miss the product that best suits their needs as they shift towards simplifying decision heuristics [3]. For these reasons, HCIs must be carefully designed and should provide users with clear explanations about the configuration task by using a language that fit their cognitive expectations.

In this vision paper, we focus on the need for guidelines to help practitioners evaluate the quality of HCIs in configurators. In Section 2, we show that previous works related to this issue primarily consist in empirical studies of existing systems. In Section 3, we discuss a new approach for assessing the quality of HCIs in configurators, which is embedded in theories from the field of HCI. Finally we propose three research questions we plan to address in future work to realize our vision.

State of the Art

Rogoll et al. [9] offer a comparison of twelve configurators from the apparel industry in terms of usability and product visualization. The authors aim at illustrating good and bad practices in the design of configurators.

Abbasi et al. [1] have conducted an empirical study of 111 web configurators coming from 21 different industrial sectors reported in the Cyledge database[1]. The authors report quantitative empirical results related to good and bad practices in the design of HCIs, focusing on aspects that may directly affect the end-user experience by causing confusion, waste of time and errors.

In [7] Rabiser et al. identify eight evaluation criteria, which they refer to as user-guidance capabilities, through a literature review on product derivation support in configurators. The authors discuss the eight capabilities within the HCI framework of cognitive dimensions of notations [2]. They then review how the DOPLER CW, a configuration tool, supports these capabilities by analyzing the results of user interviews.

In [8] Randall et al. analyze five principles to be taken into

[1] http://www.configurator-database.com/database

account when designing user interfaces for configurators in order to improve usability: (1) customize the customization process, (2) provide starting points, (3) support incremental refinement, (4) exploit prototypes to avoid surprises and (5) teach the customer.

Research Challenges

Beyond De-Facto Standards

The existing work presented in Section 2 primarily relies on empirical studies of existing configurators to identify good and bad practices in HCI design. In [6] Nielsen and Loranger define de-facto standards as web elements that are similarly designed on 80-100% of all websites. Streichsbier et al. [10] have already put the usefulness of de-facto standards for configurators into questions, as they observed a lack of consistency in the use of web elements in configurators. Even though their study focuses on particular types of web elements and took place in 2009, when configurators might not have been characterized as a widespread technology, it still raises the question of whether alternative approaches could bring valuable support to the design of HCIs. We argue that methodologies other than inquiries for de-facto standards remain under-explored.

Towards Model-Based Evaluation

According to Junker [5], a configuration task can be defined by (1) the functional and technical properties of the product and the relationships between them, and (2) the user requirements regarding the functional properties. These constituents form the *configuration model*, which specifies the set of all possible final products. More specifically, it defines the set of all possible sequences of configuration choices a user can make before she reaches a valid final product. In other words, when engineers work on the acquisition of domain knowledge and write down the configuration model, they are specifying all the different ways a user can navigate the solution space.

On the other hand, HCIs allow users to communicate their configuration choices to the system, and are thus the mean by which users navigate the solution space. HCIs can be seen as the interface through which users can relate to the configuration model. This idea leads us to question whether recommending practitioners with concrete HCI designs based on particular patterns found in configuration models can be a viable approach.

The idea of inferring design guidelines from the properties of configuration models will require to understand how the available domain-specific knowledge should be taken into consideration in design decisions.

In order to investigate these ideas, instead of performing crossdomain studies of existing configurators, we propose to frame relevant HCI theories in the context of both configuration modeling and domain-driven design. To this end, we plan to address the following research questions through future work:

RQ1 How should domain specific knowledge drive the evaluation of configurator HCIs?

RQ2 Which theories from the field of HCI should be considered for inquiring HCI design recommendations based on the properties of configuration models?

RQ3 What are the types of tools that could assist practitioners in assessing the enforcement of the elicited recommendations?

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