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Synergic Effects of Sales-Configurator Capabilities on Consumer-Perceived Benefits of Mass-Customized Products

Enrico Sandrin
Postdoctoral research fellow, Department of Management and Engineering, University of Padova, Stradella S. Nicola, 3, 36100 Vicenza, Italy, enrico.sandrin@unipd.it

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Abstract

Sales configurators (SCs) are beneficial to both mass customizers and their customers. The widespread adoption of online SCs, which enable consumers to self-customize their product solutions online, reflects the importance of these tools for companies that pursue mass customization. Prior research has found empirical evidence that the SC capabilities of focused navigation, flexible navigation, easy comparison, user-friendly product-space description, and benefit-cost communication improve the utilitarian benefit consumers perceive to gain from the possession of a mass-customized product. Only the first three capabilities, however, have been shown to enhance the uniqueness and self-expressiveness benefits. These findings derive from the study of the independent effects of the five capabilities on the utilitarian, uniqueness and self-expressiveness benefits. The present paper adds to prior research results by conceptually and empirically examining the synergic effects of the five capabilities on such benefits. Data analysis is performed using structural equation modeling and a sample of 675 configuration experiences using real online SCs for laptops/notebooks, economy cars, and sport shoes/sneakers. The paper finds that all five capabilities become effective in improving all the three consumer-perceived benefits when the capabilities are implemented jointly. This result suggests that a holistic approach in the implementation of the five capabilities is more effective in improving the consumer-perceived benefits of mass-customized products than a piecemeal approach.

Key words: *Complementarity, Consumer value, Mass-customization toolkits, Product self-customization, Sales configurators, Synergy*

1. INTRODUCTION

As customers become increasingly sophisticated, product life cycles shrink, and global competition intensifies, more and more companies need to embrace a mass-customization strategy [1–3]. The goal of mass customization is to fulfill each customer's idiosyncratic needs without substantial trade-offs in cost, delivery, and quality [4–6].

An important technological development for mass customizers has been the use of online sales configurators (SCs) [7], also known as mass-customization toolkits [8]. An SC is a knowledge-based software application that supports a potential customer, or a sales-person interacting with a potential customer, in completely and correctly specifying a product solution within all the possible solutions offered by a company [9, 10]. Sales configurators may be stand-alone applications or part of other applications called product configurators. Product configurators also support the creation of the technical product data necessary to build a solution requested by a customer [9–12]. The number of online SCs, also called web-based SCs, has grown over the last decade due to improvements in and diffusion of computer and Internet technology [13, 14]. Online SCs enable customers to self-customize product solutions online and may also have an e-commerce function that allows customers to buy their customized product online [13].

The widespread adoption of mass customization [7] may increase the need for mass customizers to discover unexploited sources of differentiation advantage over competitors adopting the same strategy [15]. A key in gaining such a differentiation advantage could be the increase in customer-perceived benefits derived from the possession of a mass-customized product. Beyond the traditionally considered utilitarian benefit of possessing a product that better fits a customer's functional and aesthetic needs [16, 17], uniqueness and self-expressiveness are two additional consumer-perceived benefits [17]. The importance of "non-utilitarian" benefits for consumers is witnessed, for example, in Franke and Schreier's [18] study, where a consumer's willingness to pay for a mass-customized product increases as the consumer's perception of the product's uniqueness increases, thus providing a uniqueness benefit in addition to the utilitarian one.

Consequently, manufacturers pursuing mass customization should take into account all the benefits their customers can derive from a mass-customized product, and should build their resources to maximize such benefits [17]. Since online SCs are heavily used resources of mass customizers, a highly relevant question is: what are the characteristics an SC should have to increase the benefits of a mass-customized product? Previous research addressing this question has mainly focused on how SCs should be designed to enhance the utilitarian benefit of the configured product [8, 17]. The only exception is Sandrin et al.'s [19] study concerning the effects of five SC capabilities (i.e., focused navigation, user-friendly product-space description, flexible navigation, easy comparison, and benefit-cost communication capabilities) on three consumer-perceived benefits of mass-customized products (i.e., utilitarian, uniqueness, and self-expressiveness benefits). The five SC capabilities considered by Sandrin et al.'s [19] were originally conceptualized, operationalized, and validated by Trentin et al. [20] and represent a means to evaluate an SC in terms of its capabilities regardless of the specific design solutions adopted. A major advantage of these five capabilities is that they are not context-specific, which makes them suitable for evaluating different SCs in different industries.

Sandrin et al.'s [19] study finds that benefits-cost communication and user-friendly product-space description capabilities do not have a significant effect on uniqueness and self-expressiveness benefits. This result could lead practitioners to concluding that these two SC capabilities are not necessary to enhance these two benefits. However, Sandrin et al.'s [19] study focused on the independent effects of the five SCs capability, leaving possible synergic effects unexplored. It is possible, for example, that the two capabilities that do not have significant independent effects on the uniqueness and self-expressiveness benefits actually reinforce the effects of the other three capabilities on the same benefits. In other terms, all five SC capabilities could be important, when implemented jointly, to increase the consumer-perceived benefits of mass-customized products.

To narrow this research gap, the present paper conceptually develops and empirically tests the hypotheses that the five SC capabilities mentioned above have positive synergic effects on the utilitarian benefit, the uniqueness benefit, and the self-expressiveness benefit of possessing a mass-customized product. Data analysis is performed using structural equation modeling and a sample of 675 configuration experiences using real online SCs for laptops/notebooks, economy cars, and sport shoes/sneakers.

The paper finds that all five capabilities become effective in improving all the three benefits when the capabilities are implemented jointly. This result suggests that a holistic approach in the implementation of the five capabilities is more effective in improving the consumer-perceived benefits of mass-customized products than a piecemeal approach.

The remainder of this paper is organized as follows. Section 2 formally introduces the research constructs based on the existing literature and develops the research hypotheses. Section 3 presents the method deployed to test such hypotheses. The results of the hypothesis-testing portion of the study are reported in Section 4. Finally, Section 5 presents the discussion of the results, and Section 6 presents the conclusions, addressing the implications of the study as well as its limitations and the related directions for future research.

2. THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

2.1 Consumer-perceived benefits of a mass-customized product

According to Merle et al. [17], consumers can derive three different benefits from the possession of a mass-customized product: utilitarian, uniqueness, and self-expressiveness benefits (Table 1). A consumer perceives utilitarian benefits when a mass-customized product enables the consumer to fulfill his/her functional and aesthetic needs [17, 21, 22]. Accordingly, utilitarian benefit is defined as "the benefit acquired from the closeness of fit between the objective features of a product (i.e., its functional and/or aesthetic features, depending on the product category) and the consumer's preferences [17, 21, 22]" [19: 1297]. The main argument in favor of mass customization is the increased utilitarian benefit that a consumer derives from a mass-customized product, as compared with the best standard product available [17, 19, 22].

On the other hand, uniqueness and self-expressiveness benefits derive from the symbolic qualities of a product rather than from its objective characteristics [19]. A product is considered as a symbol when it stands for or expresses something else [23]. The product as a symbol serves as a means of communication, since it conveys a symbolic meaning [23].

The symbolic meaning a product communicates to an individual is determined not only by the objective characteristics of the product, but also by subjective factors belonging to the individual, such as his/her prior experiences [19, 24].

A consumer perceives uniqueness benefits when a mass-customized product enables the consumer to assert personal uniqueness [17, 19, 22]. Accordingly, uniqueness benefit is defined as the benefit acquired from the opportunity to assert personal uniqueness using a self-customized product [17]. This benefit is explained by prior research on the topics of uniqueness [e.g., 25], optimal distinctiveness [e.g., 26], individuation [e.g., 27], and social differentiation [e.g., 28]. These studies share the idea that individuals need a certain level of both similarity and differentiation between the self and relevant others [26]. The need for uniqueness is the motive that pushes individuals to establish and maintain some sense of differentiation from others [29, 30]. This motive manifests itself in a variety of behaviors, where the manifestations of uniqueness are both for the internal audience of oneself and for the external audience of other people [29]. As possessions

are an important component of sense of self [31], one way for individuals to fulfill their need for uniqueness is through the acquisition, utilization, and disposition of products that few others possess [19, 32]. In particular, as customization differentiates the product a consumer receives from that received by others, consumers may fulfill their need for uniqueness by customizing commonly owned products [19, 33, 34].

A consumer perceives the self-expressiveness benefit when a mass-customized product enables the consumer to own a product that reflects his/her view of himself/herself [17, 19]. Accordingly, this consumer-perceived benefit is defined as the benefit derived from the opportunity to possess a product that reflects one's self-image [17, 19]. This benefit is clarified by prior research on self-concept in consumer behavior [e.g., 35], where self-concept indicates "the totality of the individual's thoughts and feelings having reference to himself as an object" [19, 36: 7]. Many studies in this stream of research have examined consumer behavior (e.g., purchase intention or product preference) as a function of self-image congruence [37]. Self-image congruence is defined as the match between the symbolic attributes of a product and the components of a consumer's self-concept, such as how he/she perceives himself/herself (actual self), how he/she would like to perceive himself/herself (ideal self), or how he/she presents himself/herself to others (social self) [35, 37]. Depending on which component of self-concept is involved, self-image congruence is guided by different motives [37]. In particular, when the involved component is actual self, the motive underlying self-image congruence is known in literature as the need for self-consistency, which is defined as the individual's need to behave in ways that are consistent with his/her view of himself/herself [37]. This need motivates the consumer to purchase a product with a symbolic meaning that is congruent with his/her actual self [35]. Product customization provides an opportunity for consumers to fulfill their need for self-consistency, since they can choose from among several options [17, 38].

Table 1. Consumer-perceived benefits of a mass-customized product [17, 19]

Benefit	Nominal Definition
Utilitarian benefit (UT)	The benefit derived from the closeness of fit between the objective features of a product (i.e., its functional and/or aesthetic features, depending on the product category) and the consumer's preferences
Uniqueness benefit (UN)	The benefit acquired from the opportunity to assert personal uniqueness using a self-customized product
Self-expressiveness benefit (SE)	The benefit derived from the opportunity to possess a product that reflects one's self-image

To summarize, a consumer can fulfill different needs, which leads to different consumer-perceived benefits, by means of the possession of a mass-customized product. The product can meet the consumer's functional and aesthetic needs, which leads to a utilitarian benefit; can satisfy his/her need for uniqueness, which leads to a uniqueness benefit; and can fulfill his/her need for self-consistency, which leads to a self-expressiveness benefit. Consumers anticipate the utilitarian, uniqueness, and self-expressiveness benefits while they customize their product solution with an SC [19].

2.2 **Sales configurator capabilities and their effects on the consumer-perceived benefits**

Sales configurators are designed to present a company's product offerings, also known as product space [39] or solution space [40], and guide the user or a sales-person interacting with a potential customer, in completely and correctly specifying a product solution within a company's product offerings [9, 10, 41].

Sales configurators, especially online SCs, which enable customers to customize their own product solutions online, play an increasingly important role in the state-of-the-practice in mass customization [7, 8].

During the last decade, a growing number of studies have addressed the issue of which characteristics an SC should have in order to increase the benefits and reduce the costs of its use by a potential customer. Based on a research project with Dell Computer, Randall et al. [42] offer suggestions to alleviate the difficulty experienced by a customer in self-customizing a product and to increase the customer-perceived fit of the customized product with his/her own preferences. These suggestions include, for instance, allowing the customer to quickly identify a predefined product configuration that is close to the desired outcome and that can be subsequently refined, customizing the configuration process according to the customer's familiarity with the product, providing rich illustrations of the configured product, and allowing for side-by-side comparisons of previously saved configurations. Personalization possibilities for an on-line configuration process, as well as techniques to implement such possibilities, are discussed in greater detail by Kreutler and Jannach [43]. Dellaert and Stremersch [44] find that the difficulty of the configuration process decreases when the SC shows only the total price of the configured product, and not also the prices of the individual product options. Kamis et al. [45] provide empirical evidence that an attribute-based SC increases both the customers' enjoyment of the configuration process and the customer-perceived usefulness of the SC, thereby raising purchase intention as well as the intention to reuse the configurator. An attribute-based SC presents customers with all the product attributes that can be customized along with all the possible levels for each attribute and also shows an image of the product being configured. Valenzuela et al. [46] further investigate the advantages of the attribute-based presentation compared with the alternative-based one, in which customers have to choose among fully

specified product alternatives. These scholars find that the attribute-based presentation reduces decision difficulty in product customization and increases both satisfaction with the configured product and willingness to purchase. Other SC characteristics that enhance customer satisfaction with the configured product are the provision of easy examples of configured products that do not exceed the customers' abilities to perform the self-customization task [38], and the provision of cues that are compatible with the product category under consideration [47]. More specifically, extrinsic cues (e.g., expert reviews and word of mouth) should be provided in case of experience products, whose quality can be determined only after purchase, while intrinsic cues, which reflect objective product characteristics, should be provided in the case of search products, for which sufficient information can be acquired from firms prior to purchase [47]. Trentin et al. [20] show that satisfaction with a configured product and purchase intention grow based on the extent to which an SC deploys five capabilities (i.e., flexible navigation, focused navigation, easy comparison, user-friendly product-space description, and benefit-cost communication), which reduce the difficulty experienced by a potential customer in configuring a product and in making a purchase decision (Table 2).

Table 2. Sales configurator capabilities [48]

SC capability	Nominal Definition
Focused navigation capability (FocN)	The ability of an SC to quickly focus a potential customer's search on those solutions in a company's product space that are most relevant to the customer
User-friendly product-space description capability (UFD)	The ability of an SC to adapt the description of a company's product space to the individual characteristics of a potential customer as well as to the situational characteristics of his/her use of the SC
Flexible navigation capability (FlexN)	The ability of an SC to let its users easily and quickly modify a product configuration they have previously created or are currently creating
Easy comparison capability (EC)	The ability of an SC to support its users in comparing product configurations they have previously created
Benefit-cost communication capability (BCC)	The ability of an SC to effectively communicate the consequences of the configuration choices made by a potential customer both in terms of what he/she would would receive and in terms of what he/she would pay

The same authors in another study find that the same five SC capabilities make the experience of self-customizing a product more enjoyable and make potential customers feel stronger pride of authorship, thus delivering higher hedonic and creative-achievement benefits [48]. Finally, the same five SC capabilities increase the consumer-perceived utilitarian benefit, but only three out of the five increase consumer-perceived uniqueness and self-expressiveness benefits [19]. It is worth noting that previous studies only consider the independent effects of individual SC capabilities without considering the interaction or complementarity effect among a bundle of SC capabilities implemented jointly.

2.3 **Synergies among sales configurator capabilities**

The economic theory of complementarities highlights the super-additive value of resource combinations [49]. Complementary resources are not identical, but they are interdependent and mutually supportive [49]. The returns obtained from the joint adoption of a set of complementary resources outweigh the returns obtained from the adoption of individual resources in isolation [49, 50].

The complementarity concept applies to the case of the five SC capabilities and the three consumer-perceived benefits of interest to the present study. During the configuration process, the five capabilities mutually reinforce each other in aiding the customer to identify the product solution that best matches his/her functional and aesthetic needs as well as his/her needs for uniqueness and for self-consistency.

Before starting the configuration process, an average potential customer already has in mind a set of product attributes for which his/her preferences are well defined [51]. At the beginning of the configuration process, the focused navigation capability (FocN) of an SC, which is the ability to quickly focus a potential customer's search on those solutions in a company's product space that are most relevant to the customer [48], permits the configuration process to start from those attributes for which the customer's preferences are well-defined [52]. To take full advantage of the FocN, the potential customer needs to be able to easily determine the attributes relevant to him/her by understanding the information available in the SC [53-55]. The user-friendly product-space description capability (UFD) of an SC allows the description of a company's product space to adapt to the individual characteristics of a potential customer as well as to the situational characteristics of his/her use of the SC [48]. Consequently, the UFD acts as a catalyst for the FocN to drive the potential customer quickly to where the most likely best solution is for him/her. It is worth noting that the UFD, which has been found to have no independent effects on the uniqueness and self-expressiveness benefits [19], at least plays an important role in reinforcing the effects of the FocN.

Once the consumer has narrowed the set of solutions he/she would consider purchasing, some of the remaining choices are likely to be affected by greater

uncertainty [51, 52]. To solve this uncertainty, the customer can make one or more trial-and-error cycles exploring the set of solutions he/she has initially focused on [56, 57]. Such an exploration requires both rapid changes to the current configuration and the ability to compare different configurations effectively, for example, to compare [42] and evaluate [55] different configurations of a number of attributes relevant for the customer. The first requirement is addressed by the flexible-navigation capability (FlexN), which is the ability of an SC to let its users easily and quickly modify a product configuration they have previously created or are currently creating [48].

The second requirement is met by the easy-comparison capability (EC), which is the ability of an SC to support its users in comparing product configurations they have previously created [48]. To understand the differences highlighted with the EC, the potential consumer needs an explanation of the benefits and costs for each option [42, 52]. With the benefit-cost communication capability (BCC), which is the ability of an SC to effectively communicate the consequences of the configuration choices made by a potential customer both in terms of what he/she would receive and in terms of what he/she would pay [48], the consumer can understand how the various choice options contribute to fulfilling his/her needs. It is worth noting that the BCC, which has been found to have no independent effects on the uniqueness and self-expressiveness benefits [19], at least plays an important role in reinforcing the effects of the EC by aiding the customer to interpret the differences highlighted by the EC. In summary, the joint implementation of these SC capabilities enables the customer to understand which choices within the initial consideration set are actually better than others. In case the customer is not yet ready to make a final choice, the five SC capabilities enable him/her to narrow the consideration set further and to carry out another trial-and-error cycle. Again, with the aid of all five SC capabilities as described above, the customer can further refine the configuration choices until he/she is ready to make a final decision. Consequently, the following hypotheses (summarized in Figure 1) are proposed:

Hypothesis H1: The complementarity of the FocN, UFD, FlexN, EC, and BCC deployed by an (online) SC has a positive effect on the consumer-perceived utilitarian benefit of a product customized with that SC.

Hypothesis H2: The complementarity of the FocN, UFD, FlexN, EC, and BCC deployed by an (online) SC has a positive effect on the consumer-perceived uniqueness benefit of a product customized with that SC.

Hypothesis H3: The complementarity of the FocN, UFD, FlexN, EC, and BCC deployed by an (online) SC has a positive effect on the consumer-perceived self-expressiveness benefit of a product customized with that SC.

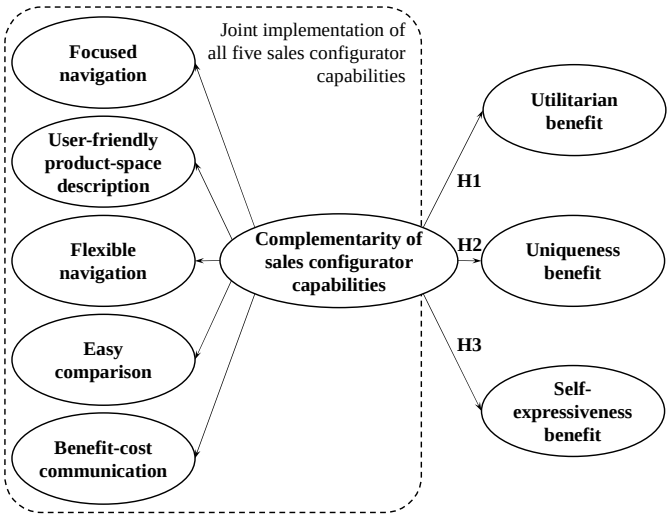

Figure 1. Theoretical model and research hypotheses overview

3. METHOD

3.1 Data description and measures

In order to test the proposed hypotheses, an empirical study was designed using a sample of postgraduate management engineering students at a large, public university in Italy. There were 75 participants (53 males), aged 24–27 years, living in urban (28%), suburban (45%), and rural (27%) areas. All participants had a positive attitude towards online shopping (mean: 5.35 on a seven-point Likert scale anchored by “strongly disagree” [1] and “strongly agree” [7]; standard deviation: 0.96) and, on average, had sufficient expertise in using the Internet to conduct transactions (mean: 3.97 on the same Likert scale; standard deviation: 1.39). Each study participant was asked to self-customize one product from start to finish according to his/her own preferences on each of nine pre-assigned online SCs, for a total of 675 self-customization experiences. For each experience, each participant filled out a questionnaire covering the constructs of interest. All constructs of interest were measured using validated multi-item scales available in the literature. Specifically, the five multi-item scales of the SC capabilities were taken from Trentin et al. [48] and the three multi-item scales of the consumer-perceived benefits were taken from Merle et al. [17], as shown in Appendix A. The nine configurators assigned to each participant were chosen from a set of 31 real online SCs for consumer goods belonging to three product categories: notebooks/laptops, sports shoes/sneakers, and economy cars. The use of three different product categories, ranging from rather simple goods to more complex products, allowed an increase in the variation ranges of the independent variables (i.e., the five sales-configurator capabilities) in the data set. Additional details of the data collection procedure can be found in Sandrin et al. [19].

3.2 Measurement quality

Since both the data set and the constructs of interest are the same as in Sandrin et al. [19], the results of the

assessment of measurement quality are the same and are reported here for the sake of convenience. Data analysis was performed through structural equation modeling using LISREL 9.20 [58]. As the variables did not meet the assumption of multivariate normal distribution (Mardia's test was significant at $p < 0.001$), the Satorra-Bentler correction was applied to produce robust maximum likelihood estimates of standard errors and chi-squares (χ^2). Before conducting the analyses, possible effects of the participants' characteristics were controlled. To that purpose, consistent with prior studies [e.g., 6, 20, 48], the observed indicators were regressed on 75 dummies representing the participants in the study, and the standardized residuals from this linear, ordinary least square regression model were used as the data in all subsequent analyses.

Common method bias was assessed by performing Harman's single-factor test. Confirmatory factor analysis (CFA) was used to test the hypothesis that a single factor accounted for all of the variance in the data [59]. The poor fit of the single-factor model with the data [χ^2/df (df) = 24.87 (299), RMSEA = 0.21, CFI = 0.47] suggested that common method bias was not a concern in this study. Furthermore, CFA was used to assess measurement quality (unidimensionality, convergent validity, reliability, and discriminant validity). In this case, the use of CFA to assess the measurement quality is appropriate, as the factorial structure that links the observed and unobserved variables is already known, since previously validated measurement scales are used [60]. In this case, CFA was performed by estimating an a priori measurement model specifying the posited relations of the observed variables to the underlying latent constructs, with the latter ones being free to correlate [60]. This CFA model showed good fit indices [χ^2 (df) = 634.58 (271), χ^2/df = 2.34, NNFI = 0.97, CFI = 0.97, IFI = 0.97, RMSEA (90% CI) = 0.050 (0.046; 0.055)], meaning that the hypothesized factorial structure reproduced the data well. Furthermore, all standardized factor loadings were positive, greater than 0.70, and statistically significant at $p < 0.001$ (Appendix A). Overall, these results suggested unidimensionality (i.e., for each multi-item measurement scale, the set of empirical indicators reflects one and only one latent factor) and convergent validity (i.e., the items used as different indicators of the same construct provide the same results) of the used measurement scales [60, 61]. Reliability of the measurement scales was assessed using both average variance extracted (AVE) and composite reliability (CR). All CR values exceeded 0.70 and all AVE scores were greater than 0.50. This indicated that, for each measurement scale, a large amount of the variance is captured by the underlying latent construct rather than being due to measurement error [62, 63].

Finally, discriminant validity, which refers to the extent to which measures intended to capture different constructs actually reflect separate constructs, was tested using Fornell and Larcker's [62] procedure. As shown in Appendix B, for each of the eight latent constructs, the square root of the AVE exceeded the correlations with all the other latent constructs, which suggests good discriminant validity [62].

4. RESULTS

Hypotheses 1, 2, and 3 were tested according to Tanriverdi and Venkatraman [49] description of how to test complementarity. The complementarity of the five SC capabilities was formally specified as a reflective second-order latent factor, with the first-order factors representing the individual capabilities. A reflective second-order latent factor is an unobserved factor that manifests itself through some first-order factors and captures an underlying phenomenon that explains why the first-order factors co-vary with each other [64, 65]. It is worth noting here that a formative rather than a reflective second-order latent factor would not have been appropriate to capture covariation, as it does not assume any covariance among the first-order factors [65]. The second-order factor captures the main source of covariance among the capabilities and it models the complementarity of the first-order factors by accounting for their multilateral interaction and covariance [49, 66]. The second-order factor represents the overall capability of an online SC composed of a set of five complementary capabilities implemented simultaneously. As shown in Appendix B, the correlations among the five SC capabilities are highly significant, thus suggesting that a second-order factor capturing the common covariance among the capabilities can be a suitable model to characterize the relationships among the five capabilities.

To test Hypotheses 1, 2, and 3, therefore, the reflective second-order model of the effect of the complementarity of the five SC capabilities on the three consumer-perceived benefits was compared with the first-order model of the independent effects of the same five SC capabilities on the same criterion variables. The latter is the model developed and tested by Sandrin et al. [19], whose results are reported here in Table 3 and Figure 2 for the sake of convenience. In both models, the three consumer-perceived benefits were free to correlate with each other.

To compare the first-order and second-order models, the four criteria adopted by Tanriverdi [65] were used; namely, (1) goodness of fit statistics for the two models [67-69]; (2) significance of the second-order factor loadings [68, 69]; (3) target coefficient (T), which is the ratio of the χ^2 value of the first-order model to the χ^2 value of the second-order model [70]; and (4) significance of the structural links to the criterion variable of interest [69].

The fit indices of the first-order model and those of the second-order model (Table 3) were almost identical and consistently demonstrated that both these theoretical models fit the data well. It is worth noting that "even when the second-order factor model is able to explain effectively the factor covariations, the goodness-of-fit can never be better than the competing first-order model" [69: 31]. Consequently, as the second-order model is more parsimonious, with fewer parameters to be estimated and more degrees of freedom, it should be preferred to the first-order model [67, 69].

Table 3. Fit statistics of the first-order model and the second-order model

Fit index	First-order model	Second-order model
χ^2 (df)	634.58 (271)	749.53 (288)
χ^2/df	2.34	2.60
NNFI	0.97	0.96
CFI	0.97	0.97
IFI	0.97	0.97
RMSEA (90% CI)	0.050 (0.046; 0.055)	0.054 (0.050; 0.058)

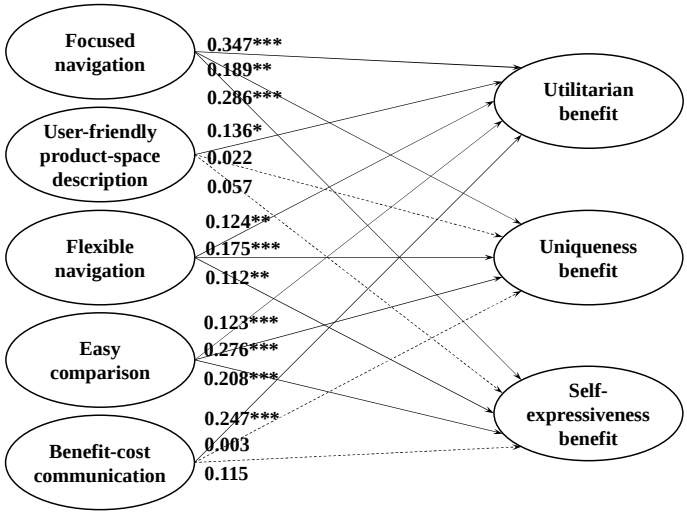

Figure 2. Independent effects of the five sales configurator capabilities on the three consumer-perceived benefits of a mass-customized product (*p < 0.05; **p < 0.01; ***p < 0.001) (source: Sandrin et al. [19])

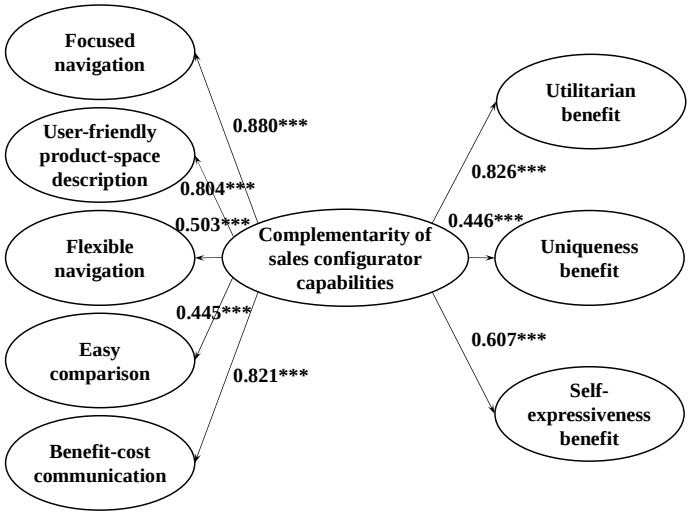

Figure 3. Effect of the complementarity of the five sales configurator capabilities on the three consumer-perceived benefits of a mass-customized product (***p < 0.001)

Note: For the sake of clarity in both Figure 2 and Figure 3, only the causal paths are presented.

In addition, all second-order factor loadings were highly significant at p < 0.001, also providing justification for the acceptance of the second-order model [68, 69]. As for the target coefficient, its value (T = 0.85) was close to the theoretical upper limit of 1, which also recommends acceptance of the second-order model [49, 70]. Finally, as shown in Figure 3, in the second-order model, all the impacts on the criterion variables (i.e., utilitarian, uniqueness, and self-expressiveness benefits) are statistically significant. Conversely, in the first-order model, four impacts on the uniqueness and self-expressiveness benefits are not significant at p < 0.05. Collectively, these results support Hypotheses 1, 2, and 3.

5. DISCUSSION

This is the first study that examines the effects of the joint implementation of a bundle of SC capabilities on the consumer-perceived benefits of possessing a mass-customized product. By doing that, this paper finds at least two results that improve the current understanding of how online SCs can support a business-to-consumer mass-customization strategy. First, the two capabilities (UFD and BCC) that individually taken were found by Sandrin et al. [19] not to have a significant effect on the uniqueness and self-expressiveness benefits [19] are actually important for the purposes of increasing such benefits because the UFD and BCC reinforce the effects of the other capabilities on those benefits. Second, the other three capabilities (FocN, FlexN, and EC) not only have positive significant effects on all the three benefits when they are taken individually, as found by Sandrin et al. [19], but also enhance such benefits by reinforcing the effects of one another.

Another point that is worth discussing is the existence of some differences in the magnitude of the path coefficients for the second-order construct. While being all significant at p < 0.001, the path coefficients for the EC and FlexN are relatively lower than those for the other three (FocN, UFD, and BCC). This could be explained by the fact that in the sample there are some SCs that exhibit relatively less EC compared to the other capabilities. On the other hand, as regards the FlexN, some SCs in the sample have relatively more FlexN compared to the other capabilities.

As regards the magnitude of the path coefficients from the complementarity of the five SC capabilities to the three consumer-perceived benefits, there are again some differences, although the coefficients are all highly significant. This means that for a given increase in all five capabilities, the utilitarian benefit increases the most (path coefficient = 0.826) among the three considered benefits. Therefore, it seems that the synergy among the five SC capabilities plays a stronger role in gaining a utilitarian benefit than the other two benefits. This finding could be explained by the fact the SCs in the sample are generally centered on the utilitarian benefit and need improvement in their ability to communicate the uniqueness and self-expressiveness benefits [19].

6. CONCLUSION

The present paper takes a step forward in raising practitioners' awareness that SCs can be an effective tool to augment the benefits consumers will derive from the possession of mass-customized goods. It does so by showing that the five SC capabilities of focused navigation, user-friendly product space description, flexible navigation, easy comparison, and benefit-cost communication are a set of mutually reinforcing characteristics of an (online) SC that helps consumers better fulfill not only their functional and aesthetic needs, but also their needs for uniqueness and for self-consistency. This means that for achieving high values of consumer-perceived benefits of a customized product, an effective way to design an SC is to develop all five SC capabilities at a high level. In other words, a selective approach that develops only some SC capabilities and leaves behind some other SC capabilities is not an optimal solution to increase the perceived benefits of the customized product.

From a theoretical perspective, these findings improve the current understanding of how online SCs can support a business-to-consumer mass-customization strategy [e.g., 16, 20, 42, 46]. While contributing both to the academic literature and to managerial practice, this study is not without limitations, which might be addressed in future research. This study focuses on the synergic effects of the five SC capabilities on the consumer-perceived benefits related to the possession of a mass-customized product. Future research could examines examine possible complementarity effects of the same capabilities on the consumer-perceived benefits of the mass-customization experience [17, 48] instead of the mass-customized product. A second limitation of this study is that the implementation costs of higher levels of all five capabilities in an SC are overlooked. Future research should address this limitation and, in particular, should investigate technical solutions capable of reducing such costs. A third limitation is that the empirical findings are derived from a convenience sample of potential customers and rely on only three product categories, which clearly sets limitations on the generalizability of the results. Future studies should replicate the findings in more representative samples of potential customers and across a wider set of consumer goods. A final limitation of the present study lies in the fact that possible contingency effects due to, for example, individual differences [71, 72] or cultural variables [38, 73] are not examined. A future research opportunity is, therefore, to include contingency variables that could moderate the relationships investigated in this study.

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APPENDIX A. MEASURES OF THE CONSTRUCTS OF INTEREST

For each item, respondents indicated the extent to which they agreed or disagreed with the statement on a seven-point Likert scale (7 = completely agree, 1 = completely disagree).

		Standardized factor loading[a]
Focused navigation capability (FocN)[b] (AVE: 0.726; CR: 0.914)		
FocN1	The system made me immediately understand which way to go to find what I needed	0.864
FocN2	The system enabled me to quickly eliminate everything that was not interesting to me at all from further consideration	0.786
FocN3	The system immediately led me to what was more interesting to me	0.896
FocN4	This system quickly leads the user to those solutions that best meet his/her requirements	0.859
User-friendly product-space description capability (UFD)[b] (AVE: 0.736; CR: 0.893)		
UFD1	The system gives an adequate presentation of the choice options for when you are in a hurry, as well as for when you have enough time to go into the details	0.899
UFD2	The product features are adequately presented for the user who just wants to find out about them, as well as for the user who wants to go into specific details	0.913
UFD3	The choice options are adequately presented for both the expert and inexpert user of the product	0.754
Flexible navigation capability (FlexN)[b] (AVE: 0.609; CR: 0.823)		
FlexN1	The system enables you to change some of the choices you have previously made during the configuration process without having to start over again	0.741
FlexN2	This system requires very little effort to modify the choices you have previously made during the configuration process	0.792
FlexN3	Once you have completed the configuration process, this system enables you to	0.806

		Standardized factor loading[a]
	quickly change any choice made during that process	
Easy comparison capability (EC)[b] (AVE: 0.795; CR: 0.939)		
EC1	The system enables easy comparison of product configurations previously created by the user	0.893
EC2	The system lets you easily understand what previously created configurations have in common	0.947
EC3	The system enables side-by-side comparison of the details of previously saved configurations	0.807
EC4	The system lets you easily understand the differences between previously created configurations	0.914
Benefit-cost communication capability (BCC)[b] (AVE: 0.689; CR: 0.869)		
BCC1	Thanks to this system, I understood how the various choice options influence the value that this product has for me	0.845
BCC2	Thanks to this system, I realized the advantages and drawbacks of each of the options I had to choose from	0.783
BCC3	This system made me understand exactly what value the product I was configuring had for me	0.860
Utilitarian benefit (UT)[c] (AVE: 0.846; CR: 0.943)		
Ut1	This product is exactly what I had hoped for	0.926
Ut2	I could create the product that was the most adapted to what I was looking for	0.913
Ut3	I could create the product I really wanted to have	0.920
Uniqueness benefit (UN)[c] (AVE: 0.855; CR: 0.946)		
Un1	With this product, I will not look like everybody else	0.961
Un2	With this program, I could design a product that others will not have	0.886
Un3	With this product, I have my small element of differentiation compared to others	0.924
Self-expressiveness benefit (SE)[c] (AVE: 0.873; CR: 0.954)		
SE1	I could create a product that is just like me	0.939
SE2	This product reflects exactly who I am	0.913
SE3	This product is in my own image	0.950

[a] All factor loadings are significant at $p < 0.001$.
[b] Trentin et al. [48].
[c] Merle et al. [17] (short version of the multi-item scale).

APPENDIX B. INTER-CONSTRUCT CORRELATIONS AND DISCRIMINANT VALIDITY

	Correlations[a]							
	UT	UN	SE	BCC	EC	UFD	FlexN	FocN
UT	**0.920**							
UN	0.616	**0.925**						
SE	0.806	0.790	**0.934**					
BCC	0.673	0.298	0.462	**0.830**				
EC	0.427	0.432	0.419	0.294	**0.892**			
UFD	0.642	0.314	0.449	0.698	0.313	**0.858**		
FlexN	0.463	0.383	0.384	0.344	0.426	0.392	**0.780**	
FocN	0.724	0.390	0.539	0.727	0.391	0.711	0.428	**0.852**

Note: The square root of the average variance extracted (AVE) is shown on the diagonal of the matrix in bold; the inter-construct correlation is shown off the diagonal.
[a] All correlations are significant at $p < 0.001$.

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Sinergetski efekat mogućnosti konfiguratora prodaje na koristi za kupce kastomizovanih industrijskih proizvoda

Enrico Sandrin

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Apstrakt

Konfiguratori prodaje predstavljaju korist i za kastomizovane industrijske proizvođače i za njihove potrošače. Široka rasprostranjenost prihvatanja „online" konfiguratora prodaje, koji omogućavaju potrošačima da kastomizuju proizvode „online", odražava značaj ovih alata za kompanije koje teže kastomizovanoj industrijskoj proizvodnji. U prethodnim istraživanjima su pronađeni empirijski dokazi da mogućnosti konfiguratora prodaje koje podrazumevaju fokusiranu navigaciju, fleksibilnu navigaciju, jednostavno poređenje, prilagođenost opisa prostora proizvoda korisniku i komunikaciju koja se tiče troškova i koristi unapređuju upotrebnu vrednost koju korisnici doživljavaju da dobijaju posedovanjem kastomizovanih industrijskih proizvoda. Međutim, pokazalo se da samo prve tri od navedenih mogućnosti povećavaju koristi koje se tiču jedinstvenosti i samoizražajnosti. Ovi zaključci proizilaze iz istraživanja nezavisnih efekata navedenih pet mogućnosti konfiguratora prodaje na koristi koje se

odnose na upotrebnu vrednost, jedinstvenost i samoizražajnost. Ovaj rad doprinosi prethodnim istraživanjima konceptualnim i empirijskim istraživanjem sinergetskog efekta pet mogućnosti konfiguratora prodaje na koristi za korisnike. Analiza podataka je izvedena korišćenjem strukturalnog modelovanja. U te svrhe je korišćen uzorak od 675 konfiguracionih iskustava na realnim „online“ konfiguratorima prodaje za laptopove, automobile i sportsku obuću. U ovom radu je utvrđeno da svih pet mogućnosti postaju efektivne u unapređenju sve tri koristi za korisnike kada se implementiraju zajedno. Ovaj rezultat ukazuje da je holistički pristup u implementaciji pet navedenih mogućnosti konfiguratora prodaje mnogo efektivniji za unapređenje koristi za kupce kastomizovanih industrijskih proizvoda, u poređenju sa pojedinačnim pristupom.

Ključne reči: *komplementarnost, vrednost za korisnika, alati za kastomizovanu industrijsku proizvodnju, samokastomizacija proizvoda, konfigurator prodaje, sinergija*