User Interface Modifications in Established Product Configurators

Paul Blazek, Clarissa Streichsbier, Martina Partl, Lars Skjelstad

User Interface Modifications in Established Product Configurators

Paul Blazek[1], Clarissa Streichsbier[1], Martina Partl[1], Lars Skjelstad[2]

[1]cyLEDGE Media GmbH, Wiedner Hauptstraße 118, 1050 Vienna, Austria

[2]SINTEF Technology and Society, S.P. Andersensv. 5, 7465 Trondheim, Norway

p.blazek@cyledge.com

c.streichsbier@cyledge.com

m.partl@cyledge.com

lars.skjelstad@sintef.no

Abstract. The evaluation of the gathered data in the Configurator Database, the biggest collection of web-based product configurators, shows dynamic patterns of growth and decline in product configurator offerings in the last years. While configurators of all product groups and industries disappear from the market and others are newly added, there is quite a number of established customizable product offerings. This paper researches how the user interfaces of these products undergo modifications when compared over time.

Keywords: Product Configurator, User Interface, Interaction, Mass Customization.

1   Introduction

Mass customization, derived from the combination of the contradictory terms "mass production" and "customization", is possible for nearly every product. This concept allows a company to respond to customer needs and demands. The communication between company and customer is a crucial requirement in a mass customization process, which is realized by a web-based customization tool, a so-called configurator. This application enables users to design their own, individual products exactly matching their needs [1]. The interfaces and features of these tools can vary, also with respect to how well they represent the total solution space [2]. Nevertheless, mostly a well-defined configuration space is provided, which defines possible configuration options [1]. By shifting the time-consuming tasks of identification process to the customers themselves, configurators are one of the efficiency drivers for the mass customization concept [3]. But when moving the responsibility of creating an individualized product to customers, companies have to face that certain requirements to support and guide the customer in the process without creating confusion are necessary [1].

So it is comprehensible that the success of a configuration system doesn't only rely on technological capabilities. A lot of research underlines the importance of an appropriate user interface that supports the understanding of the configuration options and process, visualizes the product in an expected way, guides the user, creates positive emotional effects and triggers further user activities [4, 5].

A systematic monitoring of the configurator landscape reveals that web-based product configurators are modified and rebuild regularly, indicating that the digital behavior of customers and their respective expectations on the offered interaction space changes over time.

This paper highlights changes of existing product configurator offerings with regard to their respective industries and examines patterns of user interface changes.

2   The Product Configurator Landscape

### 2.1   Status Quo of web-based Product Configurators

When it comes to understanding the status quo of online product configurators the Configurator Database Research Project (www.configurator-database.com) proves to be a helpful resource of monitored data. This project was started in 2007 with the aim to give a continuously updated overview of the world of configurators. As mass customization gains more importance, the number of configurators in the database is increasing. But also a significant number of product configurators vanished over time and were removed from the database. In 2007 the project team could identify 600 web-based product configurators that were accessible online, in 2013 already 900 configurators, in 2014 the number grew to 970 configurators, while in 2015 a new milestone could be proclaimed: more than 1000 online configurators could be identified, and at the end of the year, 1050 configurators were listed in the database. At the end of 2016 this number grew to an impressive 1200 online configurators [1]. The customizable products of the configurator database are very diverse, so they have been categorized in 17 industries (fig. 1.: industries with description and some products examples for each industry).

| Industry	Description	Product Example
Accessories	Everything that can be worn (except clothing and footwear)	Jewelry, bags, hats, belts, cases, glasses, watches, gloves
Apparel	All kinds of clothing & fabrics (except footwear)	T-Shirts, pants, mixed clothing, underwear, socks, jackets, bikinis
Beauty & Health	Care products and cosmetics	Make up, lipsticks, shampoos, soaps, lotions, perfumes
Electronics	Electronic devices and applications	Computers, notebooks, usb sticks, cables
Food & Packaging	All kinds of food and beverages	Beers, wines, chocolates, cookies, candy, cereals, tea, coffee, snacks, labels
Footwear	Everything that is worn on the feet	Sneakers, flip flops, high heels, boots
Games & Music	Everything for music and gaming time	Musical instruments, board games, puzzles, playing cards
House & Garden	All kinds of products for house and garden	Kitchens, garages, elevators, fences, furniture, doors, windows, saunas, tables, lamps, carpets, door knobs, light switches
Industrial Goods	Different products mainly for manufacturers	Steel, chemistry, medicine, safety systems
Kids & Babies	Products designed specifically for babies and children	Blankets, bottles, diapers, dolls, baby accessories, children's books, playgrounds, soft toys
Motor Vehicles	Cars and other vehicles	Automobiles, motor bikes, yachts, campers
Office & Merchandise	All kinds of office supplies and merchandise	Folders, pens, business cards, stamps, pencils
Paper & Books	Printed products and photo products	Books, cards, calendars, wallpaper, photo canvas, notebook, wrapping paper
Pet Supplies	Products for Pets	Pet food, pet accessories, aquariums
Printing Platforms	Platforms which offer products of various industries	Giftware, photo products, 3D products, engraved products
Sportswear & Equipment	Equipment and clothes for sports	Skateboards, bicycles, snowboards, golf balls, diving suits, jerseys
Uncategorized	Products which do not fit in any other industry	Tissue Boxes, swords, gemstones, signs, locks, coins

Fig. 1. Industries of the Configurator Database [1]

When taking a closer look at the status-quo of 2016, most of the online accessible configurators can be found in the industry *House & Garden* with 177 listed entries, followed by *Apparel* (n=167) and *Accessories* (n=144) [1].
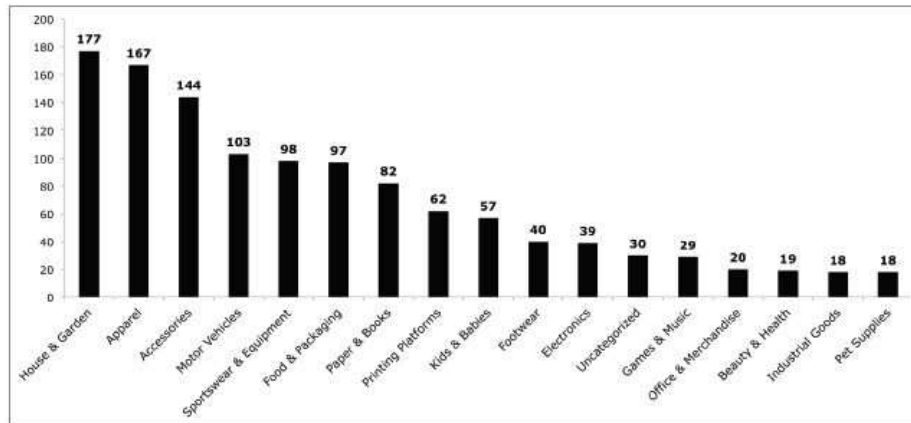
Fig. 2. Industry Ranking in the Configurator Database (n=1200) [1]

When not just looking at the configurator frequency in industries but at particular products, the most popular products for mass customization are cars, t-shirts, giftware and shirts. Besides these, there are also a lot of unusual customizable products like chimneys and aquariums which occur only once in the database.
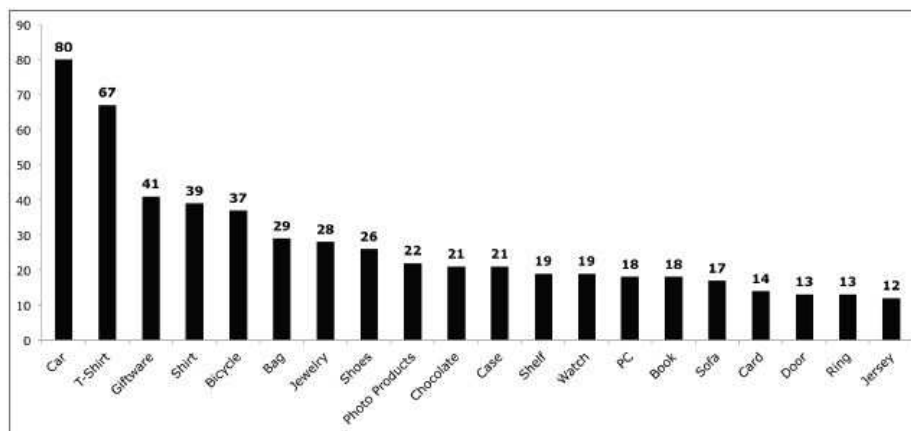
Fig. 3. Top 20 of the Most Popular Products in the Configurator Database (n=1200) [1]

The field of mass customization shows significant year-on-year-changes in the number of configurators, which becomes obvious when analyzing and updating the Configurator Database. When comparing the identified configurators in the Configurator Database Report 2016 with those of the Configurator Database Report 2015 204 (19%) of the 1050 listed product configurators in 2015 disappeared in the following 12 months. On the other hand 354 (34%) new product configurators were

5

introduced to the online market, which indicates that mass customization approaches gather momentum.

The biggest changes can be found in the industries *Industrial Goods*, *House & Garden* and *Sports Equipment*, as the number of configurators has extremely expanded. On the contrary the configurators in the industries *Food & Packaging* and *Paper & Books* are declining.
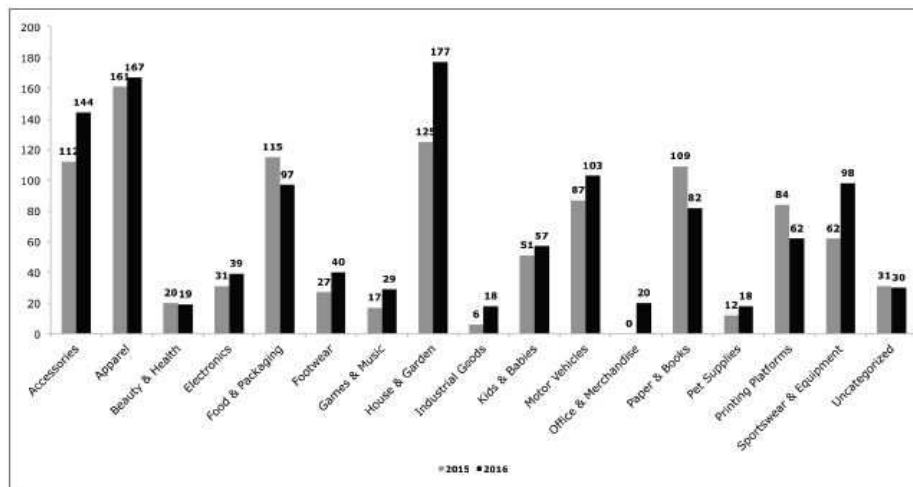

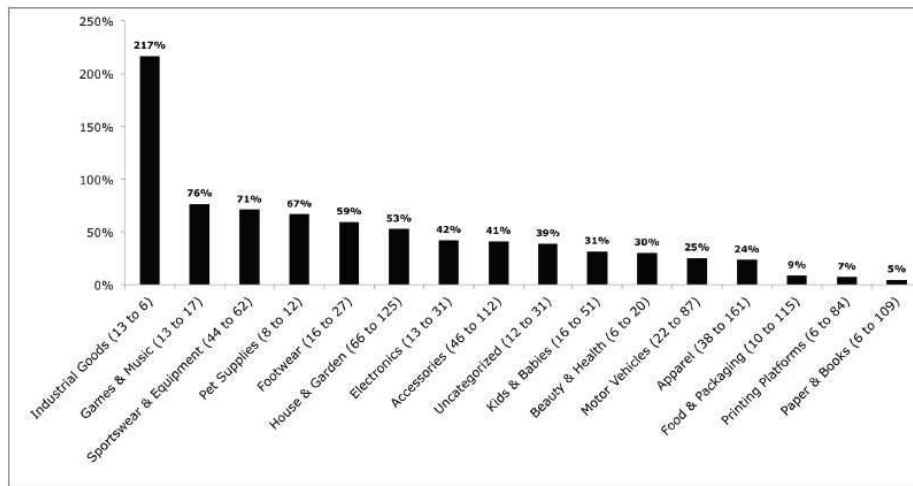**Fig. 4.** Numbers of Product Configurators per Industry [1]

Fig. 5. Added Configurators 2016 (n=1050) [1]

3   Empirical Analysis

3.1   Research Aims

Existing research shows that there is a constant flow in the landscape of online configurators. Completely new customizable products with the respective new configurators appear online while others are removed [6]. But what happens with configurators that remain online over years for products that are established on the market?
The aim of this study is to get a better insight into updates of remained online configurators within the last year: Did the user interface of configurators of various industries change within one year or did they stay the same? Which industry shows the strongest trend concerning changes in user interfaces? When taking a closer look at the industry with the strongest change, which user interface components did change? What does the user interface changes mean for further research?

The output shall help to get a first idea if and which industries have a rapid change concerning their user interfaces. Furthermore it shall show which user interface components underlie a change by taking a closer look at the product configurators of one industry. Nevertheless the main aim is to figure out whether or not lean configuration processes should be forced.

3.2   Method and Setting

The method used for this study is a quantitative analysis to detect changes according the user interfaces of configurators in various industries from 2015 to 2016. In order to reveal differences of configurator user interfaces within one year the Configurator Database Reports 2015 [7] and 2016 [1] were compared.

In the first place all industries are analyzed whether their user interface has changed or not within one year. This should give a better idea which industry has the biggest movement. For this analysis only the configurators which remained active were considered, which means that removed or added configurators are not included.

As the aim of the second part of the analysis is to get a better idea of what components within the user interface have changed, it will focus on the industry with the highest level of change. Furthermore only the biggest product category will be considered as comparing different product categories may not provide valid results.
The proceeding to identify changes concerning the user interface is the following:

7

1. The sample of configurators of one industry which changed their user interface within one year is taken from the Configurator Database Reports 2015 [7] and 2016 [1] (Appendix Table 1.).
2. The stored user interface of every configurator from 2015 [7] is compared with the one from 2016 [1]. If a configurator already changed until June 2017, the current version of the respective user interface was used.
3. The gathered data is used to define a set of categories to make the user interface changes comparable.
4. The sample is evaluated according the defined categories.
5. The output shall disclose which user interface components underlie the biggest change.

The following set of categories was defined for the quantitative analysis:

- **Visual Appearance**
  - Did the visual appearance change (colors, font, looks, icons etc.)?
- **Configuration Steps (Navigation)**
  - Did the the amount of configuration steps change or remain the same? If it changed, are there more or less steps concerning the year before?
  - Did the wording of the configuration steps change? This concerns only the steps/option which remained the same.
  - Did the position and/or alignment of the configuration steps within the user interface change?
  - Did the position of the process buttons change, if existing before? Process buttons lead the user to the next or previous configuration step.
- **Product Visualization**
  - Did the offered views of the product visualization change?
  - Did the background situation of the product visualization change?
  - Did the position (alignment) of the product visualization change?
  - Did the size of the product visualization become bigger, smaller or stay the same?
- **Others**
  - **Product Price**: Did the position of the product price change?
  - **Configuration Summary**: Did the position (alignment) of the summary (button or full visible) change - only concerning summaries that are not integrated in the process steps.

4   Results and Key Findings

4.1   User Interface Changes of Product Configurators from 2015 to 2016

The Configurator Database Reports of 2015 and 2016 show considerable movements concerning removed and added configurators. When taking a closer look at the configurators that remained the same in 2015 and 2016, Fig. 6. shows that there has been a change of user interfaces of some configurators in each industry.
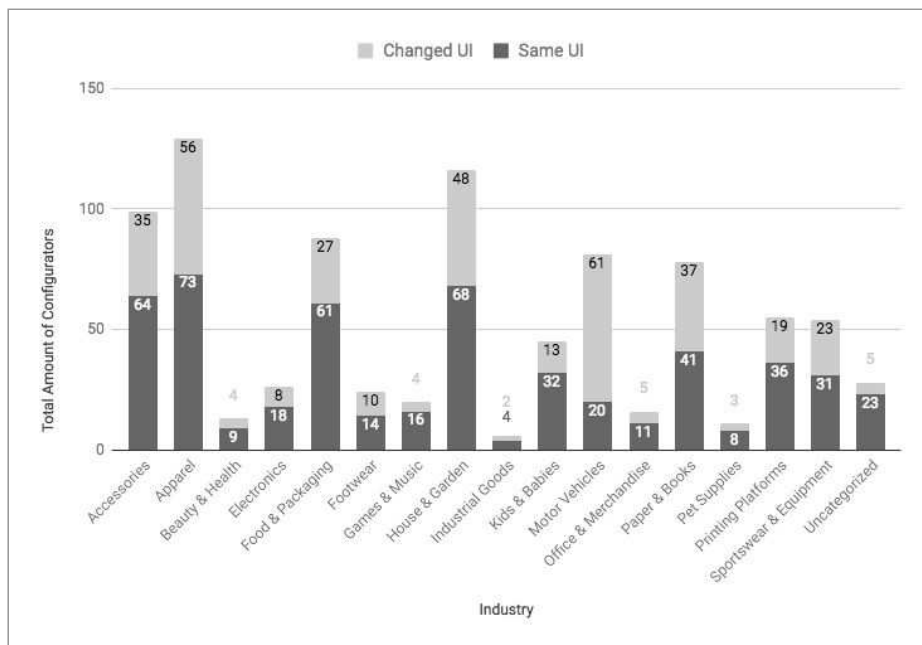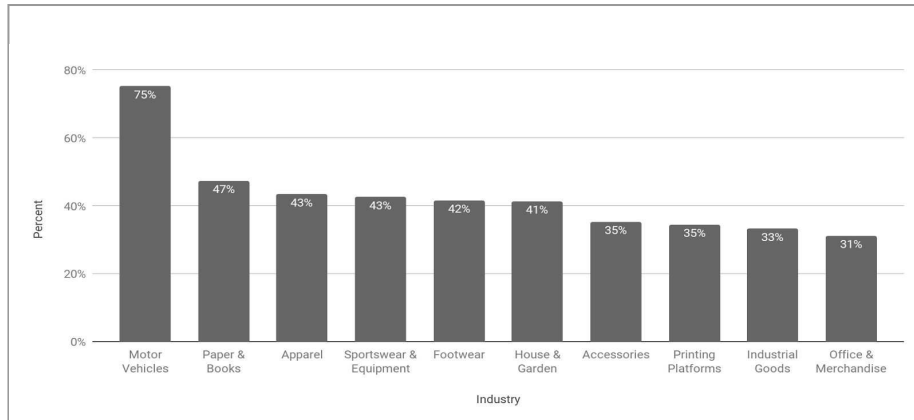

Fig. 6. Changed Interfaces per Industry from 2015 to 2016 in Total

Identifying the Industry with most updates. To figure out which industry represents the highest degree of updates concerning the user interface, the graphic below ranks the top 10 industries concerning their percentage share of all remained configurators. The *Motor & Vehicle* industry is leading with 75%, followed by *Paper & Books* with 47% and *Apparel* with 43%. Therefore the focus for the following quantitative analysis will be put on the *Motor & Vehicle* industry.

Fig. 7. Top 10 Changed User Interfaces per Industry from 2015 to 2016 in Percentage

When taking a closer look at the *Motor & Vehicle* industry the leading product category that has changed most within the *Motor & Vehicle* industry is cars with 52 configurators.

4.2 User Interface Changes of Car Configurators

As the leading product category within the *Motor & Vehicle* industry is cars, this quantitative study was conducted with 52 car configurators that experienced a change from 2015 to 2016.

In the following the results are summarized according to the defined categories described in 3.2. Setting and Methods.

Changes of Visual Appearance. The visual appearance of a configurator are the colors, fonts, icons, button design etc. that are used. The study shows that all of the 52 analyzed car configurators changed their visual appearance from 2015 to 2016. Three configurators changed only the visual appearance and no other components. Fig. 8. & Fig. 9. provide an example of the Bentley configurator which solely changed the visual appearance from 2015 to 2016 while the features and the navigation structure remained the same.
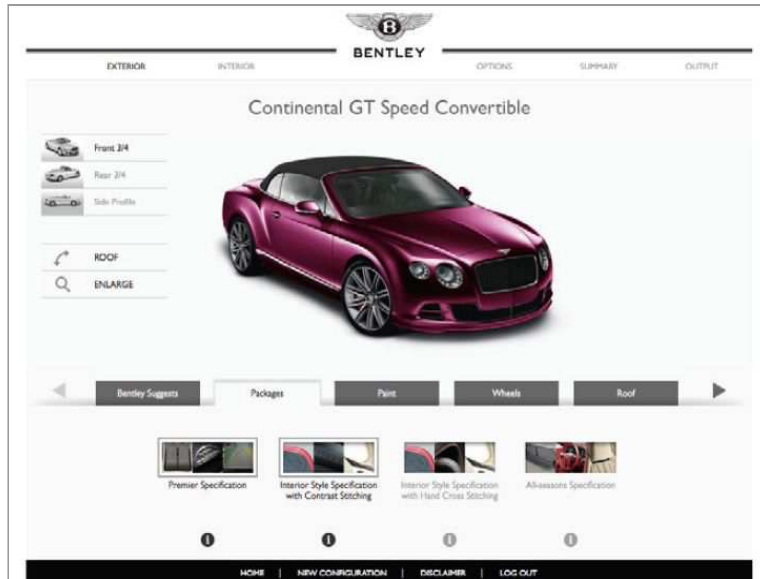
Fig. 8. Screenshot of www.bentleyconfigurator.com: 2015 [7]
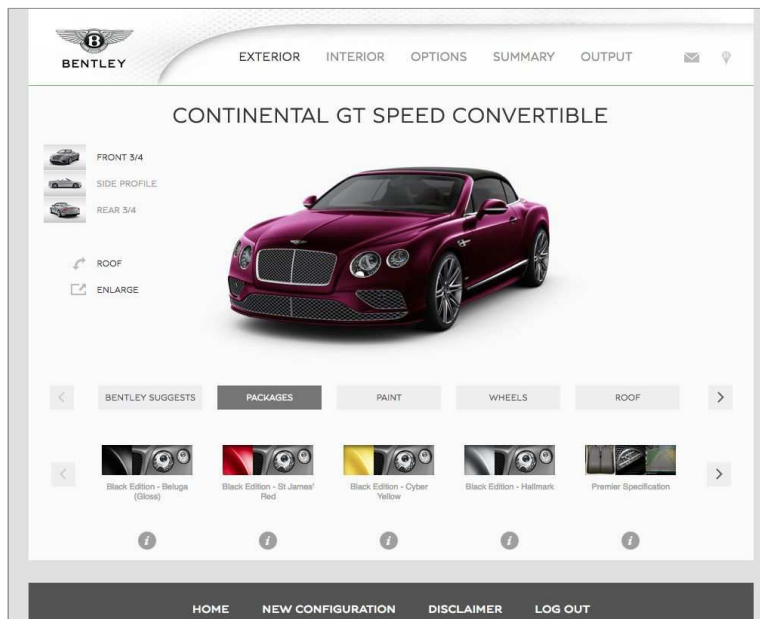

Fig. 9. Screenshot of www.bentleyconfigurator.com: 2016

Changes of Configuration Steps (Navigation). The configuration steps guide the user through the possible configuration options.

- **Amount**: As seen in the graphic below (Fig. 10.) 75% of the 52 analyzed car configurators have changed the amount of the offered configuration steps. 50% have more steps than in 2015 and 25% less than 2015. Only 17,3% stayed with the number of steps from 2015 to 2016. For 7,7% it was not possible to make a valid statement, as the screenshot of 2015 didn't concern the needed information.
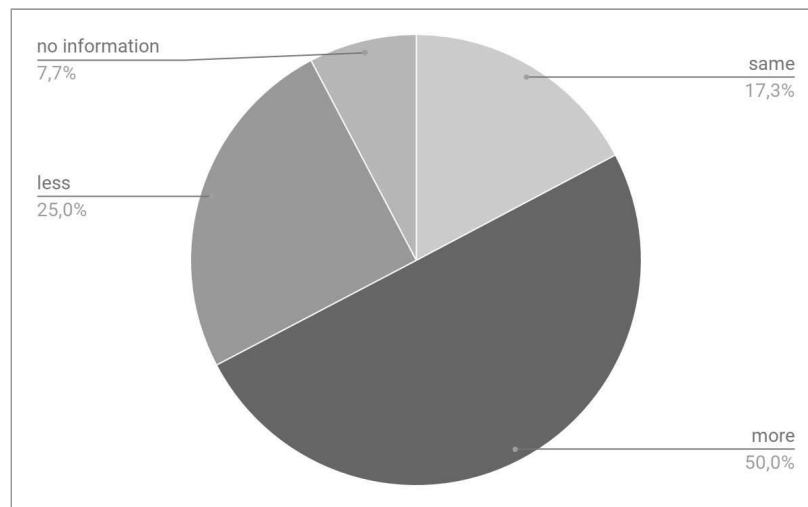
Fig. 10. Changes in Amount of Configuration Steps (n=52)

- **Wording**: The wording of the steps is also an essential part within a customization process. Users get a better idea what they are expecting in each step and companies have the possibility to use their own corporate language. The research shows that 40 out of 52 car configurators changed the wording of the configuration steps, preconditioned that the step itself stayed the same from 2015 to 2016.
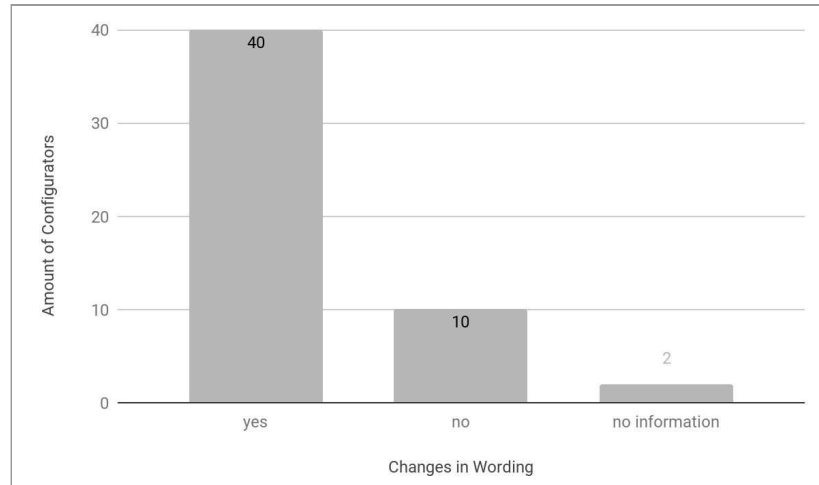
Fig. 11. Changes in Wording of Configuration Steps (n=52)

- **Position and Alignment**: 57,7% of the analyzed car configurators changed the position and/or alignment of the configuration steps. The example below shows the car configurator of Ford Germany, in which the configuration steps in 2015 are aligned horizontally below the product visualization and in 2016 vertically on the left side of the product visualization.
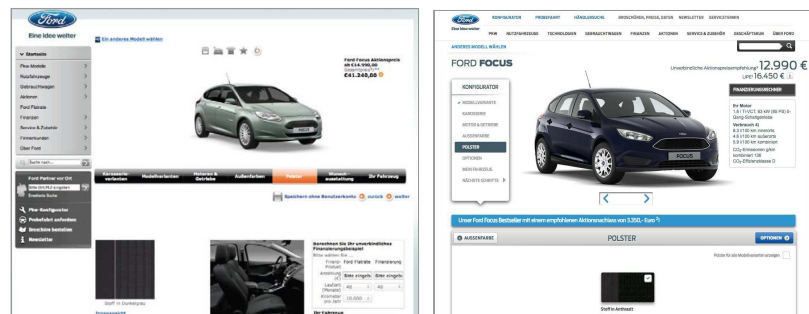

Fig. 12. Screenshot of www.ford.de : 2015 (left) [7] and 2016 (right)

- **Process Button**: The process button guides users from one configuration step to the next or previous. The button shall give users a guidance, therefore the positioning is relevant. 38,5% of the 52 analyzed car configurators changed the position from 2015 to 2016. However 13,5% removed the process button within this timeframe and 11,5% added one.
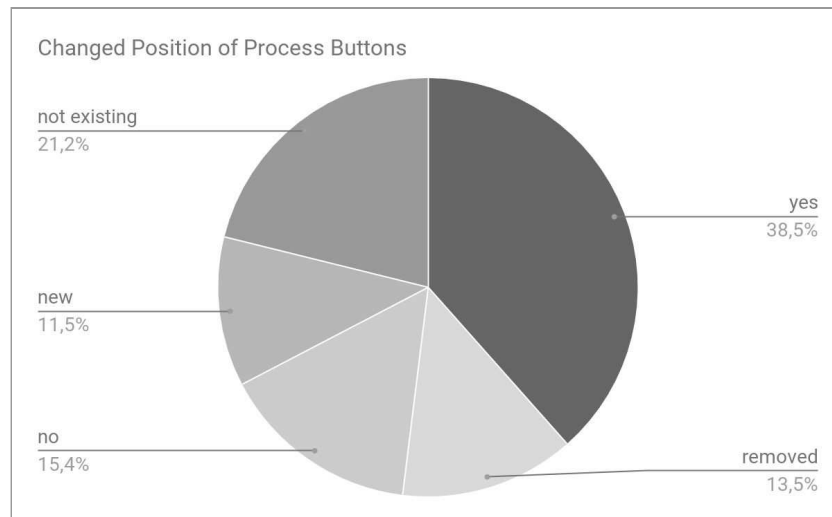
Fig. 13. Changed Position of Process Buttons (n=52)

Changes of Product Visualization. The visualization of the customizable product is essential in a configuration process. It helps users to get a better idea of the product they may purchase and decreases doubts [7]. In the following changes concerning different aspects of the product visualization are described.

- **Views**: As cars are more complex products, car configurators often offer the product visualization in several views to get a better idea of the product. 35 of 52 car configurators (67%) changed the amount of views from 2015 to 2016. For example Alfa Romeo offered in 2015 only two external views, whereas in 2016 a 360 degree view.
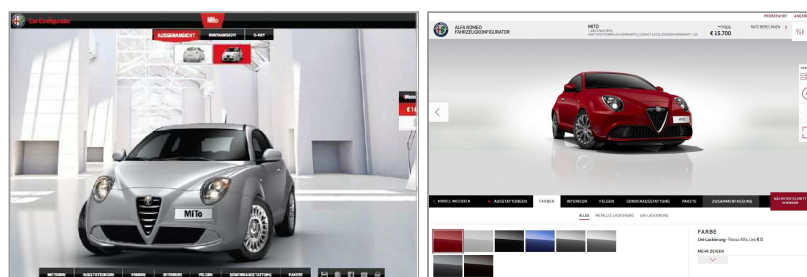

Fig. 14. Screenshot of www.alfaromeo.de: 2015 (left) [7] and 2016 (right)

- **Visualization Background**: Visualization background refers to the environment in which a car is presented. This can be for example a city,

special landscape, in front of a house or just in an unicolor space. 46,2% of the 52 car configurators changed their background visualization from 2015 to 2016. An example is shown in Fig. 14. - Alfa Romeo presented the cars in a kind of hall background in 2015, but removed this background in 2016 in favor of a more neutral presentation surface.

- **Position**: The position of the visualization may be seen as a crucial factor as a company has to decide in which sector of the screen it makes the configuration process easy and pleasant for a user. 53,8% of the 52 car configurators changed the position of the product visualization from 2015 to 2016. The screenshots below show that the car configurator of GMC placed the visualization of the customizable car on the right side of the process steps in 2015, but switched the visualization and process steps in 2016.
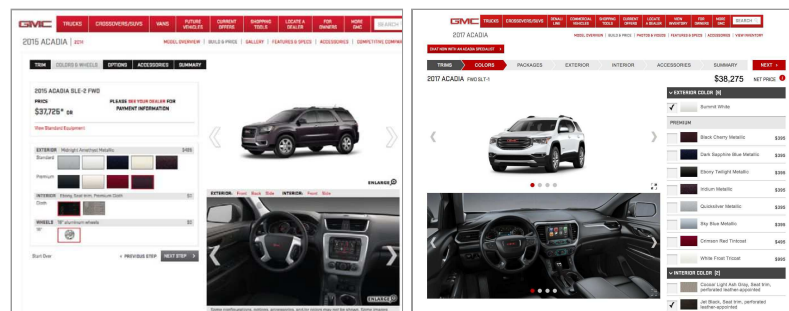

Fig. 15. Screenshot of www.gmc.com: 2015 (left) [7] and 2016 (right)

- **Visualization Size**: The size of the product visualization may be an interesting field of research as a company has to decide to assess the importance between a visual, emotional component - the product visualization and the more technical component - the configuration options. 29 of the 52 car configurators (55,8%) didn't change the size of the product image. 16 (30,8%) car configurators made the product visualization bigger and 7 (13,5%) made the product visualization smaller. The car configurator of Lexus Germany decided to enlarge the product visualization from 2015 to 2016. The configuration steps get less priority, as they are positioned at the very bottom and they are collapsible.
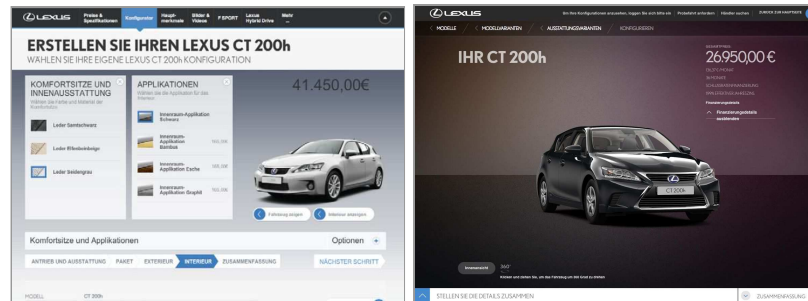
Fig. 16. Screenshot of www.lexus.de: 2015 (left) [7] and 2016 (right)

Other Changes. Two more aspects have been evaluated, which were analyzed detached from the previous categories. In the following the positioning of the product price and the configuration summary are described in detail.

- **Product Price:** The display of the product price is substantial in a configuration process as it gives the user cost transparency over the chosen options [9]. So the positioning of the product price on the screen can be seen as an important issue. 37 (71,2%) out of 52 car configurators changed the position of the product price from 2015 to 2016. 2 configurators added the price to the configurator and one doesn't show the price at all. Ford Germany changed the positioning of the price from the lower right side in 2015 to the upper right side.
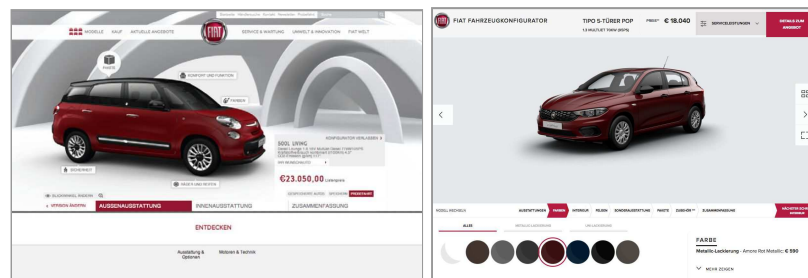

Fig. 17. Screenshot of www.fiat.de: 2015 (left) [7] and 2016 (right)

- **Configuration Summary:** The configuration summary presents all custom options that were chosen within the configuration process and give the user an overview of the individualized product before further purchasing decisions [7, 8]. 61,5% (32) of the 52 car configurators cover the summary in the process navigation, so the position changed when the whole process navigation changed. 14 of the remaining configurators display the summary

as a button. 13 of the 14 summaries changed their position and one didn't. 5 configurators don't offer a summary as button or in the process navigation at all. One configurator added a summary in 2016.

4.3   Premise of the Analysis

This quantitative analysis gives an overview of changed user interfaces of various industries within one year, with a special focus on the *Motor & Vehicle* industry. Although the study takes a closer look at the changes of user interfaces of car configurators, the results do not give information about whether these changes have an impact on purchasing decisions of users or why companies decided to change the user interface.

5   Summary and Outlook

In times where user needs are getting more and more into focus and product offerings change in consequence of developing user needs, the aim of this study is to take a look at the status quo of product configurators of various industries. The basis of this study are the Configurator Database Report 2015 [7] and Configurator Database Report 2016 [1], which both offer a collection of more than 1000 online product configurators in 17 industries.

In the first part of this paper the status quo and changes of the product configurator landscape are elaborated. The second part of this paper focuses on the quantitative analysis, which delivered the following results. The product configurators that remained online from 2015 to 2016 were analyzed concerning interface changes. The analysis shows that 75% of the user interfaces of the *Motor & Vehicle* industry have changed within one year, followed by the industries *Paper & Books* with 47% and *Apparel* with 43%. Focusing on the changed user interfaces of the *Motor & Vehicle* industry the leading product category is cars with 52 configurators. These 52 car configurators have been analyzed according predefined categories, namely changes in visual appearance, ☐configuration steps (amount, wording, position, process buttons), product visualization (views, visualization background, position visualization size) and the positioning of the product price and the configuration summary.

The visual appearance (e.g. colors, fonts, style etc.) of all analyzed 52 car configurators has changed from 2015 to 2016. 75% of the 52 analyzed car configurators have changed the amount of the offered configuration steps, whereas 50% offer more steps and 25% less steps compared to 2015. The wording of the

configuration steps was changed by 40 of the 52 car configurators. 57,7% of the 52 car configurators changed the position and/or alignment of the configuration steps. 67% changed the amount of views offered for the product visualization, furthermore 46,2% of the 52 car configurators modified the background visualization and 53,8% changed the position of the product visualization. 29 of the 52 car configurators (55,8%) didn't change the size of the product visualization, however 16 (30,8%) made the product visualization bigger and 7 (13,5%) made the product visualization smaller. 71,2% of the 52 analyzed configurators changed the position of the product price. 61,5% cover the customization summary in the process navigation; the 14 remaining configurators display the summary as a button. 13 of the 14 summaries changed their position and one didn't.

The study gives a good overview of changed user interface elements of car configurators. It proves that there is a flow concerning the position, alignment and other characteristics of user interface elements.

However, the analysis doesn't reveal why 75% of companies in the *Motor & Vehicle* industry have such a high tendency to change their user interfaces within one year. Some of the screenshots of the Configurator Database Report 2016 [1] are not even up to date anymore, so it can be assumed that car configurator may change much more rapidly than configurators of other industries. For further research it would be interesting to interview car companies to find out why they have such a high tendency to change the user interface of their configurator and what their main impulse is to change them (user testing, customer feedback, market research, consulting company etc.). Another important field of research is if companies offering car configurators work with systems that allow them to change the user interfaces rapidly and allow them to react on trends and desires or if they rely on more complex and time consuming systems.

Appendix

Table 1. Sample of 52 car configurators [1, 6]

No.	Company Name	URL
1	Alfa Romeo	http://www.alfaromeo.de
2	Audi DE	http://www.audi.de/de/brand
3	Bentley	http://www.bentleymotors.com
4	BMW USA	http://www.bmwusa.com
5	Buick	http://www.buick.com

6	Cadillac	http://www.cadillac.com
7	Chevrolet DE	http://www.chevrolet.de
8	Chevrolet USA	http://www.chevrolet.com
9	Chrysler	http://www.chrysler.com
10	Citroen	http://www.car-configurator.citroen.co.uk
11	Dacia DE	http://www.dacia.de
12	Dodge	http://www.dodge.com
13	Ferrari.com	http://www.ferrari.com
14	Fiat DE	http://www.fiat.de
15	Fiat USA	http://www.fiatusa.com
16	Ford DE	http://www.ford.de
17	Ford USA	http://www.ford.com
18	GMC	http://www.gmc.com
19	Holden	http://www.holden.com.au
20	Honda DE	http://www.honda.de
21	Honda USA	http://www.honda.com
22	Hyundai USA	http://www.hyundaiusa.com
23	Jaguar	http://www.jaguar.com
24	Jeep	http://www.jeep.com
25	Kia US	http://www.kia.com
26	Land Rover	http://www.landrover.com
27	Lexus DE	http://www.lexus.de
28	Lexus USA	http://www.lexus.com
29	Lincoln	http://www.lincoln.com
30	Maserati	http://www.maserati.com
31	Mazda UK	http://www.mazda.co.uk
32	Mazda USA	http://www.mazdausa.com/
33	Mini AT	http://www.mini.at
34	Mini USA	http://www.miniusa.com
35	Mitsubishi	http://www.mitsubishi-motors.at

36	Nissan DE	http://www.nissan.de
37	Peugeot	http://www.peugeot.at
38	Porsche AT	http://www.porsche.at
39	Ram	http://www.ramtrucks.com
40	Renault	http://www.renault.de
41	Seat	http://www.seat.de
42	Skoda	http://www.skoda.at
43	Smart	http://www.smartusa.com/
44	Subaru US	http://www.subaru.com
45	Suzuki DE	http://auto.suzuki.de
46	Tesla Motors	http://www.teslamotors.com
47	Toyota DE	http://www.toyota.de
48	Toyota USA	http://www.toyota.com
49	Volkswagen AT	http://www.volkswagen.at
50	Volkswagen DE	http://www.volkswagen.de
51	Volkswagen USA	http://www.vw.com/
52	Volvo	http://www.volvocars.com

References

1. Blazek P, Partl M, Streichsbier C (2016) Configurator Database Report 2016, Lulu Inc., Raleigh
2. Hermans G (2012) A Model for Evaluating the Solution Space of Mass Customization Toolkits, in: International Journal of Industrial Engineering and Management 2012 3(4), pp. 205-214.
3. Piller F, Blazek P (2014) Core Capabilities of Sustainable Mass Customization. In: Felfernig A, Hotz L, Bagley C, Tiihonen J (eds) Knowledge-based Configuration: From Research to Business Cases, Waltham, pp. 107–120.
4. Felfernig A, Blazek P, Reinfrank F, Ninaus G (2014) User Interfaces for Configuration Environments. In: Felfernig A, Hotz L, Bagley C, Tiihonen J (eds) Knowledge-based Configuration: From Research to Business Cases, Morgan Kaufmann-Elsevier, Waltham, pp. 89-106.
5. Blazek P, Pilsl K (2014) The impact of the arrangement of user interface elements on customer satisfaction in the configuration process. In: Brunoe T, Nielsen K, Joergensen K, Taps S (eds) Proceedings of the MCPC 2014, the 7th World Conference on Mass Customization, Personalization, and Co-creation. Lecture Notes in Production Engineering. Springer, Cham

6. Blazek P, Kolb M, Streichsbier C, Honetz S (2017) The Evolutionary Process of Product Configurators. In: Bellemare J, Carrier S, Nielsen K, Piller F (eds) Managing Complexity. Springer Proceedings in Business and Economics, Springer, Cham
7. Blazek P, Partl M, Streichsbier C (2015) Configurator Database Report 2015, Lulu Inc., Raleigh
8. Blazek P, Pilsl K (2016) Guidelines for Setting Up Successful Product Configurator Projects. In: Anisic Z, Forza C (eds) Proceedings of the 7th International Conference on Mass Customization and Personalization in Central Europe (MCP-CE 2016), Novi Sad, pp. 30-33.
9. Streichsbier C, Blazek P, Partl M (2010) The influence of de-facto standards on users dealing with B2C configuration systems. Proceedings of the MCP-AP 2010, Taipei