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Supporting the social dimension of shopping for personalized products through online sales configurators

Chiara Grosso[1] · **Cipriano Forza**[1] · **Alessio Trentin**[1]

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Abstract Mass customizers often sell personalized products through online sales configurators, also known as mass-customization toolkits. Recently, a number of mass customizers have connected their sales configurators with social software applications. This is not surprising, as social software enables an interactive and socially rich shopping experience, which makes shopping with a mass-customization toolkit more similar to retail shopping. However, research on the use of social software by mass customizers is very limited: almost all previous studies on mass-customization toolkits have focused on the dyadic interaction between a sales configurator and an isolated, potential customer. Based on an analysis of 277 real online sales configurators, the present paper identifies eight different ways in which online sales configurators can connect with social software. These different connection modalities are compared both in terms of enabled social interactions and in terms of support provided for the sales configuration task. The paper also shows that, in the analyzed sample, the level of adoption varies substantially across the different modalities and, for the same modality, across industries. A number of opportunities for future research on these sales configurator-social software connection modalities are finally outlined.

Keywords Mass customization · Mass-customization toolkit · Online sales configurator · Social software · Social interaction · Shopping experience

1 Introduction

Mass customizers often sell their products on the web through online sales configurators (hereafter simply called configurators) (Fogliatto et al. 2012). This selling approach has

✉ Chiara Grosso
chiara.grosso@unipd.it

[1] Dipartimento di Tecnica e Gestione dei Sistemi Industriali, Universita' degli Studi di Padova, Vicenza, Italy

proven to be beneficial both to mass customizers (Heiskala et al. 2007; Forza and Salvador 2008) and to their customers (Grosso et al. 2014; Trentin et al. 2014; Franke et al. 2010; Merle et al. 2010; Schreier 2006). However, selling through the web may be challenging, not only because, for many companies, it is a new way of selling, but also because web technologies are witnessing a number of innovations. Among these innovations, a prominent role is played by social software applications (hereafter simply called social software - SocSW). Social software refers to computing tools that support, extend, or derive added value from online networking activities (Avram 2006). Social software enables people to connect, collaborate, create online networks, and manage content in a social and bottom-up fashion. Bottom-up communication is a specific characteristic of SocSW and differs from top-down company communication or offline media (Avram 2006; Warr 2008).

The SocSW phenomenon on the web has grown impressively in the past few years, as millions of people have joined online communities and have started using online social platforms (Chui et al. 2012; Kaplan and Haenlein 2010, 2012). Globally, SocSW currently reaches more than 1.5 billion people (Chui et al. 2012; Kaplan and Haenlein 2010; Perrin et al. 2015). Increasingly, SocSW is being adopted by companies to increase their sales and improve their connections with actual and potential customers (Chui et al. 2012; Geyskens et al. 2002; McAfee 2006; Grosso 2014). In this respect, mass customizers are not an exception, as they are starting to include SocSW in their sales-configuration websites as an aid for potential customers involved in configuration tasks.

Relatively few studies, however, have addressed the inclusion of SocSW in online sales configurators. Previous research has highlighted the growing trend of SocSW usage for sharing information about configured products (Piller et al. 2012; Blazek et al. 2012) and has indicated that combining configurators with SocSW is a promising field of inquiry (Franke and Hader 2014; Piller and Blazek 2014), consistent with initial findings on how peer input improves the sales-configuration process (Franke et al. 2008; Jeppesen 2005).

This is a gap that research on product-configuration systems needs to address for at least three reasons. First, the shopping process, including shopping for configured products on a configurator, encompasses a wide range of social interactions (Solomon et al. 2014; Tauber 1972; Moschis and Churchill Jr 1978). Second, e-commerce is undergoing a constant evolution, driven by the adoption of a variety of web features aimed to enhance customer participation, networking, and information sharing as well as to achieve greater economic returns (Chui et al. 2012; Geyskens et al. 2002; McAfee 2006; Grosso 2014; Huang and Benyoucef 2013). Unsurprisingly, the concept of social commerce has been introduced and defined as an Internet-based commercial application, leveraging social media and web technologies which support social interaction and user generated content in order to assist consumers in their decision making and acquisition of products and services within online marketplaces and communities (Huang and Benyoucef 2013, 247). Third, prior research on configurators has shown that consumers are willing to pay a considerable premium to buy configured products whenever they experience a positive perception of the configuration process itself (Franke and Piller 2004).

To narrow this research gap, we need to consider, first of all, how SocSW could support a configurator user decision-making process during his/her configuration task if the configurator and SocSW are in some way connected. Hereafter, we first set the theoretical background; subsequently, we empirically explore the configurator-SocSW connections; finally, we discuss our results in relation to those of previous relevant studies, we outline future research opportunities, and we describe the implication of our work for configurator designers.

2 Background

2.1 The social dimension of shopping process

2.1.1 The shopping process: the EBM model

The shopping experience involves a variety of personal, situational, and social consumer variables that impact the consumers decision-making process. Engel, Blackwell, and Miniard (Engel et al. 1995) developed a model known as the EBM model, from their initials, to understand the variables implicated in the consumers entire decision-making process. One of the advantages of the EBM model is its applicability to a wide range of situations to explain and predict consumer behavior. The core of the EBM model is based on five decision-process stages that any consumer goes through during his/her shopping experiences.

The first stage is called problem recognition and refers to the consumers identification of a need or problem. The consumer experiences an unbalanced condition between the actual and the desired state of need (Engel et al. 1995).

Once the consumer has identified the need s/he wants to satisfy, the consumer goes through a second stage, called information search. The consumer starts gathering information on possible solutions. This stage involves both internal and external consumer sources. Internal sources are, for example, the consumers previous shopping experiences, his/her memory. External sources include interpersonal sources, such as relatives, friends, or company representatives (Bearden and Etzel 1982). The information search stage provides the consumer with the basis to evaluate the various alternatives available to satisfy his/her need.

The third stage of the decision-making process is called evaluation of alternatives. At this point, the consumer evaluates the information previously gathered, develops a set of criteria to compare the alternatives and, finally, defines his/her own preferences.

The fourth stage, called purchase stage, refers to the consumers decision about whether to buy the preferred product/service. The purchase stage also includes the consumers decision about where and how to buy.

The fifth stage refers to post-purchase consumer decisions. A good experience will motivate the consumer to repeat the shopping experience, to provide positive feedback to others, and to positively influence other customers intentions to shop. On the contrary, post-purchase dissatisfaction will produce a negative impact on consumers' attitudes towards the product, the company, and the shopping process (Engel et al. 1995).

2.1.2 The social dimension of online shopping processes

Shopping experiences encompass a wide range of social interactions (Solomon et al. 2014; Tauber 1972; Moschis and Churchill Jr 1978; Engel et al. 1995; Bearden and Etzel 1982; Cheung and Lee 2006; Parsons AG 2002; Lueg and Finney 2007; Teo and Yeong 2003; Butler and Peppard 1998; Lee et al. 2011). A consumer does not shop only for utilitarian reasons. Shopping may be (also) based on other personal motives, such as self-gratification, learning about fashion trends, and diversion from daily routine. In addition, shopping may be (also) driven by a variety of social motives, including affiliation with a group, emulation of others behavior, homologation to a trend, and the pleasure of sharing experience with others (Tauber 1972; Moschis and Churchill Jr 1978; Parsons AG 2002).

Not only may the shopping process be driven (also) by social motives, but, during the process itself, consumers may experience the need to interact with other persons (e.g., the

need for transmitting information or receiving feedback, help, or hints regarding their decisions). Consumer theorists have long recognized the influence that relatives, friends, peers, and reference groups have on consumer decision making (Solomon et al. 2014; Tauber 1972; Moschis and Churchill Jr 1978; Bearden and Etzel 1982; Childers and Rao 1992). These exchanges of information generate a phenomenon called informational social influence, which entails accepting feedback information from others to facilitate problem solving or to cope with some aspect of the environment (Lee et al. 2011). Informational social influence drives consumers to learn about a product/service by seeking information from peers or reference groups. Informational social influence supports a consumer in circumstances of time constraints, limited knowledge, or when s/he perceives a high risk in shopping (Lee et al. 2011, 185). Feedback from others during a shopping experience enables recommendation mechanisms (based on real-time interactions between individuals) that influence and guide the consumer in his/her decision-making process.

Research on online consumer behavior has highlighted the positive impact of informational social influence on the consumers decision to shop online (Lee et al. 2011; Wang et al. 2012). By virtue of web evolution, consumers can easily communicate and exchange online information about their shopping experiences. In particular, they can easily access large amounts of information on a product or service that is provided directly from those who have had a recent experience with it (Lee et al. 2011; Wang et al. 2012). One study on online consumer socialization showed that peer communication online can influence consumers so strongly that they will convert into Internet shoppers (Wang et al. 2012).

Despite web evolution, however, online shopping tends to be more impersonal, anonymous, and automated than offline shopping (Hassanein and Head 2007). In online consumer markets, there is still a reduced presence of social factors that support the consumers decision-making process. In particular, an online shopping experience typically lacks the sociability that characterizes the purchase stage. Previous research has highlighted how online stores tend to display their products with no social appeal, often providing only a functional, attribute-based, and unemotional product description (Hassanein and Head 2007, 691). Lee et al. (2011) argued that given the risk perceived by consumers in online shopping (Pires et al. 2004), consumers will feel the need to ask the opinions of their friends or online reference groups before making an online purchase decision, as a consumer will prefer to act in accordance with persons that s/he trusts and to be in contact with them during his/her shopping experience (Moschis and Churchill Jr 1978; Bearden and Etzel 1982; Cheung and Lee 2006; Childers and Rao 1992).

2.2 Social software applications

The distinctive characteristics of SocSW derive from its social purposes, namely: (a) to intensify and extend online and offline social interaction, (b) to adapt to its users instead of the reverse, (c) to connect users to a network, and (d) to connect users computing tools (Avram 2006; Warr 2008; Kim 2012).

Social software embraces a large number of tools for online interaction services, including (but not limited to) weblogs, instant messaging, music and photo sharing, mailing lists, message boards, online social network tools, online forums, wikis, social guides, social bookmarking, social tagging citations, social libraries, and virtual worlds (Avram 2006; Warr 2008). Web communication tools supported by SocSW are called social media (SM) (Kaplan and Haenlein 2010). Social media are network-based tools that allow users to interact online for different purposes (e.g., for fun, professional support, content sharing,

gaming) (Ellison and Boyd 2007). Table 1 provides a brief description of the SocSW that will be recalled in the following sections of the present article.

2.3 Social software support for the social dimension of online shopping processes

Social software supports various forms of interactions between its users (e.g., sharing a comment or archives or text messages, chatting, voting, endorsing). Interactions are enabled between individuals that know each other as well as with unknown individuals (Wang et al. 2012).

Interactions supported by SocSW are similar to face-to-face interactions (e.g., video calls, chats) and, for this reason, SocSW provides a high level of social presence to its users. Social presence is the inherent quality of a medium to support its users in feeling others as psychologically present by enabling various forms of interaction similar to face-to face interactions (Wang et al. 2012; Hassanein and Head 2007). According to the social presence theory (Gefen and Straub 2004; Gefen et al. 2003), a medium with high social presence conveys a feeling of human contact, sociability, and sensitivity. Researches showed the positive influence of social presence on online consumers intention to purchase (Hassanein and Head 2007; Gefen and Straub 2004). In an online shopping process, the social presence provided by a commercial website enables consumers to perceive the company of others (Wang et al. 2012).

In order to satisfy the users need for social interaction, SocSW intensifies and extends users social interactions, both online and offline, thus providing their users with different sources of feedback information, mostly transmitted during real-time interactions. By virtue of real-time interaction, a user of SocSW is able to collect information provided by others and feels supported in his/her choice process (Teo and Yeong 2003; Wang et al. 2012; Hassanein and Head 2007).

Complementing a shopping website with SocSW makes the website a highly interactive communication medium and, therefore, a medium able to provide a socially rich shopping experience similar to retail shopping experiences.

2.4 On-line sales configurators

One particular shopping process is online shopping for personalized products. This process happens more and more through configurators. Consistent with previous research, we define configurators as knowledge-based software applications that support a potential customer, or a salesperson interacting with the customer, in completely and correctly specifying a product solution within a companys product offerings (Heiskala et al. 2007; Forza and Salvador 2008; Tiihonen and Felfernig 2010; Falkner et al. 2011). Franke et al. (2008) described the self-customization process through configurators as a problem-solving process (Newell and Simon 1972) that includes the development of an initial idea, the generation of a preliminary design (interim design solution), and the final design evaluation.

Configurators guide customers towards the purchase of a configured product that best fits their needs. As happens with retail shopping, a potential customer who is shopping in a configurator environment may experience the need for interacting with others in order to find support in identifying the product solution that best fits his/her needs. It is worth noting that utilitarian benefits are not the only benefits that lead customers to a purchase decision. Other types of benefits, linked to the need for social interaction, may be equally important. The configuration experience itself has been recognized as a source of consumer value

Table 1 Brief descriptions of social software

Weblog (Blogs)	Online platforms for a content management system. Blogs are websites that allow the user to communicate online while maintaining control of the contents and communications. Blogs are based on RSS (Really Simple Syndication or Rich Site Summary), a family of Web feed formats used to publish frequently updated content (Schmidt 2007). Blogs are largely used by companies as communication tools for the construction and maintenance of relationships between companies and their customers (Kelleher and Miller 2006).
Media sharing platforms	Online platforms that offer online services such as loading, storing, sharing, and browsing different media contents and formats (e.g., photos, videos, documents). Depending on the format of the shared content, the service platform assumes a corresponding name (e.g., photo-sharing platform, video-sharing platform). Media-sharing platforms allow the co-viewing of content (i.e., multiple users can simultaneously see the same content). Media sharing also allows collaborative filtering of content (i.e., models and filters that select and propose content based on views selected by the user). Media-sharing platforms support aggregation sharing and content tagging on other external SM platforms (Ellison and Boyd 2007).
Social Networks (SNs)	Web-based services that allow users to build a public or semi-public personal profile within a bounded system and to create a list of contacts by adding a list of other users with whom to share content. Depending on the social network, user contacts are called friends or circles. Social network services support mechanisms for building relationships between users (Ellison and Boyd 2007).
Discussion Forums or online communities	Online platforms where groups of users interact using specific technologies. Community members can interact and share content depending on the enabling technologies of the different platforms (video, chat, email, comments, and videos). Online communities define themselves by the topics and the purposes for which they are established (e.g., education, business) and by the kind of software environment that supports them (e.g., list servers, bulletin boards, forums, discussion lists, various combinations of these). Discussion forums also include communities of practice, e-learning platforms, discussion groups, online brand communities, and consumer communities (Herring 2002).
Internet Relay Chat (IRC)	Instant messaging protocol that allows real-time communication between two users, or simultaneous dialogue of entire groups of users (chat rooms). It enables real-time communication via the Internet. Once a chat has been initiated, involved users can enter text by typing on the keyboard, and the entered text will appear on the other users monitors. A large number of social networks and online services offer a chat feature (Herring 2002).
E-mail systems	Some of the most popular Internet-based applications, due to email efficiency, low cost, and compatibility with diversified types of information. The Simple Mail Transfer Protocol (SMTP) is a transportation protocol used to transfer email messages over the Internet (Tang et al. 2014).

(Trentin et al. 2014; Merle et al. 2010). Previous research has shown that consumers are willing to pay a considerable premium to buy configured products whenever they experience a positive perception of the configuration process itself (Franke and Piller 2004).

3 Research aims and method

In order to better understand how existing configurators connect with SocSW and to assess the levels of adoption of the identified connection modalities, we analyzed 277 real configurators. We first looked for the presence of connections between configurator and SocSW. Subsequently, we analyzed the different configurator-SocSW connection modalities that we had detected in our sample. Finally, we determined the frequency of adoption of the identified connection modalities.

The 277 analyzed configurators were drawn from the configurator database available on www.configurator-database.com, where they are classified based on country, industry, and product. From the 1,050 entries in that database, a first selection was made following the criterion of country. Specifically, 406 configurators were selected from the United States, England, Ireland, Australia, and New Zealand. The rationale for choosing configurators from countries where English is the first language was that English is considered the de facto lingua franca (Jenkins 2007) for business (De Swaan 2013).

The second step of the selection procedure involved stratified probabilistic sampling. Each stratum was identified by the combination of country-industry-product. For each stratum, we randomly choose two-thirds of the configurators listed in the configurator database (in case of a fractional number, we chose the smallest superior integer number). Eventual no longer active configurators were replaced by active ones randomly chosen within the same stratum. The resulting sample is described in Table 2. This sample represents the 68 % of the configurators in English-speaking countries that are present in the configurator database, which in turn, constitute 39 % of the configurator database, the largest freely available list of configurators.

In order to understand which stages of the configuration/shopping process are supported by the different configurator-SocSW connection modalities we detected in our sample, we mostly relied on analytical reasoning. However, our reasoning was grounded in a number of configuration experiences we performed using multiple configurators for every identified configurator-SocSW connection modality. First, we identified which stages of the user's decision-making process, as described by the EBM model, are supported by each modality and, subsequently, we analyzed how the connection modality supports these stages. We adopted the technical terminology provided by Franke et al. (2008) to describe the configuration process. Accordingly, by partial product configuration, we mean a product configuration that has not been completed. By intermediate product configuration, we mean a preliminary product configuration that has not yet been selected as the preferred one. By final product configuration, we mean the product configuration that the user has chosen, possibly after considering various intermediate configurations. In addition, we adopted the following terminology to refer to the individuals with whom a configurator user can interact: online circles, that is, people that the user already knows, trusts, and is also in connection with via SocSW; peers, that is, unknown people of equal standing, such as other configurator users or other customers; expert sources, that is, unknown people that the user recognizes as experts, such as company representatives.

Table 2 Sample of configurators

Industry	Products	Total	
Apparel	Jackets, fabrics, jeans, mixed clothing, shirts, shorts, socks, t-shirts	43	16 %
Accesories	Bags[a], caps, cases, glasses, jewellery, scarves, watches, rings, necklaces, sleeve (i.e. slipcase)	35	13 %
Automobile & Vehicles	Cars, motorcycles, car plates (i.e. license plates)	30	11 %
Food	Cake, candy, cereal, chocolate, coffee, cookies, tea, soda, wine, cupcakes, gift baskets, ice cream, labels[a], meat, nutrition bars	26	9 %
House & Garden	Bathroom, bedding[a], blinds, carpets, chairs, doors, frames, furniture, home decor, house plans, kitchen room (i.e. whole kitchen), lamps, knobs, mattresses, tables	26	9 %
Mixed Gift Products	3D products, party equipment, giftware[a], photo products, signs	26	9 %
Paper & Office	Books[a], cards, book covers, flip books, labels[a], murals, newspapers, pens, stamps, wallpaper, wrapping paper	18	6 %
Kids & Babies	Bedding[a], books[a], dolls[a], giftware[a], kits, meal goods, pacifiers, playgrounds, soft toys, videos, blankets, tattoos	18	6 %
Sports Equipment	Bicycles, golf products, pool tables, skateboards, sleeping bags, jerseys, bowling balls	16	6 %
Footwear	Shoes, sneakers, sport shoes	10	4 %
Electronics & Media	Cameras, electronics, laptops, pcs, servers	6	2 %
Unusual Products	Bags[a], dolls[a], discs	5	2 %
Entertainment	Drum sets, paint kits, playing cards	5	2 %
Beauty & Health	Hair coloring, lipstick, makeup, perfume	4	1 %
Pets	Pet food, dog bed	2	1 %
	Total	**277**	**100 %**

[a]Products in the configurator database that are classified in more than one industry

4 How configurators are connected with social software

We identified eight different modalities and their variants for connecting SocSW with configurators. In the following subsections, we briefly describe each modality (M) and how it supports the configuration/shopping process.

4.1 M1: Icon(s) on the company website that enable configurator users to connect with the company SM profile(s)

Social media icon(s) are placed on the company website, outside the configurator. Users can connect with the company's SM profile(s) by clicking on the respective icons. Example of configurator: MY M&M'S (http://www.mms.com).

Modality 1 supports the consumer in two stages of his/her decision-making process, namely: the search for information and evaluation of alternatives. Modality 1 allows the user

to browse the companys SM profile(s) and, therefore, to collect hints that can help him/her develop an initial configuration idea or evaluate alternative configurations.

While M1 does not directly support the user in interacting with others, the user is enabled to use social media platforms where s/he can interact with other SM users who share the same interest. In M1, the user is not enabled to transmit information from the configurator to his/her SM profiles or vice versa.

4.2 M2: Icon(s) in the configurator that enable users to connect with their SM profile(s)

4.2.1 Variant M2.1

The configurator contains one or more SM icons that bring the user to his/her own corresponding profile(s) in order to automatically publish the link to the entry webpage of the configurator. The user can also publish additional information (e.g., information about his/her configuration experience, pieces of advice) by placing it in his/her profile(s) while s/he is sharing the configurator link. Example of configurator: Puget Systems (https://www.pugetsystems.com/echo.php).

Modality 2.1 supports the consumer in two stages of the shopping process, namely: the search for information and post-purchase. Modality 2.1 allows an information exchange between the user and his/her online circles, which helps the user collect useful information for developing an initial idea. For example, the user can ask if anyone from his/her online circles already knows the configurator s/he is going to use and if anyone knows how to make the best use of it. In addition, M2.1 supports the user at the stage of post-purchase, as s/he may decide to inform his/her online circles about the configurator where s/he has previously configured a product.

Modality 2.1 does not enable the users to interact with others within the configuration environment, but brings the user to the SM platforms where s/he can interact with his/her online circles. Moreover, the configurator user can gather feedback information only in the SM platforms outside the configuration environment.

4.2.2 Variant M2.2

One or more SM icons are placed in the configurator. Each icon brings the user to his/her corresponding SM profile in order to automatically share a complete configuration. The user can also add personal comments while s/he is still in the configuration environment (e.g., adding details about the configuration experience on that specific configurator). All the contents shared by the user on his/her SM profile(s) will be shared to his/her online contacts on that specific social platform, provided the SocSW underlying that platform enables this feature. Example of configurator: Tesla Motors (http://my.teslamotors.com).

Modality 2.2 supports the consumer in three stages of the decision-making process, namely: evaluation of alternatives, purchase, and post-purchase. Modality 2.2 enables sharing of a complete configuration from the configurator to the SM environment. Thus, the user can interact with online circles to gather advice and improve upon an intermediate configuration or to make the purchase decision. In addition, M2.2 supports the user at the stage of post-purchase, for the same reasons as M2.1 does.

Modality 2.2 enables the user to interact with people who are willing to support him/her and who the user believes are trustworthy. However, such interactions occur only outside the configuration environment. In M2.2, the sharing of information is enabled only in one

direction, that is, from the configurator site to SM platforms. The user can share his/her configuration outside the configurator, but s/he can collect feedback information only in the SM platforms.

4.2.3 Variant M2.3

Social media icons are included in the configurator, and each icon brings the user to his/her corresponding SM profile, where s/he can automatically publish not only a complete configuration, but also a partial one, while the configuration process is in process. The user can also add personal comments along with the complete/partial configuration. Example of configurator: Nike (http://www.nike.com/us/en_us/c/nikeid).

Like M2.2, M2.3 supports the consumer in three stages of the decision-making process, namely: evaluation of alternatives, purchase, and post-purchase, for the very same reasons.

Modality 2.3 supports the user in interacting with his/her online circles on SM platforms while s/he is configuring a product. The user feels confident that, if needed, s/he can contact and be supported by his/her online circles during the entire configuration process. By doing so, M2.3 recreates a shopping situation similar to retail shopping where a customer can shop together with his/her online circles. However, any interaction between the user and his/her online circles takes place only outside the configurator. Modality 2.3 supports the transmission of information from the configurator to the SM platforms, but not vice versa. The user can gather feedback information about his/her configuration only in the social platforms.

4.3 M3: Direct browsing/uploading of files shared in the users SM profile(s) to the configurator

The configurator includes one or more SM icons and, by clicking on them, the user is taken to his/her SM folders, which lets him/her browse and, possibly, upload an item (e.g., a photo or an image) to the configurator. Example of configurator: Personal Wine (https://www.personalwine.com).

Modality 3 supports the consumer in the stages of information search and evaluation of alternatives. Modality 3 supports the development of an initial idea and the evaluation of an intermediate configuration, since it provides additional choice options (e.g., personal photos) that the user has previously shared with his/her online circles on the SM platform(s).

No interaction is enabled while the user browses and uploads items from the SM folders to the configurator. However, by choosing items from his/her SM folders, the user can select those items that have previously received positive feedback in his/her online circles on the SM platform and can discard the ones that have received negative feedback.

4.4 M4: Simplified configurator embedded in the company SM profile(s)

A simplified configurator is embedded into the companys SM profile(s) (e.g., Facebook). The simplified configurator is included as an application of the company's SM profile(s) and is visible on an ad-hoc webpage. Since the configuration options are very limited, the simplified configurator works as a demo configurator. A complete configuration process is only possible using the full configurator. Often, the link to the full configurator is available on the companys SM profile(s). Example of configurator: Vauxhall - Adam configurator (https://www.facebook.com/vauxhall/), Penny Skateboards (https://www.facebook.com/pennyskateboards/).

Modality 4 supports the consumer in two stages of the decision-making process: search for information and evaluation of alternatives. Modality 4 supports the configuration process during the development of an initial idea by enabling the user to experience the configuration in a highly interactive environment, such as an SM platform. In SM platforms, a user is not specifically looking for a configurator. The opportunity to find a simplified configurator allows him/her to deal with a customization process, to start a number of configuration trials, or to simply understand how a configurator works. Modality 4 supports the evaluation of an interim configuration by enabling the user to share an intermediate configuration with his/her online circles on that specific SM.

Modality 4 allows the user to feel the support of both his/her online circles and the company without leaving the configuration environment. Modality 4 supports users in transmitting information and gathering feedback from online circles and company representatives directly where the configuration process occurs. This process takes place in an environment where the user feels confident because s/he already knows how to reach information easily from people s/he knows. Moreover, the user can exchange information by using different communication features enabled by SocSW (e.g., by publishing or adding comments, endorsing, liking content, chatting).

4.5 M5: Weblog (blog) enabling configurator users to connect with peers and company representatives

We observed two different types of blogs: Type 1 refers to a blog that supports only reading by external users. Type 2 refers to a blog that supports both reading and writing by external users. We called Type 1 a Blog-Diary and Type 2 a Blog-Post.

4.5.1 Variant M5.1

The company website provides a link to connect configurator users to the Blog-Diary. The Blog-Diary mainly presents information about brands, events, sponsorships, and competitions. Thus, Blog-Diary contents inform the user not only about functional topics (e.g., product functionalities or features), but also about company initiatives. Modality 5.1 brings the user outside the configuration environment. Example of configurator: Diamond-Heaven (http://www.diamond-heaven.co.uk/dh/blog/latest).

Modality 5.1 supports the customer during the search for information. Modality 5.1 provides hints that can inspire and guide the user in the development of his/her initial configuration idea (e.g., information about the company's new products, new fashion trends). Modality 5.1 allows one-way communication from the company to the user.

4.5.2 Variant M5.2

The company website provides a link to connect configurator users to the company Blog-Post. The Blog-Post reports additional information that is not available in the configurator environment, provided by the company itself and/or by other blog users. The Blog-Post contents are mainly centered on utilitarian information (e.g., product functionalities and features). Example of configurator: Customized World (http://blog.customizedworld.com).

Modality 5.2 supports the customer decision-making process from the search for information to the post-purchase stage. Modality 5.2 supports the stage of post-purchase because it enables the user to share feedback in the Blog-Post once s/he has completed the configuration process (e.g., details about the configurator). The user will share positive or negative

feedback based on the perceived quality of his/her configuration experience. Modality 5.2 supports the development of the users initial idea, since it can help the user gather hints and find answers to his/her questions. Modality 5.2 supports the evaluation of an intermediate configuration and the final design by enabling communication exchanges between the user and both company representatives and peers (e.g., other customers, blog users). Thus, the additional information reported in the Blog-Post by the company and/or peers can help the user improve his/her intermediate configuration or convince him/her to purchase the final product configuration.

Modality 5.2 allows two-way communication from the company to the user and vice versa, but the user can interact only with peers and company representatives. Modality 5.2 brings the user outside the configuration environment. The Blog-Post environment provides a locus where the user does not know in advance with whom s/he will interact or if s/he can reach someone when s/he needs feedback support. Thus, there is no guarantee that the configurator user will receive feedback when s/he requires it or that s/he will receive feedback coherent with his/her requests.

4.6 M6: Company discussion forum enabling configurator users to connect with peers and company representatives

The company website provides a link to bring configurator users to its discussion forum. The link is placed outside the configurator; thus, SocSW is not directly accessible during the configuration process. Example of configurator: Dell (http://en.community.dell.com/support-forums/).

Modality 6 supports the user from the search for information to the post-purchase stage. Modality 6 supports the development of an initial configuration idea by providing hints and information that can guide the user, since the contents are provided both by the company and by peers (e.g., other customers). Modality 6 supports the evaluation of an intermediate configuration and the final design by allowing two-way interactions between the user and the company or peers. Thus, the user can feel supported in his/her search for hints on how to improve the intermediate configuration or in deciding whether to buy the final one.

Modality 6 enables the user to interact with peers as well as with company representatives, but not with his/her online circles. However, M6 brings the user to a site where, although s/he does not know in advance with whom s/he will interact, s/he can be confident that the other discussion-forum users are highly motivated to support each other as members of the same community. Modality 6 enables users to get feedback information from expert sources, since most discussion-forum users are experienced consumers, professionals, or experts in a specific topic discussed in the forum. However, there is no guarantee that the configurator user will get the feedback s/he requires when s/he needs it. The interactions can occur in real-time, exactly when the user asks for feedback, only if the discussion forum provides a chat application as an additional communication tool between its users.

4.7 M7: Email service enabling configurator users to connect with online circles/company representatives

Although email is a basic connection modality, its important to include it among the identified connection modalities because it may represent the first step made by a company to adopt a two-way communication channel to support social interaction with customers as well as social interaction between configurator users and others.

4.8 Variant M7.1

The configurator website provides an email service that is directly accessible from the configurator website at the end of the configuration process. Modality 7 supports sending a complete configuration to one or more members of the user's online circles. Example of configurator: Elis Cheescake (http://shop.elicheesecake.com/product/cheesecake_ccake).

Modality 7.1 supports the customer in the evaluation of alternatives and the purchase stages. Modality 7.1 enables the sharing of a complete configuration with one or more members of the users online circles. Modality 7.1 allows for sending email from the configurator, but not to it. Thus, the user has the advantage of collecting information and hints,and asking for advice from someone s/he already knows, but has to do that outside of the configuration environment.

Modality 7.1 supports users in interacting with their online circles. The user is confident in addressing his/her requests to someone s/he already knows and is likely to be willing to help him/her. However, there are no guarantees that feedback will be available when the user demands it. The communication exchanges via email are asynchronous and, thus, email exchanges rarely take place exactly when the user asks for feedback.

4.8.1 Variant M7.2

The company website provides an email service as a form of customer service. Email exchanges are enabled only between company representatives and users. Example of configurator: Blancier (http://www.blancier.com/).

Modality 7.2 supports the customer at each stage of his/her decision-making process. Modality 7.2 provides an additional communication tool to the configurator user, but it is placed outside of the configurator. Modality 7.2 supports the user in gathering feedback only from the companys representatives. The user has the advantage of receiving feedback from expert sources, but there is no guarantee that s/he will receive feedback exactly when s/he is in need of it.

4.9 M8: Instant messaging service enabling configurator users to connect with the companys customer service

The company website provides a real-time messaging service (chat) as a form of customer service. This service can be placed outside or inside the configurator website, but in both cases it enables real-time communication only with company representatives. The user cannot interact with his/her online circles or with other peers. Example of configurator: CustomInk (http://www.customink.com/cink/r.jsp?C=4).

Like M7.2, M8 supports the customer at each stage of his/her decision-making process, with the difference that this support is in real time.

Modality 8 enables the user to interact only with company representatives. Thus, the user is confident that feedback will properly fit with his/her requests. However, the users online circles cannot support him/her.

5 The levels of adoption of the identified connection modalities

The different connection modalities identified though our analysis of 277 real configurators can be grouped into two sets. The first includes M1, M5.1, M5.2, M6, and M7.2.

We call these connection modalities colocation-based modalities, as they are characterized by the simple colocation of SocSW and configurator in the company website. In this case, even though SocSW is not actually integrated within the configurator, nonetheless

Table 3 Levels of adoption of colocation-based connection modalities per industry

Industry	Number of configurators adopting the modality						Total
	M1	**M5.1**	**M5.2**	**M6**	**M7.2**	**At least one *(in addition to M7.2)****	
Apparel	33	9	7	0	43	35	43
	77 %	21 %	16 %	0 %	100 %	81 %	100 %
Accesories	29	7	5	1	35	30	35
	83 %	20 %	14 %	3 %	100 %	86 %	100 %
Automobile	26	2	2	1	30	27	30
& Vehicles	87 %	7 %	7 %	3 %	100 %	90 %	100 %
Food	23	9	3	1	26	24	26
	88 %	35 %	12 %	4 %	100 %	90 %	100 %
House	23	9	4	0	26	24	26
& Garden	88 %	35 %	15 %	0 %	100 %	92 %	100 %
Mixed	22	7	3	2	26	24	26
Products	85 %	27 %	12 %	8 %	100 %	92 %	100 %
Paper	15	4	1	0	24	16	24
& Office	63 %	17 %	4 %	0 %	100%	67%	100%
Kids	14	2	5	1	18	14	18
& Babies	78 %	11 %	28 %	6 %	100 %	78 %	100 %
Sports	12	3	0	0	16	12	16
Equipment	75 %	19 %	0 %	0 %	100 %	75 %	100 %
Footwear	9	1	1	1	10	9	10
	90 %	10 %	10 %	10 %	100 %	90 %	100 %
Electronics	6	1	2	1	6	6	6
& Media	100 %	17 %	33 %	17 %	100 %	100 %	100 %
Unusual	4	1	0	0	6	4	6
Products	67 %	17 %	0 %	0 %	100 %	67 %	100 %
Entertainment	3	0	3	0	5	3	5
	60 %	0 %	60 %	0 %	100 %	60 %	100 %
Beauty	3	2	0	0	4	3	4
& Health	75 %	50 %	0 %	0 %	100 %	75 %	100 %
Pets	1	1	1	0	2	2	2
	50 %	50 %	50 %	0 %	100 %	100 %	100 %
Total	**223**	**58**	**37**	**8**	**277**	**233**	**277**
	81 %	**21 %**	**13 %**	**3 %**	**100 %**	**84 %**	**100 %**

[a]At least one of the other collocation-based connection modalities besides M7.2

configurator users can take advantage of SocSW during their configuration experiences. Interestingly, while all the configurators in our sample adopt at least M7.2, only 22 configurators (8 %) restrict themselves to using only this modality. The others complement M7.2 with one or more additional modalities. Particularly, 233 configurators (84 %) combine M7.2 with other colocation-based modalities: M1 in the 81 %, M5.1 in the 21 %, M5.2 in the 13 %, and M6 in the 3 % of the cases. As a result, 143 configurators (52 %) adopt two, 87 (31 %) adopt three, and 3 (1 %) adopt four colocation-based modalities. Unsurprisingly, there are some differences in the adoption of colocation-based modalities across industries (see Table 3). While in some sectors (i.e., footwear, and electronics and media), the percentage of the configurators that implement at least one colocation-based modality in addition to M7.2 hits 90 % or more, in other industries (i.e., sports equipment, and paper and office) this percentage does not reach 75 %. Additionally, some differences across sectors also concern which colocation-based modalities are the most adopted. For example, while the percentage of configurators that adopt at least one integration-based modality in addition to M7.2 is similar in the automobile & vehicles industry and in the house and garden sector, automobile and vehicles configurators use M5.1 and M5.2 less than do house and garden configurators.

The second set includes M2.1, M2.2, M2.3, M3, M4, M7.1, and M8. We name these connection modalities integration-based modalities, as they are the ones that actually integrate SocSW within the configurator, thus allowing configurator users to access SocSW directly from the configurator. Out of the 277 configurators in our sample, 177 (64 %) adopt at least one integration-based modality. More specifically, M7.1 is adopted by the 25 %, M8 by 26 %, M2.1 by 20 %, M2.2 by 13 %, M2.3 by 12 %, M3 by 5 %, and M4 by 1 % of the configurators (See Table 4). Furthermore, 35 % of the sample adopts at least one of the three variants of M2. Interestingly, some configurators adopt up to four integration-based modalities. More specifically, 22 % adopt two, 6 % adopt three, and 1 % adopts four integration-based modalities. However, there is a considerable difference in the adoption of integration-based modalities across industries (see Table 4). While in some sectors (i.e., footwear, and electronics and media), more than 80 % of the configurators implement at least one integration-based modality, in other industries (i.e., paper and office) the level of adoption of these modalities does not reach 45 %. Additionally, the differences across sectors also concern which integration-based modalities are the most adopted. For example, while the percentage of configurators that adopt at least one integration-based modality is similar in the apparel and sports equipment industries, apparel configurators typically connect with SocSW in a different way than do sports equipment configurators.

6 Comparing the identified connection modalities

Both the colocation-based modalities and the integration-based ones can be compared in terms of support they provide for the sales configuration/decision-making process at its different stages. Similarly, both groups of modalities can be compared in terms of characteristics of the enabled social interactions: with whom it is possible to interact, whether or not interaction happens in real time, whether interaction occurs inside or outside of the configurator, and whether the communication flow, if any, is unidirectional or bidirectional. The results of these comparisons are reported, for each of the two groups, in the subsequent subsections.

Table 4 Levels of adoption of integration-based connection modalities per industry

Industry	Number of configurators adopting the modality								Total
	M2.1	**M2.2**	**M2.3**	**M3**	**M4**	**M7.1**	**M8**	**At least one***	
Apparel	11	4	3	2	0	12	11	27	43
	26 %	9 %	7 %	5 %	0 %	28 %	26 %	63 %	100 %
Accessories	9	6	3	2	0	10	13	26	35
	26 %	17 %	9 %	6 %	0 %	29 %	37 %	74 %	100 %
Automobile	2	6	7	0	1	12	10	22	30
& Vehicles	7 %	20 %	23 %	0 %	3 %	40 %	33 %	73 %	100 %
Food	3	4	1	3	0	5	4	14	26
	12 %	15 %	4 %	12 %	0 %	19 %	15 %	54 %	100 %
House	3	4	3	1	0	5	7	15	26
& Garden	12 %	15 %	12 %	4 %	0 %	19 %	27 %	58 %	100 %
Mixed	9	1	5	2	0	7	9	20	26
Products	35 %	4 %	19 %	8 %	0 %	27 %	35 %	77 %	100 %
Paper	2	2	0	1	0	3	2	8	24
& Office	8 %	8 %	0 %	4 %	0 %	13 %	8 %	33 %	100 %
Kids	4	0	2	0	1	4	1	8	18
& Babies	22 %	0 %	11 % 0 %	6 %	22 %	6 %	44 %	100 %	
Sports	1	2	2	1	1	2	7	11	16
Equipment	6 %	13 %	13 %	6 %	6 %	13 %	44 %	69 %	100 %
Footwear	3	5	5	0	0	5	2	9	10
	30 %	50 %	50 %	0 %	0 %	50 %	20 %	90 %	100 %
Electronics	3	1	2	0	0	2	3	5	6
& Media	50 %	17 %	33 %	0 %	0 %	33 %	50 %	83 %	100 %
Unusual	2	1	0	0	0	1	1	5	6
Products	33 %	17 %	0 %	0 %	0 %	17 %	17 %	83 %	100 %
Entertain-	1	0	0	0	0	1	1	3	5
ment	20 %	0 %	0 %	0 %	0 %	20 %	20 %	60 %	100 %
Beauty	1	0	0	0	0	1	0	2	4
& Health	25 %	0 %	0 %	0 %	0 %	25 %	0 %	50 %	100 %
Pets	1	1	0	1	0	0	1	2	2
	50 %	50 %	0 %	50 %	0 %	0 %	50 %	100 %	100 %
Total	**55**	**37**	**33**	**13**	**3**	**70**	**72**	**177**	**277**
	20 %	**13 %**	**12 %**	**5 %**	**1 %**	**25 %**	**26 %**	**64 %**	**100 %**

[a] At least one of the integration-based connection modalities

6.1 Colocation-based connection modalities

6.1.1 Support to the configuration/decision-making process

Our analysis indicates that each of the colocation-based modalities supports the user in a different way at the different stages of the configuration/decision-making process. More

specifically, the support provided by M1 and M5.1 focuses on the early stages of the process (i.e., information search and evaluation of alternatives) while M5.2, M6, and M7.2 support the user during the entire process. Even though these modalities do not allow users to share their configured product, they support users in collecting information that can help them to develop an initial idea of configuration and to evaluate an intermediate or complete configuration (Table 5).

6.1.2 Characteristics of the enabled social interactions

With whom Colocation-based connection modalities support user in gathering information and in receiving feedback mostly from unknown people, such as company representatives, social network users (M1), blog users (M5.2), and forums participants (M6), who share the same interest in the companys products and who have the same experience, or even more, with the same products. As for M7.2, even though it represents a very basic mechanism of customer service, it is something that allows users to interact with company representatives and it is something that users typically expect to find in any commercial website.

When, How, Where Even though colocation-based modalities enable interactions mostly between people who do not know each other, its worth noting that most of these modalities allow for two-way communication (blog post, forums, email). However, there is no guarantee that social feedback is provided exactly when the user needs it, because all depends on the availability of the people from whom feedback is expected (e.g., blog users, forum participants).

6.2 Integration-based connection modalities

6.2.1 Support to the configuration/decision-making process

Our analysis indicates that the support provided by M2.1, M3, and M4 focuses on the early stages of the configuration/decision-making process (i.e., information search, and evaluation of alternatives), even though M2.1 also allows users to share information with their online circles in the post-purchase stage. On the other hand, the support provided by M2.2, M2.3, and M7.1 focuses on the intermediate stages of alternatives evaluation and purchase, with M2.2 and M2.3 also supporting the post-purchase stage. Finally, M8 supports the user during the entire process (Table 6).

6.2.2 Characteristics of the enabled social interactions

With whom With the exception of M8, all integration-based connection modalities support the user in receiving social feedback from his/her online circles. Modality 4 also enables interactions with other configurator users.

When, How, Where With the exception of M3, which does not support social interactions, the communication process enabled by an integration-based modality can be one-way (e.g., from the configuration environment to the outside, but not vice versa) or two-way. The former is the case of the modalities that allow a content-sharing option outside of the configuration environment: M7.1 does this by sending the final configuration by email; M2 does

Table 5 Comparison of colocation-based connection modalities

Comparison of colocation-based connection modality	EMB decision process				Configuration process			Social-interaction characteristics					
								With whom			When	How	Where
	a	b	c	d	1	2	3	Exp	OC	Peer	Real time	Comm unic.	Interact. Environ.
M1 - Icons in the company website to connect configurator users to company SM profile(s)	X	X			X	X					No	No	Outside
M5.1 - Company Blog-Diary to provide user with contents published by company representatives (e.g. information about brands, events, sponsorships),	X				X						No	Oneway	Outside
M5.2 - Company Blog-Post to provide user with additional information, not available in the configurator environment, provided by the company itself and/or by other blog users	X	X	X	X	X	X		X		X	No	Twoway	Outside
M6 - Company discussion forum to connect configurator users to his/her online circles	X	X	X	X		X	X	X		X	No	Twoway	Outside
M7.2 Company email as company customer service channel	X	X	X	X	X	X	X	X			No	Twoway	Outside

EBM decision-making process. a: information search; b: alternative evaluation; c: purchase; d: post-purchase. Configuration process. 1: initial idea development; 2: intermediate evaluation; 3: configuration evaluation. Social-interaction characteristics. With whom: Exp.: expert sources (e.g., company representatives); OC: online circles; Peer: other configurator users. When: Yes: in real time; No: not in real time. How: Two-way: two-way communication; One-way: one-way communication; No: no communication enabled. Where: Inside: inside the configurator; Outside: outside the configurator.

Table 6 Comparison of integration-based connection modalities

Integration-based connection modality connection modality	EMB decision process				Configuration process			Social-interaction characteristics					
								With whom			When	How	Where
	a	b	c	d	1	2	3	Exp	OC	Peer	Real time	Comm unic.	Interact. Environ.
M2.1 - SM icons enable the user to automatically publish the configurator link on his/her SM profile(s)	X			X	X				X		Yes	Oneway	Outside
M2.2 - SM icons bring the user to his/her corresponding SM profile to automatically share a complete configuration		X	X	X			X		X		Yes	Oneway	Outside
M2.3 - SM icons bring the user to his/her corresponding SM profile to automatically share a partial configuration while the configuration is in process		X	X	X		X	X		X		Yes	Oneway	Outside
M3 - Direct browse/upload into the configurator of files shared in the users SM profile(s)	X	X			X	X			X		No	No	No Where
M4 - Simplified configurator embedded into the companys SM profile	X	X			X			X	X	X	Yes	Twoway	Inside
M7.1 Email to send complete configuration to the users relevant others		X	X				X		X		No	Oneway	Outside
M8 - Instant message services to connect the user to company representatives	X	X	X	X	X	X	X	X			Yes	Twoway	Inside

EBM decision-making process. a: information search; b: alternative evaluation; c: purchase; d: post-purchase. Configuration process. 1: initial idea development; 2: intermediate evaluation; 3: configuration evaluation. Social-interaction characteristics. With whom: Exp.: expert sources (e.g., company representatives); OC: online circles; Peer: other configurator users. When: Yes: in real time; No: not in real time. How: Two-way: two-way communication; One-way: one-way communication; No: no communication enabled. Where: Inside: inside the configurator; Outside: outside the configurator.

it by sharing only a configurator link (M2.1), a partial (M2.3), or a final (M2.2) configuration on social platforms. Even though only one-way communication is enabled, nonetheless these modalities support users in collecting social feedback, as the sharing takes place in a highly interactive environment frequented by the user's online circles. On the contrary, two-way communication is enabled by M8, an integration-based modality that allows sending and receiving messages in the same environment, and by M4. Although the latter is more basic, nonetheless it supports two-way communication because a basic configurator is integrated into a dedicated page in the companys SM profile. Modalities supporting two-way communication ensure real-time social interaction. Specifically, M4 ensures real-time social interaction with the users online circles, while M8 ensures interaction with company representatives. Two connection modalities stand out for their ability to make online configuration experiences similar to the retail shopping experiences: M2.2 and M2.3. In particular, M2.3 allows the user to share not only a complete configuration, but also a partial one, while the configuration process is under way.

7 Related works

Social commerce principles and design features As recalled in the paper introduction, social commerce can be defined as a web-based commercial application that assists consumers in their decision-making process and, possibly, in the acquisition of products and services within online marketplaces and communities (Huang and Benyoucef 2013). Huang and Benyoucef (2013) proposed a generic set of principles for guiding social commerce design: individual, conversation, community, and commerce principles. The four principles guide high-level social commerce design and each principle is linked to a number of social commerce design features:

- *Individual principle* refers to providing a sense of self-identification and awareness that can be recognized by others. The features corresponding to this principle include showing the users real name with personal pictures, allowing the user to create and access his/her own profile, building a social experience, and highlighting interesting social information
- *Conversation principle* refers to providing a variety of interaction features among participants in order to establish collaborative and bidirectional communications. The corresponding features include information sharing and encouraging participants to provide feedback.
- *Community principle* refers to building a community based on groups of people who can support each others decision-making process. The corresponding features include offering appropriate support, connecting people and friends, and updating social activities to maintain relationships.
- *Commerce principle* refers to engaging participants with services and applications provided by online businesses. The corresponding features include shopping with like-minded people, offering social validation (i.e., informational social influence), and providing social applications that make expert advice available to customers, allow customers to ask questions online, and facilitate listening to or observing peoples experience and feedback.

In addition, Huang and Benyoucef (2013) stated that for any social commerce website, it is critical to achieve a minimum set of social commerce design features.

The present study contributes to the research on social commerce principles and design features by focusing on how to support the social dimension of consumers experiences of shopping for personalized products by means of configurators. This study identifies eight configurator-SocSW connection modalities that respond to the social commerce principles identified by Huang and Benyoucef (2013) and implement some of the social commerce design features indicated in their study. Some modalities respond to the principle of individuality. Specifically, M3 responds to this principle by allowing the user to choose personal items from his/her online SM profile(s) and to include such items in his/her configured product; M2.1, M2.2, M2.3, and M4 respond to the principle of individuality by supporting the user in informing his/her online circles about his/her activities.

Both modality types colocation-based (M5.2, M6, M7.2) and integration-based (M2.1, M2.2, M2.3, M4, M7.1, M8) respond to the principle of conversation, though in different manners. In particular, M8 allows real-time two-way communication by providing a chat channel between the configurator user and the companys representatives, thus providing the user with expert advice. In M2.1, M2.2, M2.3, and M4, this is achieved by linking the user to a social environment where s/he can collect information (e.g., social networks) and get feedback from different people (e.g., online circles, peers, company representatives) during his/her configuration process. Modalities 5.2 and 6 support users in conversing through online blogs and forums, while M7.2 enables conversation between the user and the company by email.

Some modalities respond to the principle of community. Specifically, M5.2 and M6 do that by linking the user with an environment where s/he can receive support from other people (i.e., blogs, forums), while M2.2, M2.3, M4, and M7.1 support the user in interacting specifically with his/her online circles, that is, with people from his/her own online communities.

All the identified modalities respond to the principle of commerce by supporting the social commerce design feature of providing social applications. Moreover, M5.2 and M6 enable the user to listen to and watch other peoples experiences and feedback, and M8 provides the user with expert advice.

In summary, the present study contributes to the research on social commerce principles and design features by improving the understanding of how Huang and Benyoucef (2013) principles can be implemented in the specific commercial environment represented by a configurator.

Social media use in mass customization Blazek et al. (2012) assessed the status quo of SM usage in companies that adopt configurators. They (Blazek et al. 2012) viewed the use of SM by such companies not only as a way of fulfilling communication purposes, but also as a way to help their customers in the configuration process. Blazek et al. (2012) study identified the following four types of SM usage:

- *Social media account:* The company runs one or different SM profiles (e.g., Facebook, Twitter).
- *Social media icons and sharing:* the company uses SM icons (e.g., Facebook, Twitter) to connect its potential customers with their profiles on those specific social networks.
- *Social media login in the configurator:* The company uses SM to allow its potential customers to connect with their Facebook profiles and import information (e.g., photos).
- *Product configurator in Facebook:* The company builds up a configurator in Facebook.

The present study takes a number of steps forward with respect to Blazek et al. (2012) work. In particular, this study does not limit the analysis to social networks (e.g., Facebook, Twitter), but extends it to other SocSW, such as company blogs, company forums, photo-sharing platforms, and media-sharing platforms.

By considering various SocSW, this study was able to identify additional configurator-SocSW connection modalities (i.e., M5, M6, M7.2, M8) beyond those that correspond to Blazek et al. (2012) four types of SM usage (i.e., M1, M2, M3, M4). Furthermore, this study elaborates on some of the types of SM usage identified by Blazek et al. (2012). For example, with reference to what Blazek et al. (2012) called SM icons and sharing, this study distinguishes and describes different ways of sharing content from the configuration environment to the users online SM profile(s) (i.e., M2.1, M2.2, M2.3). For each sharing solution, this study explains what the user can share and how the user is supported in doing that.

Finally, this study takes a further step with respect to Blazek et al. (2012) work by analyzing how each configurator-SocSW connection modality supports the customers decision-making process during the configuration task and by describing how each connection modality enables social interactions that make the shopping experience using a configurator socially rich.

In summary, this study contributes to the research on SM usage in mass customization by enriching, along several dimensions, the picture provided by Blazek et al. (2012).

Customer-perceived benefits of mass customization Previous research has suggested that complementing a configurator with peer/social feedback can be very helpful for a customer to increase the benefits s/he derives from the self-customized product as well as from the self-customization experience (Grosso et al. 2014; Trentin et al. 2014; Merle et al. 2010; Schreier 2006). Peer/social feedback is particularly important in two of the main phases of the customer's self-customization process, namely: the development of an initial idea, and the evaluation of a preliminary design solution (Franke et al. 2008). Feedback mechanisms during the configuration task foster customers learning about the companys solution space, with its myriad possibilities, as well as about the customers personal preferences, which customers may not have perfect insight into (Franke and Hader 2014). Franke and Hader (2014) suggested that a promising method for a configurator to provide feedback would be to include a function that allows users to submit their (interim) design solutions for rapid feedback from other users who are online. Piller and Blazek (2014), in turn, observed that a growing number of SM supports customers in sharing their created products, and this can foster customer-perceived creative-achievement benefit. The present study contributes to the research on the customer-perceived benefits of mass customization in two ways. First, it identifies configurator-SocSW connection modalities that allow configurator users to collect social feedback and, for each of these modalities, describes in detail how and where such feedback can be collected (e.g., if feedback is delivered in the configuration environment or if the user has to go outside the configuration environment to get it).

Second, this study shows that several companies are offering their customers the possibility of interacting not only with peers (e.g., other configurator users), but also with people outside the configuration environment, such as the customers online circles or expert sources that the customers can personally choose and reach during the configuration process. The fact that companies are investing in this direction suggests the opportunity for future research to more in-depth investigate the benefits that customers can enjoy as a result of being in relationship with others while shopping on a configurator (i.e., social benefits), as happens with retail shopping.

In summary, this study contributes to the research on the customer-perceived benefits of mass customization by articulating prior research suggestions (e.g., by providing a detailed description of how customers can collect valuable feedback on their (interim) design solutions from a variety of individuals) and by outlining future research directions on the benefits the configuration experience can deliver when configurators are integrated with SocSW.

Recommendation systems Prior research on recommendation systems has called for the adoption of a theoretical framework that includes theories on consumer behavior and decision-making processes in order to enhance the understanding of how to implement recommendation systems that better help users make good decisions (Felfernig et al. 2008; Chen et al. 2013). In accord with this call, this study considered the consumer decision-making process described by the EBM model, and the social factors that affect consumer behavior during shopping experiences. By considering the framework of social theories in particular, this study highlighted the importance of viewing the configurator user not as an isolated individual, but as someone who is in connection with others (e.g., online circles, peers, company representatives). Prior research on recommendation systems has also posited that successful recommender applications have to provide an effective knowledge acquisition process and intuitive interaction mechanisms (Felfernig et al. 2006). Intelligent recommender systems are required to provide personalized dialogues to support the customer in the product selection process and in identifying the product more effectively (Tiihonen and Felfernig 2010; Falkner et al. 2011; Felfernig et al. 2014).

This study identified and described different configurator-SocSW connection modalities that support the users interactions with his/her online circles, peers, or expert sources in order to get feedback and guidance during the configuration task. Clearly, the user will be more confident in the advice of his/her trusted sources than in advice from people s/he does not know or from application software.

In summary, this study contributes to the research on recommendation systems by suggesting the development of systems that are able to link the user to his/her online circles in order to get recommendations from trusted sources of information.

Recommendation techniques and configuration process Recommendation techniques are increasingly applied also in configuration environments due to their ability to proactively support the user in his/her decision-making process (Tiihonen and Felfernig 2010). When the number and complexity of options presented by a configurator may overwhelm the users ability to identify an appropriate configuration, recommendation techniques can come to the aid (Tiihonen and Felfernig 2010; Falkner et al. 2011). For example, they can suggest a complete configuration or they can suggest ways to complete an interim configuration (Tiihonen and Felfernig 2010).

The present study shows how the connection of a configurator with SocSW may provide the configurator user with the opinions of his/her online circles. Specifically, M2 and M3, provide the user with a set of sharing options that trigger social feedback from his/her online social platforms, thus enabling social recommendation dynamics to proactively guide the user in his/her configuration process to find an appropriate configuration. In particular, M2.2 and M2.3 trigger a social recommendation dynamic that supports the user in evaluating a complete configuration, or in completing a configuration, by providing tools to collect external opinions delivered by the users online circles (e.g., number of likes, positive or negative comments). In turn, M3 provides the configurator user with items from his/her online social environment to choose as attributes for his/her configuration. The items from

online social platforms have received an endorsement (e.g., a number of likes) or social feedback (e.g., positive or negative comments). Thus, the user can select items with higher levels of endorsement or more positive social feedback provided by his/her online circles.

In summary, this study points out social recommendation dynamics enabled by SocSW-configurator connection modalities and provides hints for research on recommendation technologies applied to configurators.

Open configuration Open configuration has been defined as the integration of groups of users in configuration-related tasks. Openness is related to the idea of a closer integration of end-users into configuration knowledge base development and maintenance operations and of supporting decision-making processes in scenarios where groups of users are in charge of configuring a product or service (Felfernig et al. 2014, 93).

The present study highlighted the role that online circles can play in a configurator user's decision-making process: as individuals able to guide and support the user and also as individuals that the user looks for when s/he needs guidance. For example, M2 links the user to the external environment of social networks, thus supporting the users interactions with his/her online circles. Modality 4 even allows the user to start the configuration process in a social environment shared by the user with his/her own circles. The results of this study imply that future research on open configuration should consider making it possible for a configurator user to collaborate not only with a group made up exclusively of other configurator users, but also with people from the users online circles, who can be invited when needed during the configuration task. Providing end-users with features for communication exchanges with online circles outside the configuration environment would support decision-making processes in a collaborative scenario that provides heterogeneous and highly trusted sources of knowledge.

In summary, this study contributes to the research on open configuration by pointing out the opportunity to extend the notion of collaborative configuration to relevant people outside the community of configurator users.

8 Conclusions and future research

The present study investigated the connections between configurators and SocSW by analyzing 277 configurators chosen from the Cyledge Configurator Database through stratified random sampling. Firstly, it identified and described eight different connection modalities and their variants. Some of these connections (M1, M5.1, M5.2, M6, M7.2) represent the simple colocation of configurators and SocSW, while others (M2.1, M2.2, M2.3, M3, M4, M7.1, M8) imply actual integration. Secondly, for each connection modality, the present paper explained which stages of the configuration/decision-making process are supported, how the user is enabled to interact (e.g., by sharing content by email, on a social network, by chatting), and with whom he/she is allowed to interact (e.g., online circles, company representatives, peers). Finally, the paper assessed the levels of adoption of the various modalities. It emerged that M7.2 (email as customer service) is a basic colocation-based connection modality adopted by all configurators, but very few configurators (8 %) adopted only this simple modality, while the majority of configurators co-implement multiple connection modalities. Most of them also use more advanced colocation-based connections, while roughly two-thirds of them use one or more integration-based connections. These results indicate that the connection of configurators and SocSW, while being a very recent

phenomenon, has already reached significant levels of application, especially in certain industries.

The designers of configurators can also benefit from the results of the present paper. More specifically, they are advised that by choosing different connection modalities they can deeply differentiate the context in which the configurator user self-customize his/her own product. In particular, designers have to decide whether or not to support the user with a two-way exchange of information (i.e., from the configurator to online social environments and vice versa). They also have to decide not only by whom the social feedback is to be provided, but also whether the user can receive social feedback on demand while remaining in the configurator or whether s/he has to leave the configurator. Finally, they have to determine whether or not they will support the user with real-time social interaction. The present paper not only advises configurator designers about these decisions but also supports them by comparing the connection modalityes along these three main characteristics of the enabled social interactions.

The research on the connections between configurators and SocSW is in its infancy and this is not surprising given the fact that this phenomenon manifested itself very recently. Further research is needed to follow this fast-evolving phenomenon in order to identify new opportunities for mass customization strategies. Monitoring the emergence of new connection modalities and describing the status of adoption of the identified connection modalities across industries and countries is important to grasp the evolution of this phenomenon. At the same time, we need a deeper understanding of the benefits for the configurator users and for the companies that connect their configurators with SocSW. Examples of questions to be answered by future research are: Which benefits can the configurator user derive by sharing his/her configuration via SocSW? And, does the visibility enabled by SocSW impact the user configuration experience? Future research might also address the possible integration of a recommendation system with SocSW. In this case, examples of questions to be answered by future research are: If and to what extent is integrating SocSW and recommendation applications advantageous for mass customization strategies? And, which changes in recommendation systems enable their integration with SocSW?

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