

Status Quo Bias in Configuration Systems

Monika Mandl¹, Alexander Felfernig¹, Juha Tiihonen², and Klaus Isak³

¹ Institute for Software Technology, Graz University of Technology,
Inffeldgasse 16b, A-8010 Graz, Austria

{monika.mandl, alexander.felfernig}@ist.tugraz.at

² Computer Science and Engineering, Aalto University,
02015 TKK, Finland

juha.tiihonen@tkk.fi

³ Institute for Applied Informatics, University of Klagenfurt,
Universitaetsstrasse 65-67, A-9020 Klagenfurt, Austria

kisak@configworks.com

Abstract. Product configuration systems are an important instrument to implement mass customization, a production paradigm that supports the manufacturing of highly-variant products under pricing conditions similar to mass production. A side-effect of the high diversity of products offered by a configurator is that the complexity of the alternatives may outstrip a user's capability to explore them and make a buying decision. A personalization of such systems through the calculation of feature recommendations (defaults) can support customers (users) in the specification of their requirements and thus can lead to a higher customer satisfaction. A major risk of defaults is that they can cause a status quo bias and therefore make users choose options that are, for example, not really needed to fulfill their requirements. In this paper we present the results of an empirical study that aimed to explore whether there exist status quo effects in product configuration scenarios.

Keywords: Configuration Systems, Interactive Selling, Consumer Buying Behavior, Consumer Decision Making.

1 Introduction

Following the paradigm of *mass customization*, the intelligent customizing of products and services is crucial for manufacturing companies to stay competitive. Configuration systems, which have a long tradition as a successful application area of Artificial Intelligence [1,2,3,4,5], have been recognized as ideal tools to assist customers in configuring complex products according to their requirements. Example domains where product configurators are applied are computers, cars, and financial services. An important task typically supported by configurators is to check the consistency of user requirements with the knowledge base, such that the amount of incorrect quotations and orders can be reduced.

One major problem of configuration systems is the high diversity of offered products. Users are often overwhelmed by the complexity of the alternatives, a

phenomenon well known as mass confusion [9]. A possibility to help the user identifying meaningful alternatives that are compatible with their current preferences is to provide *defaults*. Defaults in the context of interactive configuration dialogs are preselected options used to express personalized feature recommendations. Felfernig et al. [7] conducted a study to investigate the impact of personalized feature recommendations in a knowledge-based recommendation process. Nearest neighbors and Naive Bayes voter algorithms have been applied for the calculation of default values. The results of this research indicate that supporting users with personalized defaults can lead to a higher satisfaction with the configuration process. In this paper we want to discuss further impacts of presenting such default values to users of configurator applications. We present the results of a case study conducted to figure out whether default values can have an impact on a user's selection behavior in product configuration sessions. The motivation for this empirical analysis is the existence of so-called status quo biases in human decision making [14].

The remainder of the paper is organized as follows. In the next section we discuss the concept of the status quo bias in human decision making. In Section 3 we introduce major functionalities of RecoMobile, an environment that supports the configuration of mobile phones and corresponding subscription features. In Section 4 we present the test design of our user study. In the following we discuss the results of our user study with the goal to point out to which extent a status quo effect exists in product configuration systems (Section 5). Finally, we discuss related work and conclude the paper.

2 Status Quo Bias in Decision Making

People have a strong tendency to accept preset values (representing the status quo) compared to other alternatives [11,13,14]. Samuelson and Zeckhauser [14] explored this effect, known as *status quo bias*, in a series of labor experiments. Their results implied that an alternative was significantly more often chosen when it was designated as the status quo. They also showed that the *status quo effect* increases with the number of alternatives. Kahnemann, Knetsch and Thaler [11] argue that the *status quo bias* can be explained by a notion of *loss aversion*. They explain that the status quo serves as a neutral reference point and users evaluate alternative options in terms of gains and losses relative to the reference point. Since individuals tend to regard losses as more important than gains in decision making under risk (i.e., alternatives with uncertain outcomes) [12] the possible disadvantages when changing the status quo appear larger than advantages.

A major risk of preset values is that they could be exploited for misleading users and making them choose options that are not really needed to fulfill their requirements. Bostrom and Ord defined the *status quo bias* as “a cognitive error, where one option is incorrectly judged to be better than another because it represents the status quo” [10]. Ritov and Barron [13] suggest counteracting the *status quo bias* by presenting the options in such a way that keeping as well as

changing the status quo needs user input. They argue that “when both keeping and changing the status quo require action, people will be less inclined to err by favoring the status quo when it is worse” [13].

In this paper we want to focus on answering the question whether a *status quo bias* exists in the context of product configuration systems and whether it is possible to reduce this biasing effect by providing an interface supporting the interaction mechanisms introduced by Ritov and Barron [13].

3 The RecoMobile Prototype

RecoMobile is a knowledge-based configuration system for mobile phones and services enriched with recommendation functionalities to predict useful feature settings for the user [7]. Example pages of RecoMobile are depicted in Figure 1. After the specification of a few general attributes of the configuration domain (e.g., the *preferred phone style*) the system calculates personalized recommendations on the basis of user interactions of past configuration sessions. These recommendations are presented to the user as default proposals for the following questions regarding *mobile subscription details*, *privacy settings*, and the *phone*. After the specification of the user requirements, RecoMobile presents a phone selection page which enlists the set of phones that fulfill the given set of customer requirements. For each mobile phone the user can activate a fact sheet that is implemented as a direct link to the supplier’s web page. Finally, it is possible to select the preferred mobile phone and to finish the session.

In the context of this paper we present a study where we used the RecoMobile prototype to explore whether there exist status quo effects in the context of product configuration sessions.

4 Study Design

Our experiment addressed two relevant questions. (1) *Are users of product configuration systems influenced by default settings even if these settings are uncommon?* (2) *Is it possible to counteract the status quo bias by providing a configuration interface where both keeping and changing the presented default settings needs user interaction?* To test the influence of uncommon defaults on the selection behavior of users we differentiate between three basic versions of RecoMobile (see Table 1). Users of RecoMobile Version A were not confronted with defaults, i.e., they had to specify each feature preference independent of any default proposals. Out of the resulting interaction log we selected for each feature (presented as questions within a configuration session) the alternative which was chosen least often and used it as default for Versions B and C. These two versions differ in the extent to which user interaction is required. In Version B user interaction is only required when the customer wants to change the recommended default setting (*low user involvement*). In Version C the acceptance as well as the changing of the default settings requires user interaction (*high user involvement* - see Figure 2). We conducted an online survey at the

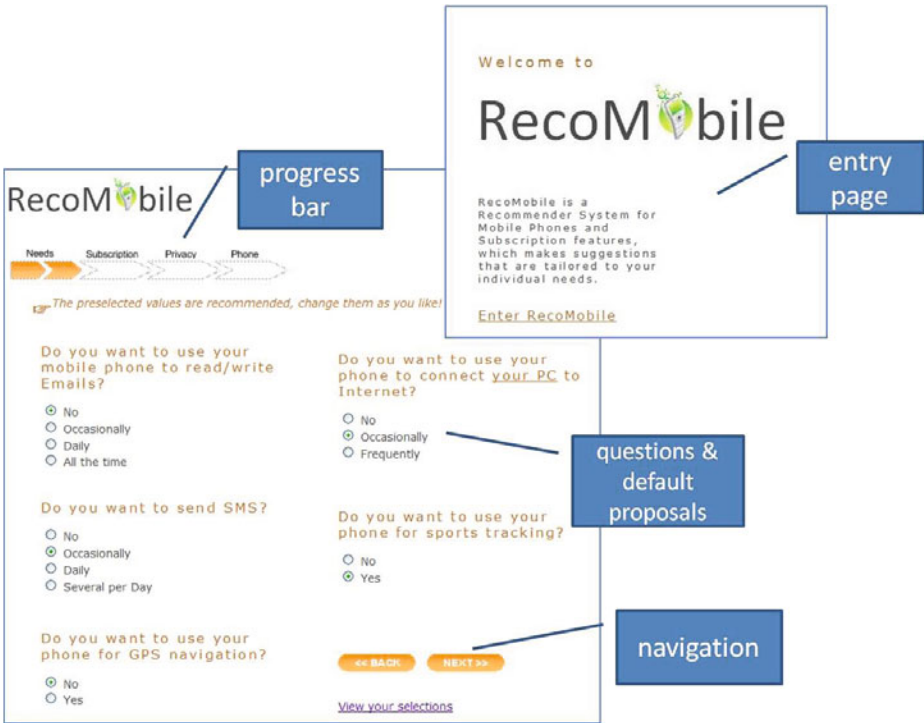


Fig. 1. RecoMobile user interface – in the case of default proposal acceptance no further user interaction is needed (low involvement)

Table 1. RecoMobile – configurator versions in user study

Version	Default Type	Explanation
A	no defaults	no defaults were presented to the user
B	defaults without confirmation	unusual defaults were presented to the user – acceptance of defaults does not require additional interaction (low involvement version – see Figure 1)
C	defaults with confirmation	unusual defaults were presented to the user – acceptance of defaults requires additional interaction in terms of a confirmation (high involvement version – see Figure 2)

Graz University of Technology. N=143 subjects participated in the study. Each participant was assigned to one of the three configurator versions (see Table 1). The experiment was based on a scenario where the participants had to decide which mobile phone (including the corresponding services) they would select.



Fig. 2. Alternative version of the RecoMobile user interface – in the case of default proposal acceptance users have to explicitly confirm their selection (high involvement)

5 Results

In our evaluation we compared the data of the configurator version without default settings (Version A - see Table 1) with the data collected in Versions B and C. For each feature we conducted a chi-square test (the standard test procedure when dealing with data sets that express frequencies) to compare the selection behavior of the users. For many of the features we could observe significant differences in the selection distribution. A comparison of the selection behavior in the different configurator versions is given in Table 2.

For example, the evaluation results regarding the feature *Which charged services should be prohibited for SMS?* are depicted in Figure 3. For this feature the default in Versions B and C was set to alternative 3 - *Utility and Entertainment* - (that option which was chosen least often in Version A). In both versions the default setting obviously had a strong impact on the selection behavior of the users. Only 2 % of the users of Version A selected option 3 whereas in Version B 24 % chose this default option. The interesting result is that the version with high user involvement (Version C) did not counteract the status quo bias. 25.6 % of the users of Version C selected the default alternative. Contrary to the assumption of Ritov and Baron [13] people tend to stick to the status quo (the default option) even when user interaction is required to accept it.

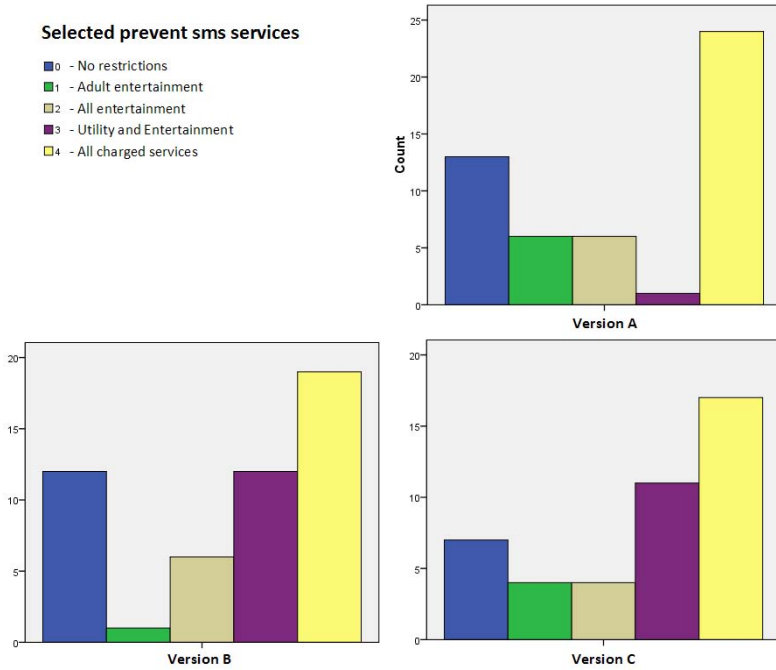


Fig. 3. Selections for *prohibit charged services for SMS* - the results of the conducted chi-square test show that the underlying distributions differ significantly ($p=0.009$ for Version A compared with Version B, $p=0.020$ for Version A compared with C)

In Figure 4 another example is shown for the feature *Which data package do you want?*. The default in Version B and C was set to option 5 (*2048 kbit/s (+ 29.90 euro)*), which was the most expensive alternative of this feature. In Version A 4 % of the users decided to choose this option - the mean value for the expenses for this attribute is 5.5 Euro (see Table 3). In Version B 16 % and in Version C 18.6 % of the users retained the status quo alternative. The mean value for the data package expenses in Version B is 12.8 Euro and in Version C 13.2 Euro. This example shows that exploiting the status quo effect can lead to selection of more expensive alternatives. Here again the status quo effect was not suppressed in Version C, where people had to confirm the default setting.

6 Related Work

Research in the field of human decision making has revealed that people have a strong tendency to keep the status quo when choosing among alternatives (see e.g. [10,11,13,14]). This decision bias has firstly been reported by Samuelson and Zeckhauser [14]. To our knowledge, such decision biases have not been analyzed in detail in the context of interactive configuration scenarios. The goal

Table 2. Comparison of value selection behavior in different configurator versions

Feature	Version A compared with Version B	Version A compared with Version C
use phone to read/write emails	p=0.079	p=0.133
use phone to connect PC to web	p=0.025	p=0.193
use phone to send SMS	p=0.302	p=0.395
use phone for sportstracking	p=0.211	p=0.825
use phone for GPS navigation	p=0.099	p=0.392
monthly minutes package	p=0.235	p=0.014
free sms messages included	p=0.323	p=0.032
selected data package	p=0.001	p=0.004
mobile antivirus service	p=0.008	p=0.002
mobile messenger	p=0.629	p=0.643
display number to receiver	p=0.100	p=0.090
publish phone number in phone book	p=0.032	p=0.497
prevent calls to foreign countries	p=0.260	p=0.107
prohibit charged services for calls	p=0.014	p=0.011
prohibit charged services for sms	p=0.009	p=0.020

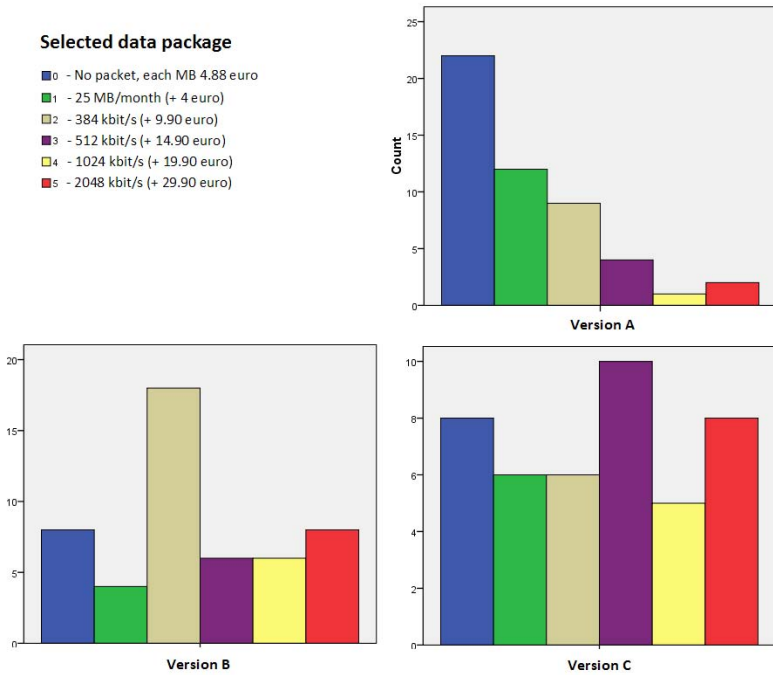


Fig. 4. Selections for *Monthly data package* - the results of the conducted chi-square test show that the underlying distributions differ significantly (p=0.001 for Version A compared with Version B, p=0.004 for Version A compared with Version C)

Table 3. Mean values for the monthly data package expenses

Version	Expenses (€) (mean value)
A	5.528
B	12.844
C	13.281

of our work was to investigate whether the status quo effect also exists in product configuration systems. Felfernig et al. [7] introduced an approach to integrate recommendation technologies with knowledge-based configuration. The results of this research indicate that supporting users with personalized feature recommendations (defaults) can lead to a higher satisfaction with the configuration process. The work presented in this paper is a logical continuation of the work of [7] which extends the impact analysis of personalization concepts to the psychological phenomenon of decision biases.

Although product configuration systems support interactive decision processes with the goal to determine configurations that are useful for the customer, the integration of human decision psychology aspects has been ignored with only a few exceptions. Human choice processes within a product configuration task have been investigated by e.g. Kurniawan, So, and Tseng [16]. They conducted a study to compare product configuration tasks (choice of product attributes) with product selection tasks (choice of product alternatives). Their results suggest that configuring products instead of selecting products can increase customer satisfaction with the shopping process. The research of [17] and [9] was aimed at investigating the influences on consumer satisfaction in a configuration environment. The results of the research of Kamali and Loker [17] showed a higher consumer satisfaction with the website’s navigation as involvement increased. Huffman and Kahn [9] explored the relationship between the number of choices during product configuration and user satisfaction with the configuration process. From their results they concluded that customers might be overwhelmed when being confronted with too many choices.

In the psychological literature there exist a couple of theories that explain the existence of different types of decision biases. In the context of our empirical study we could observe a status quo bias triggered by feature value recommendations, even if uncommon values are used as defaults. Another phenomenon that influences the selection behavior of consumers is known as *Decoy effect*. According to this theory consumers show a preference change between two options when a third asymmetrically dominating option is added to the consideration set. Decoy effects have been intensively investigated in different application contexts, see, for example [18,19,20,21,22,23]. The *Framing effect* describes the fact that presenting one and the same decision alternative in different variants can lead to choice reversals. Tversky and Kahnemann have shown that effect in a series of studies where they confronted participants with choice problems using variations in the framing of decision outcomes. They reported that “seemingly

inconsequential changes in the formulation of choice problems caused significant shifts of preference” [24].

7 Conclusions

In this paper we have presented the results of an empirical study that had the goal to analyze the impact of the status quo bias in product configuration scenarios where defaults are presented as recommendations to users. The results of our study show that there exists a strong biasing effect even if uncommon values are presented as default values. Our findings show that, for example, status quo effects make users of a configuration system selecting more expensive solution alternatives. As a consequence of these results we have to increasingly turn our attention to ethical aspects when implementing product configurators since it is possible that users are misled simply by the fact that some defaults are representing expensive solution alternatives (but are maybe not needed to fulfill the given requirements). Finally, we detected that providing the possibility of both keeping and changing the provided defaults (we called this the *high involvement user interface*) does not counteract the status quo bias. Our future work will include the investigation of additional decision phenomena in the context of knowledge-based configuration scenarios (e.g., framing or decoy effects).

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