OPEN ACCESS

UNIVERSITY OF THE
WEST *of* SCOTLAND

UWS

UWS Academic Portal

The role of customer co-creation at the fuzzy front-end

Reuther, Kevin; Schumann, Christian-Andreas; Seidel, Kristin

Published in:
BAM2019 Conference Proceedings

Published: 01/01/2019

Document Version
Peer reviewed version

Link to publication on the UWS Academic Portal

Citation for published version (APA):
Reuther, K., Schumann, C-A., & Seidel, K. (2019). The role of customer co-creation at the fuzzy front-end: a
systematic review of the literature. In *BAM2019 Conference Proceedings* [823] British Academy of Management.

Download date: 22 Oct 2019

The Role of Customer Co-Creation at the Fuzzy Front-End:
A Systematic Review of the Literature

Kevin Reuther

University of the West of Scotland
School of Business & Enterprise

Paisley Campus
PA12BE Paisley / Scotland
United Kingdom

kevin.reuther@uws.ac.uk

Westsächsische Hochschule Zwickau
Faculty of Economic Sciences

Dr.-Friedrichs-Ring 2A
08056 Zwickau / Saxony
Germany

kevin.reuther@fh-zwickau.de

Christian-Andreas Schumann

Westsächsische Hochschule Zwickau
Faculty of Economic Sciences

Dr.-Friedrichs-Ring 2A
08056 Zwickau / Saxony
Germany

christian.schumann@fh-zwickau.de

Kristin Seidel

Westsächsische Hochschule Zwickau
Faculty of Economic Sciences

Dr.-Friedrichs-Ring 2A
08056 Zwickau / Saxony
Germany

kristin.seidel.if1@fh-zwickau.de

The Role of Customer Co-Creation at the Fuzzy Front-End:
A Systematic Review of the Literature

Abstract

This paper aims to provide a first overview of the scientific literature on customer co-creation (CCC) at an early phase of innovation processes that is referred to as the fuzzy front-end (FFE). CCC refers to the integration of customers in innovation activities and is also described as the active integration of customers in the open innovation process. The FFE is characterised by three stages that could be described as 1) discovering new opportunities, 2) assessing these opportunities and 3) turning promising opportunities into a business case. This paper therefore explores CCC as a tool or element of the FFE within the framework of the open innovation process for the active integration of customers in order to generate new creative ideas or concepts. At present, there appear to be only a few scientific articles that research the relation of CCC and the FFE in detail. Therefore, this paper aims to systematically analyse the literature to identify previous work that studied CCC as an element of the FFE, provide a synthesis and critical discussion and identify areas of future research.

Word Count: 6240

INTRODUCTION

Customer co-creation (CCC) refers to the integration of customers with a view to active participation in entrepreneurial innovation activities (Ihl and Piller, 2010) and is also described as the active integration of customers in the open innovation process (Enkel, Gassmann and Chesbrough, 2009). It offers huge potential to increase the innovative capacity of today's businesses (Khanagha, Volberda and Oshri, 2017), especially as it is argued that future products will often be strongly personalized or even designed by the customers (Chesbrough, 2017).

Although the topic gained on interest over the last years, especially related to open innovation (Chesbrough, Lettl and Ritter, 2018; Theilacker, Lukas and Snow, 2016; Voorberg, Bekkers and Tummers, 2015; West and Bogers, 2017), some argue that the practical implementations of CCC by large companies such as Ritter Sport, Starbucks or Fiat are better known than the term itself (Walter and Meissner, 2017). According to a recent review of the literature on the involvement of customers in innovation processes undertaken by Tran (2017), the concept was first mentioned in an academic journal paper by Rothwell (1976). However, the concept then gained on popularity way later in 2004 with the paper "Co-creating unique value with customers" (Prahalad and Ramaswamy, 2004). This paper is frequently cited to introduce CCC today and several authors (e.g. Breda and Spruijt, 2013) name it as the origin of the concept.

A reason for the increasing popularity of the concept around 30 years after Rothwell's paper might be due to the fact that brand manufacturers faced the problem of increasing pressure to innovate, as innovation cycles became shorter and companies increasingly found it difficult to differentiate themselves from their competitors (Walter and Meissner, 2017). The growing importance and use of the Internet in both C2C and B2C contexts also supported the increasing spread of this approach (Rohrbeck, Steinhoff and Perder, 2010).

In the course of this paper, it is aimed to explore how CCC relates to the fuzzy front-end (FFE), the earliest phases of an innovation process next to new product development (or new service development) and commercialisation. The FFE is characterised by three stages that could be described as 1) discovering new opportunities, 2) assessing these opportunities and 3) turning promising opportunities into a business case (Gassmann and Schweitzer, 2014; Koen, Bertels and Kleinschmidt, 2014). However, there is a wide variety of approaches for classifying the phases (Verworn and Herstatt, 2000). It is considered an important part of innovation processes to research, as decisions made in the early phases of the innovation process have a significant impact on costs, quality and development time (Gassmann and Schweitzer, 2014; Jetter, 2005).

Based on the above, this paper regards CCC as a tool or element of the FFE within the framework of the open innovation process for the active integration of customers in order to generate new creative ideas or concepts. At present, there appear to be only a few scientific articles that research the relation of CCC and the FFE in detail. Therefore, this paper aims to systematically analyse the literature to identify previous work that studied CCC as an element of the FFE, provide a synthesis and critical discussion and identify areas of future research.

The paper is structured as follows: First, the methodological procedure for the literature review is introduced, including identification of keywords and reasons for their selection, a delimitation and structuring of the terms the work focuses on and the explanation of the searching procedure. This is followed by an evaluation and discussion of the findings referred to as the synthesis of the literature. Finally, a summary and outlook is provided that summarises implicit and explicit gaps of the literature on CCC as part of the FFE.

METHODOLOGICAL APPROACH

In this chapter the methodical procedure for the selection of keywords as well as for the literature search is shown. First, an overview of conceptual structures and correlations for classification is considered useful. Keywords that describe the main terms of this work could be customer co-creation, fuzzy front-end, Value co-creation, Open Innovation and Crowdsourcing. The focus, however, is on the CCC and FFE that are analysed in different combinations. Figure 1 shows the context and structure of the terms.
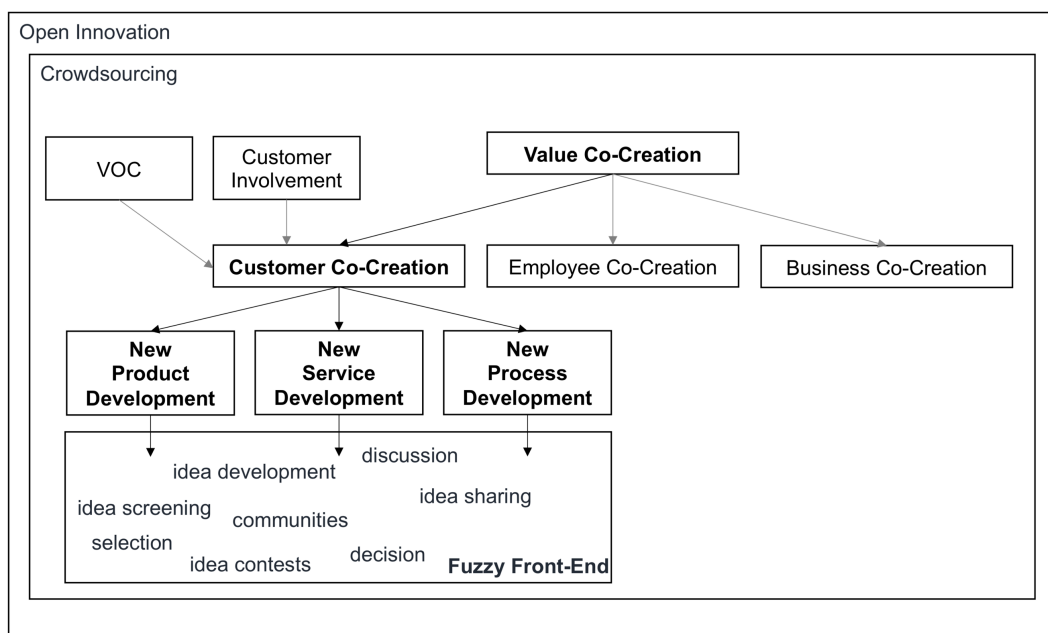

Figure 1: Structure and conceptual relationships

Open Innovation can be understood as a basic prerequisite for the application of customer co-creation, as it requires an open innovation process to enable the exchange with customers. Furthermore, crowdsourcing is a basic method for generating ideas with the help of several different parties. This involves outsourcing operational problems to many unknown and external problem solvers (Keinz, 2015). Value co-creation therefore is a particular form of crowdsourcing, which in the course of this work is understood as a general term for all types of co-creation. In the scientific literature, however, value co-creation is often used synonymously with customer co-creation. Additionally to involving the customer in the innovation process, there are further procedures that include employees or other business partners (Ramaswamy, 2009; Walcher and Leube, 2017). Therefore, this paper defines co-creation with employees as employee co-creation and cooperation with external business partners as business co-creation. These two approaches are not further discussed within this paper.

The interaction with customers is considered with regard to the development of new products, services or processes. Product development is also abbreviated as NPD, which stands for New Product Development. In contrast, NSD means New Service Development and refers to the development of new services. Less often focused or considered in connection with CCC, the creation of new processes is described in the diagram as New Process Development. The decisive factor for the classification is that the subject area is only examined with regard to the fuzzy front-end. Special tools of the CCC in the context of the fuzzy front-end are for example Idea Contests, Idea Screening, Communities of Creation for Idea Generation or Discussion Forums. All tools require an open innovation process. Idea contests are competitions to generate innovative ideas, whereby the participant with the best solution is awarded at the end (Piller and Walcher, 2006). Idea Screening stands for the review and evaluation of submitted innovations by users and Discussion Forums for product-related discussion forums on product improvement (Ihl and Piller, 2010). Communities of Creation involve a large number of users in the innovation process, in which, for example, ideas and concepts are discussed in online forums or a virtual exchange of contributions takes place (Piller, Ihl and Vossen, 2010).
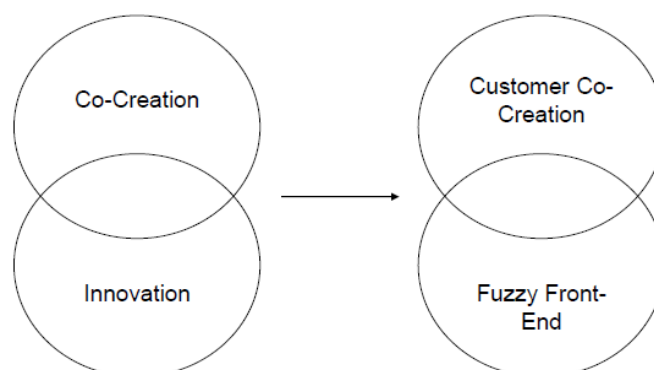
Figure 2: Selection of Keywords

Based on this overview of the terminology, a literature review can be developed. Therefore, relevant keywords need to be defined. A preliminary literature search to identify and test keywords was carried out using Google Scholar, with approximately 118,000 search results available for 'co-creation'. When limiting the search to the named topic area with regard to 'innovation', the number of hits was reduced to approximately 81,100. A further deepening of the topics was achieved with the specific search for 'customer co-creation' in the innovation context, which produced a good 3,100 results. The final keywords are 'customer co-creation' and 'fuzzy front-end', as this paper focuses on CCC's role at this early phase of innovation processes. This ultimately resulted in about 200 hits for a more detailed investigation. Figure 2 visualizes the development of the keywords.

The search is focused on the keywords customer co-creation in connection with the fuzzy front-end, since articles about other stages of the innovation process or co-creation with employees and business partners are considered to be less relevant for the focus of this paper. In addition, it became necessary to change the term fuzzy front-end to its synonyms FFE and front-end Innovation. Another decisive factor was the analysis of the articles on value co-creation in connection with the fuzzy front-end, as this term is often used synonymously with customer co-creation. During the research it became clear that it is important to distinguish between the Customer Involvement and the CCC. The active involvement of customers in the innovation process is a special activity of Customer Involvement or requires Customer Involvement for implementation (Vaisnore and Petraite, 2011). The term Voice of the Customer (VOC) is often used in this context. VOC describes listening to the voice of the customer in order to recognize and implement his needs as a company (Lusch and Vargo, 2015). Customer co-creation therefore includes the VOC, but is a separate topic that is not explored in this paper. In addition to the original search results, the hits of the keyword variations were added, resulting in approximately 250 additional results. The advanced search was done using Springer Link, which did not generate any new significant articles additionally to the results of the Google Scholar search.

After screening the titles and abstracts of the literature found, 45 results turned out to be relevant. They already named at least one of the keywords in the title or abstract, which suggests a concrete relation to the topic. For example, publications on other related topics, such as customer involvement, as well as articles that only refer to specific use cases of customer co-creation and do not take a holistic view of the topic were not considered. Literature that does not refer to the fuzzy front-end was also defined. Table 1 provides a detailed list of exclusion criteria for the relevance of the articles.

Table 1: Delimitation Criteria

Exclusion criterion	Example
Type of publication	Bachelor theses, master theses, doctoral theses
Concrete use cases without holistic consideration of the topic	applied perspective on CCC in very specific fields: Social Media, Tourism, Telecommunication, Video Games, Hotel, SME, etc.
Keyword in other context	FFE without CCC in innovation management, CCC in product service systems, CC with employees/ business partners
Related topics without reference to the keywords	Open Innovation, Customer Involvement, Stakeholder Management, Customer Needs Management, Lead-User Approach, NPD, NSD
List of keywords in bibliography/references only	-

The final literature basis for this work could be established after the explicit reading of the 45 articles. In the course of the content analysis, the exclusion criteria type of publication, keyword in other context as well as concrete use cases without holistic consideration of the topic were applied again. After the exclusion of all irrelevant work, 29 articles were left at the end for the following qualitative evaluation and discussion of the results. It is acknowledged at this point that access to further databases that has not been available at the research institute might lead to further results. An extension of this review should therefore be considered for future research.

SYNTHESIS

The synthesis focuses on the evaluation and discussion of the relevant search results. Therefore, the main statements of the relevant articles and the results are compared. Subsequently, a critical evaluation of the found literature is carried out with regard to the comprehensive consideration of the facts as well as the method of elaboration of the special areas. The following topics on the CCC in the FFE turned out to be particularly relevant:

- History of origin, demand for CCC
- Definition, typology, key processes, types of CCC, application fields
- Advantages and disadvantages of the CCC, opportunities and risks, success factors
- Tools at FFE for CCC, Internet of Things as a method for the future
- Consumer roles, motives for participation in the CC process, effects on customer groups
- CCC as part of NPD, NSD, Process Innovation
- Ideation Challenge, Online Idea Contests, Idea Crowdsourcing

Especially the authors Prahalad and Ramaswamy as well as Piller have deeply influenced the scientific field of customer co-creation, which is why almost all basics of the CCC in the relevant research work are based on the publications of the named authors. This fact points to the current research situation on the topic. There are currently only a few articles that deal with definitions, structures, effects and procedures of the CCC across countries and industries. Most of the research work deals with concrete application cases in specifically selected areas, so that no well-founded conclusions can be drawn about the overarching field. Several authors, such as Gemser and Perks (2015) or O'Hern and Rindfleisch (2010), also criticise this aspect. Therefore, the further literature analysis is limited to the 29 relevant articles, which were filtered out of a total of 200 articles after the keyword research and analysis of the concrete contents on the topic, and which discuss fundamentally decisive aspects of customer co-creation in the fuzzy front-end.

The need for comprehensive consumer participation in the innovation process developed from an asymmetry of the information. While customers know their needs inside out, companies know how best to implement them (O'Hern and Rindfleisch, 2010).

Rohrbeck, Steinhoff and Perder (2010) also see the reasons for CCC in the change in the roles of market participants from active companies to active customers. Consumers are increasingly taking on the role of active designers instead of the usual passive actions. Therefore, the literature speaks of a prosumer in such cases (Breda and Spruijt, 2013). The authors agree that these changes in the market are accompanied in particular by the spread of the Internet and the associated new opportunities for communication with customers (Martinez, 2014; Mischo, 2016; O'Hern and Rindfleisch, 2010; Rohrbeck, Steinhoff and Perder, 2010). Despite the great importance of the Internet in the field of CCC in FFE, there are few scientific studies on the subject, as Mischo (2016) criticizes. Accordingly, the Internet of Things is a new, decisive component that focuses on the use of passive customer data (Mischo, 2016).

The approach to customer co-creation is based on service dominate logic, SDL for short, where customers are active participants in the shared value creation process (Boukhris, Fritzsche and Möslein, 2017; Kaasinen et al., 2012; Kristensson, Matthing and Johansson, 2008; Mischo, 2016; O'Hern and Rindfleisch, 2010; Walcher and Leube, 2017). However, some authors criticise the theoretical data basis for the basics of CCC. Apart from SDL, there are no other theoretically sound approaches to justifying and consolidating the construct (Gemser and Perks, 2015; Kristensson, Matthing and Johansson, 2008; O'Hern and Rindfleisch, 2010). Only Motamarri (2015) uses the Permanent Beta approach instead of SDL.

Basically, customer co-creation uses two key processes resulting from the two main activities of FFE. According to the explanations of Piller, Ihl and Vossen (2010) based on O'Hern and Rindfleisch (2010), these activities are on the one hand the submission of ideas, contributions, concepts and other content and on the other hand the selection of contributions, which are then further developed. Based on this, Vaisnore and Petraite (2011) conclude with reference to Reichwald and Piller (2003) that three forms of contributions can be made by the client. First, the decision or selection from existing ideas or concepts. Secondly, the contribution of information in which the needs are communicated and, as a third form, the actual creation through the introduction of own solutions. Piller and Reichwald (2005) summarize the information that a company can generate from the CCC as need and solution information. Only Heidenreich et al. (2015) formulate slightly different three dimensions of co-creation: adaptability, effort and information exchange. It can be seen that the existing literature repeatedly quotes different works by the same authors, for example various articles by Piller or Rindfleisch, which might indicate that only a limited number of authors made fundamental contributions in this very specific field. As a result, many authors' opinions or statements are in agreement.

The above-mentioned effect can also be found in the classification of CCC into special species. O'Hern and Rindfleisch (2010) distinguish four categories in their typology: (1) Collaborating, (2) Tinkering, (3) Co-Designing, and (4) Submitting. The core contents of the four CCC types are presented in Table 2.

Table 2: Types of customer co-creation after Rindfleisch and O'Hern (2008)

Collaborating (greatest freedom)	Consumers get maximum power to design their ideas/improvements and most freedoms, e.g. open source software.
Tinkering	Customers make changes to commercially available products, which are later adopted in subsequent product versions, e.g. PC games
Co-Designing	Smaller groups of customers contribute limited contributions, a larger group of users help the company to select, e.g. online clothing producers, household goods, etc.
Submitting (slightest freedom)	Individually or as part of a team, consumers transfer their ideas for new innovations directly to the company, processes are precisely defined or graphics are set up in detail, finished prototypes are introduced, e.g. motorcycle manufacturers.

A further article on the CCC species is by Vaisnore and Petraite (2011). No change in approach is apparent, as the source of O'Hern and Rindfleisch (2010) is cited. Another approach to classifying CCC into different types is to differentiate between CCC in the NPD range and in

the NSD range according to Boukhris, Fritzsche and Möslein (2017) or Heidenreich et al. (2015). According to this, the focus is on the actual service deployment and recovery process in the NSD and functionalities of the products, the designs or both in the NPD (Heidenreich et al., 2015). Only with regard to the basic forms of co-creation for classifying the consumer-related design of products and services are there different approaches in the literature. Breda and Spruijt (2013) write about outside-in and inside-out processes, whereby the CCC is part of the first-mentioned approach. In the Outside-In form, stakeholders can generate and transmit ideas and concepts via a platform. In contrast, inside-out stands for developing ideas with employees, which is not the focus of this work (Breda and Spruijt, 2013). According to Kaasinen et al. (2012), co-creation can be divided into two other forms. According to Kristensson, Matthing and Johansson (2008), there is value co-creation and co-production, whereby the focus is on the way in which value is added as a differentiation parameter. In general, the authors' statements do not differ much from each other.

Also in this thematic area, existing foundations are used and further processed rather than critically questioned. Nor is there a comprehensive guideline for action that filters out methods for specific occasions and then derives concrete recommendations for action. Boukhris, Fritzsche and Möslein (2017) or Piller, Ihl and Vossen (2010) also criticise this aspect. Gemser and Perks (2015), Magnusson (2009) and Kristensson, Matthing and Johansson (2008) likewise call for a management approach in order to be able to derive precise procedures taking into account parameters such as the level of participation.

Based on the types of customer co-creation depending on the degrees of freedom, three influential dimensions are described in the literature. The authors Piller, Ihl and Vossen (2010) also strongly influence the literature in this area. There are three clues on the basis of which the specific methods for implementing the CCC can be aligned. Influencing parameters are thus the stage of the innovation process, the degree of cooperation and the degree of freedom given to the participants. From this, four concrete tools for implementation can be derived for the fuzzy front-end. Idea competitions, communities of creation for generating ideas, idea screening by customers or product-related discussion forums can be used (Ihl and Piller, 2010; Piller, Ihl and Vossen, 2010).

Kelleher, Céilleachair and Peppard (2017); Magnusson (2009); O'Hern and Rindfleisch (2010); Stephane and De Barnier (2014); and Walcher and Leube (2017) also name online design tools, co-creation communities or Idea Contests as implementation forms. Especially with regard to a service-oriented customer co-creation, there are three instruments for the application: social

media as a space for CC (Open Web Lab), public everyday spaces and living labs (Kaasinen et al., 2012).

Opportunities and risks as well as advantages and disadvantages of the CCC in FFE are much discussed in the literature. According to Martinez (2014), the advantages of generating ideas through mass are a higher degree of novelty and better customer benefit, which can ultimately lead to an increased competitive advantage. Likewise, a deep emotional bond, improved customer loyalty as well as higher customer satisfaction and loyalty are highlighted as positive effects (Martinez, 2014). Rohrbeck, Steinhoff and Perder (2010) also refer to these effects in simplified terms. O'Hern and Rindfleisch (2010) see the increased creativity of new products, shortened time to market and reduced development costs as advantages of this innovation management method. Weber (2016) also presents further positive effects. According to Weber, lower R&D costs, superior products and services and stronger advertising can result from early collaboration with consumers. The author also highlights concrete positive effects on the brand that include increased customer engagement and trust, increased loyalty and emotional bonding, positive word-of-mouth, and increased demand for collaboratively created products. He also believes that customer integration throughout the innovation process would further enhance the positive effects (Weber, 2016).

The statements of Barroca et al. (2017), Heidenreich et al. (2015) as well as Gemser and Perks (2015) agree with those of the already mentioned author opinions. In these articles, too, reduced R&D costs, a variety of solutions obtained, ensuring customer needs and reflecting customer behaviour are highlighted as positive (Barroca et al., 2017; Gemser and Perks, 2015). Breda and Spruijt (2013) show a different approach to dealing with the advantages of the CCC. According to their statements, there are organisational and stakeholder advantages. The authors thus classify all the effects already mentioned in two dimensions. The result is illustrated in Table 3.

Table 3: Advantages of CCC (Breda and Spruijt, 2013)

Organizational advantages	stakeholder benefits
Organizations create a self-sustaining system	municipal standards
Development of products / services	sense of belonging
(positive) network effects	friendship
reputation gains	knowledge gain
Setting an informal standard	Intellectual Stimulation
The disclosure of other related innovations by other	Fun and excitement
Building an online community	Pride and passion

The table also shows that both sides, organisations and stakeholders, learn through cooperative work, as Rohrbeck, Steinhoff and Perder (2010) also points out. The fact that many articles deal with the positive effects of customer co-creation shows the diversity of the advantages already mentioned, viewed from different points of view. Kaasinen et al. (2012) also distinguish between two other dimensions: direct and indirect effects, where the direct benefits are better quality, more fitting customer needs and fast innovation, and the indirect effects are a customer-centric image, a customer-led organisational culture and higher employee motivation (Kaasinen et al., 2012). Finally, Hanski et al. (2012) has identified a concrete description of opportunities and risks, differentiated according to economic, social and environmental aspects.

In addition to the aspects already mentioned, the authors add the following points to the positive effects of the CCC in FFE: fewer errors in FFE, lower energy and material consumption in production and use, i.e. optimal life cycle costs, more attention to recycling and disposal as well as public welfare (Hanski et al., 2012).

It is clear that the literature has dealt intensively with the positive effects. Equally visible is the contrasting, significantly lower illumination of the negative aspects of the topic, as Piller, Ihl and Vossen (2010) or Magnusson (2009) have already pointed out. Hanski et al. (2012) identifies risks that may arise from the implementation of the CCC. These are:

- additional time and costs, increased use of materials and energy
- strategic risks, serving a niche market
- loss of know-how to customers, dealing with ownership of ideas, unemployment and social insecurity
- dependence on the views and personality of the client
- customer is mainly source of incremental innovations
- misunderstandings between customers and companies

Rohrbeck, Steinhoff and Perder (2010) also point to the disadvantages of uncertainty in identifying suitable customers, internal acceptance barriers, conflicts in interactions, high costs for customer integration, inefficient product development and opportunistic customer behaviour. Risks therefore also include an excessive focus on a niche as well as negative image effects (Rohrbeck, Steinhoff and Perder, 2010). According to Martinez (2014), other risks include a high degree of access to products, maximum transparency and the associated loss of control over brand communication or the loss of management power, as well as the need for a high degree of flexibility. Gemser and Perks (2015) as well as O'Hern and Rindfleisch (2010) agree with the

above-mentioned disadvantages of the CCC. The article by Heidenreich et al. (2015) deals exclusively with the negative aspects, with the focus on customer co-creation in the NSD. Since service is highly dependent on human performance and more prone to errors, co-creation requires a great deal of effort to generate successful output. If the newly developed service has a negative impact on the customers, success and customer satisfaction drop enormously. A recovery process does not always lead to an improvement afterwards, which is why CCC also involves high risks (Heidenreich et al., 2015). In general, Piller, Ihl and Vossen (2010) fear that in this context the resource "customer base" could become scarce in the long term. This comparison shows that significantly fewer articles deal critically not only with the positive effects but also with the negative effects in relation to the topic. In addition, there are no studies on long-term effects of the CCC. Gemser and Perks (2015) and Piller, Ihl and Vossen (2010) have also come to this conclusion.

In addition to the opportunities and risks of customer co-creation, concrete success factors are also examined by various authors. Here, too, a far-reaching agreement of the statements can be seen. Rohrbeck, Steinhoff and Perder (2010) link the dependency of success to the intensity and continuity of customer integration and to the time of participation in the process. In addition, they describe an increase in success through greater customer proximity to the company and through economically attractive customers (Rohrbeck, Steinhoff and Perder, 2010). Piller and Reichwald (2005) also measure success in terms of the company's ability to respond to external players. The authors Ihl and Piller (2010) concretize the success factors. Accordingly, successful CCC at FFE requires coordination with internal innovation processes, top management support, transparency towards customers and coordination with IP management (Ihl and Piller, 2010). Comparable statements can be found at Hanski et al. (2012), where the high commitment of the management, the involvement of the marketing and technology department, clearly defined responsibilities, the choice of the right customers and the preparation of agreements on intellectual property are success factors. Piller, Ihl and Vossen (2010) also see clear ideas and guidance from managers as well as information on the suitability of the industry and the innovation project as the basis for successful implementation. According to Stephane and De Barnier (2014), fundamental premises are that the value of companies and customers is created jointly, that co-creation from experience represents the value basis and that the individual is at the centre of events. In all the above-mentioned articles, especially in Rohrbeck, Steinhoff and Perder (2010), it is directly or indirectly evident that the success of CCC requires an intensive examination of the corporate structure and management, the consumers to be integrated and their needs.

As a result, in connection with CCC in the fuzzy front-end, the literature deals not only with the basics of the topic but also with the roles of consumers and their motives for participating in the innovation process (Valuckiene, Bersenaite and Tijunaitiene, 2017). In general, Boukhris, Fritzsche and Möslein (2017) name three forms of possible customer integration at CCC: customer participation as a source of information (CIS), customer participation as co-developer (CIC) and customer participation as innovators (CIN). CIS serves the pure intensive information procurement, CIC the joint development of ideas and their evaluation by companies as well as customers and CIN the fully exempted design of products by the customer via the company (Boukhris, Fritzsche and Möslein, 2017; Cui and Wu, 2016). This is contradicted by the statement of Martinez (2014), who only talks about customer co-creation in the role of customers as innovators, i.e. at CIN.

Kelleher, Céilleachair and Peppard (2017) and Rohrbeck, Steinhoff and Perder (2010) describe a similar understanding of the role depending on the experience and expertise of the users. With reference to these articles, customers can act as initiators or resources for active needs formulation and problem understanding in the idea generation phase, as consultants or evaluators in the selection phase or as partners in the form of prototype testers as well as active designers and developers (Kelleher, Céilleachair and Peppard, 2017). Mischo (2016) also agrees with these statements by highlighting the different roles of consumers through direct or indirect participation.

According to Gemser and Perks (2015) and Kelleher, Céilleachair and Peppard (2017), a distinction can be made between two types of consumer: Ordinary users, i.e. ordinary customers, as well as lead users, i.e. opinion- or trend-leading users. While ordinary users act without prejudices and thus think beyond borders, lead users produce higher-quality, more innovative ideas (Gemser and Perks, 2015). Vaisnore and Petraite (2011) also describe the lead user approach as part of customer co-creation, and Rohrbeck, Steinhoff and Perder (2010) also sees a connection to this area. In Magnusson (2009), the breakdown between ordinary and lead users can also be found in context. The author also indicates possible applications for the corresponding customer group. Accordingly, the incremental ideas of the ordinary-users should not be integrated directly into the NPD process, but should serve the understanding of basic principles. In addition, Magnusson (2009) criticizes the participation of ordinary users because customers lack awareness of the technology and the capacities and therefore the full potential cannot be exploited. He therefore recommends the participation of ordinary users in the search for incremental solutions and cooperation with lead users in the search for radical innovations (Magnusson, 2009). In contrast to the other authors named, Magnusson (2009) thus derives

concrete recommendations for action. According to Valuckiene, Bersenaite and Tijunaitiene (2017), literature confirms that there is a connection between roles and motives for participation.

Customer motives for participation in the CCC can be divided into intrinsic and extrinsic motives, i.e. incentives can be of a material, immaterial, social, psychological or economic nature (Valuckiene, Bersenaite and Tijunaitiene, 2017). According to Kelleher, Céilleachair and Peppard (2017), lead users can be motivated more extrinsically and ordinary-users more intrinsically. Accordingly, every company has to influence its consumers according to the individually perceived motives (Valuckiene, Bersenaite and Tijunaitiene, 2017). According to Valuckiene, Bersenaite and Tijunaitiene (2017), extrinsically motivated customers are more difficult to motivate successfully than intrinsically motivated ones. Magnusson (2009) and Rohrbeck, Steinhoff and Perder (2010) also point out that intrinsic motivation is crucial. Table 4 shows the link between roles and effective incentives:

Table 4: Effective incentives in relation to consumer roles (Valuckiene, Bersenaite and Tijunaitiene, 2017)

	Self-oriented customers	**Environmentally oriented customers**
Extrinsic incentive	Auxiliary motives: material reward, e.g. money, goods	Social motives: image, status, recognition
Intrinsic Incentive	hedonic (or technical) motives: interest, learning, pleasure	Psychological (or altruistic) motives: belong to a group, help others

A similar breakdown of motives according to social, hedonistic, personal and monetary incentives is also described in a comparable way in Ali and Liem (2015), Liem and Sanders (2011) or Rohrbeck, Steinhoff and Perder (2010). According to Magnusson (2009), profiting from the idea even after participation in the innovation process is one of the promising extrinsic motives. This approach can also be found in Piller and Reichwald (2005). This article also mentions the high value of intrinsic motives, which increase the willingness to innovate and can lead to positive feelings on the part of customers (Piller and Reichwald, 2005). Thus these author opinions are in agreement with those of Magnusson (2009) and Rohrbeck, Steinhoff and Perder (2010).

The combination of the experience of the benefits and the experience of the technology among the consumers involved are premises for successful cooperation (Magnusson, 2009). Kristensson, Matthing and Johansson (2008) also have key strategies for integrating consumers in FFE. The authors also emphasise the importance of the experience a customer has gained before working with the product or service. An approach to participation is also described. First, users should identify the need for innovation in their own user environment in order to derive

their needs. The organisation then provides the customer with analysis tools and motivates them with appropriate incentives based on the motives for their participation (Kristensson, Matthing and Johansson, 2008). Comparable principles can also be found in Breda and Spruijt (2013) and Mischo (2016), where transparency, access, dialogue and reflexivity/risk assessment are presented as key issues. According to Kristensson, Matthing and Johansson (2008), it is crucial not to create dependencies of customers in idea generation, to integrate users with little technical knowledge and to ensure a heterogeneous user group for idea diversity. Thus, this article does not focus on the already named lead users, who, according to Magnusson (2009), can play an important role depending on the preferred type of innovation. According to Heidenreich et al. (2015), highly integrated consumers are more satisfied with the result of co-creation than others. The article by Weber (2016) also describes the effects on non-participants in the process.

Accordingly, this customer group prefers companies that use customer co-creation, unless the products are luxury products. CC products appear more innovative, there is a positive attitude to the brand and the willingness to pay and recommend increases. However, there are no articles on the subject for the NSD sector (Weber, 2016).

There is very little scientifically based literature on the third form of customer co-creation with regard to process innovations. Only the article by Sjödin (2018) outlines the topic on the basis of the relevant criteria chosen for this paper, whereby the author also criticizes the meagre research landscape in the discipline under consideration. One reason for this could be the complexity and high number of risks of this innovation strategy in the field of B2C. According to Sjödin (2018), there are several risk factors that pose a challenge. For example, customers need comprehensive background knowledge of the process structures and their interfaces to other business areas in order to generate efficient, usable ideas. Creating novelty in the area of processes is in principle a difficult, complex task and requires comprehensive and time-consuming project management. The risks are difficult to assess. Therefore, end users in this area are senior engineers, operators or maintenance personnel with a unique understanding of the processes and deep practical experience. This enables these users to identify potential problem areas or gaps and develop effective solutions (Sjödin, 2018). Other publications on process innovation are limited to the B2B sector, making them irrelevant to the paper. It turns out that this aspect of customer co-creation will only be examined more closely at a scientific level in 2018 and that the topic therefore has large gaps in research.

CONCLUSIONS, LIMITATIONS AND OUTLOOK

This literature review on customer co-creation at the fuzzy front-end of innovation processes aims to provide an overview of current scientific findings on the subject. It is acknowledged that the review is limited because of a restricted access to scientific databases of the research institute. Therefore, it should be understood as a provisional review to provide an initial impression of the field and that can and will be extended in future research.

The existing literature around CCC at the FFE is critically examined, evaluated and compared in order to uncover potential future fields of research. As can be seen from the synthesis of the literature, only a few articles show definitions, structures, effects and procedures across countries and industries. Most of the papers deal with concrete studies on use cases, which do not allow reliable conclusions to be drawn about overarching areas. Finally, eight interesting areas for future research can be filtered out, which are so far little part of the academic debates. On the one hand, there is a lack of consideration of the CCC in the FFE with regard to fundamental theoretical concepts on which the topic can be scientifically based. Only the SDL or the Permanent Beta Approach are mentioned as a possibility, but are not stored in detail. The authors Gemser and Perks (2015), O'Hern and Rindfleisch (2010) or Kristensson, Matthing and Johansson (2008) also came to this conclusion. On the other hand, therefore, no comprehensive recommendations for action can be derived for the CCC in the FFE under consideration of various company-specific parameters. There is currently no guideline based on the theoretical aspects, which takes different starting situations into account and, based on this, suggests specific methods for procedure and implementation. Boukhris, Fritzsche and Möslein (2017), Gemser and Perks (2015), Piller, Ihl and Vossen (2010), Magnusson (2009) and Kristensson, Matthing and Johansson (2008) also highlight this area as a need for research. A research gap in the area of process innovations on the topic under consideration is particularly noticeable. Only Sjödin (2018) takes a closer look at this aspect. In addition, based on the statements of Gemser and Perks (2015) and Piller, Ihl and Vossen (2010), it emerges that many articles deal with positive examples and that only a few studies investigate negative, especially long-term effects. There is also no scientific analysis of the effects of customer co-creation at FFE on other areas of the company, such as marketing or other organisational areas, as already highlighted by O'Hern and Rindfleisch (2010). Only one article in the synthesis deals with the effects of the CCC on non-participants in the co-creation process. There is therefore further research potential in this area, especially with regard to the NSD. This opinion is also supported by Weber (2016). In this context, motives for involving different customer groups and key integration strategies are often discussed. Little attention is paid to the question of how special consumer groups can be tracked

down in the market in order to finally win the right users for the company's CCC. Finally, based on the findings of Mischo (2016), this study sees further research potential in the area of the use of big data for customer co-creation, for example through the Internet of Things.

References

Ali, A., and Liem, A. (2015) The Use And Value Of Different Co-Creation And Tools In The Design Process. In (ed.^eds.) 20th International Conference on Engineering Design (ICED15). Milan.

Barroca, J., Koria, M., Lindy, I., and Mulas, V. (2017) FrontEnd Toolkit: A Toolkit to Transform Ideas into Intelligent Action. Washington, DC: World Bank.

Boukhris, A., Fritzsche, A., and Möslein, K. (2017) Co-creation in the Early Stage of Product-service System Development. Procedia CIRP. Vol.63 pp.27-32.

Breda, N., and Spruijt, J. (2013) The Future of Co-creation and Crowdsourcing. Edcom Annual Conference, 2013. Available at SSRN: https://ssrn.com/abstract=2286076.

Chesbrough, H. (2017) The Future of Open Innovation. Research-Technology Management. Vol.60(1), pp.35-38.

Chesbrough, H., Lettl, C., and Ritter, T. (2018) Value Creation and Value Capture in Open Innovation. Journal of Product Innovation Management. Vol.35(6), pp.930-938.

Cui, A. S., and Wu, F. (2016) Utilizing customer knowledge in innovation. Journal of the Academy of Marketing Science. Vol.44(4), pp.516-538.

Enkel, E., Gassmann, O., and Chesbrough, H. (2009) Open R&D and open innovation: exploring the phenomenon. R&D Management. Vol.39(4), pp.311-316.

Gassmann, O., and Schweitzer, F. (2014) Managing the Unmanageable: The Fuzzy Front End of Innovation. In: O. Gassmann and F. Schweitzer, (eds.) Management of the Fuzzy Front End of Innovation. Springer International Publishing Switzerland.

Gemser, G., and Perks, H. (2015) Co-Creation with Customers. Journal of Product Innovation Management. Vol.32(5), pp.660-665.

Hanski, J., Kunttu, S., Räikkönen, M., and Reunanen, M. (2012) Development of knowledge-intensive product-service systems. Outcomes from the MaintenanceKIBS project. . VTT, Espoo. VTT Technology, 21.

Heidenreich, S., Wittkowski, K., Handrich, M., and Falk, T. (2015) The dark side of customer co-creation. Journal of the Academy of Marketing Science. Vol.43(3), pp.279-296.

Ihl, C., and Piller, F. (2010) Von Kundenorientierung zu Customer Co-Creation im Innovationsprozess. Marketing Review St. Gallen. Vol.27(4), pp.8-13.

Jetter, A. (2005) Produktplanung im Fuzzy Front End. Gabler Edition Wissenschaft Wiesbaden: Deutscher Universitätsverlag.

Kaasinen, E., Koskela-Huotari, K., Ikonen, V., Niemelä, M., and Näkki, P. (2012) Three approaches to cocreating services with users. Conference Proceedings. 4th International Conference on Applied Human Factors and Ergonomics (AHFE). pp.S. 4343-4352.

Keinz, P. (2015) Auf den Schultern von ... Vielen! Crowdsourcing als neue Methode in der Neuproduktentwicklung. Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung. Vol.67(1), pp.35-69.

Kelleher, C., Céilleachair, A. Ó., and Peppard, J. (2017) Value Proposal Co-Creation in Online Community-Based Idea Contests. In: T. Russo-Spena, C. Mele, and M. Nuutinen, (eds.) Innovating in Practice. Springer Nature.

Khanagha, S., Volberda, H., and Oshri, I. (2017) Customer Co-Creation and Exploration of Emerging Technologies: The Mediating Role of Managerial Attention and Initiatives. Long Range Planning. Vol.50(2), pp.221-242.

Koen, P. A., Bertels, H. M. J., and Kleinschmidt, E. (2014) Managing the Front End of Innovation—Part I: Results From a Three-Year Study. Research and Technology Management. Vol.57(2), pp.34-43.

Kristensson, P., Matthing, J., and Johansson, N. (2008) Key strategies for the successful involvement of customers in the co-creation of new technology-based services. International Journal of Service Industry Management. Vol.19(4), pp.474-491.

Liem, A., and Sanders, E. B. N. (2011) The Impact of Human-Centred Design Workshops in Strategic Design Projects. In: K. M., (ed.) Human Centered Design. HCD 2011. Lecture Notes in Computer Science, vol 6776. Berlin, Heidelberg: Springer.

Lusch, R. F., and Vargo, S. L. (eds.) (2015) The service-dominant logic of marketing. Dialog, debate, and directions. London, New York: Routledge.

Magnusson, P. R. (2009) Exploring the Contributions of Involving Ordinary Users in Ideation of Technology-Based Services. Journal of Product Innovation Management. Vol.26(5), pp.578-593.

Martinez, M. G. (2014) Co-creation of Value by Open Innovation. Agribusiness. Vol.30(2), pp.132-147.

Mischo, H. (2016) The Internet of Things as a Co-creation Tool in the Fuzzy Front End. In (ed.^eds.) 7th IBA Bachelor Thesis Conference. University of Twente, Enschede.

Motamarri, S. (2015) The Convergence Of SDL And STD Towards Co-Creation. In (ed.^eds.) Australia & New Zealand Marketing Academy Conference 2015 (ANZMAC 2015). University of New South Wales, Sydney.

O'Hern, M. S., and Rindfleisch, A. P. (2010) Customer co-creation: A typology and research agenda. Review of Marketing Research. Vol.6 pp.84-106.

Piller, F., Ihl, C., and Vossen, A. (2010) A typology of customer co-creation in the innovation process. Available at SSRN: https://ssrn.com/abstract=1732127.

Piller, F., and Reichwald, R. (2005) Open Innovation: Kunden als Partner im Innovationsprozess.

Piller, F. T., and Walcher, D. (2006) Toolkits for idea competitions. R&D Management. Vol.36(3), pp.307-318.

Prahalad, C. K., and Ramaswamy, V. (2004) Co-creating unique value with customers. Strategy & Leadership. Vol.32(3), pp.4-9.

Ramaswamy, V. (2009) Leading the transformation to co-creation of value. Strategy & Leadership. Vol.37(2), pp.32-37.

Reichwald, R., and Piller, F. T. (2003) Von Massenproduktion zu Co-Produktion Kunden als Wertschöpfungspartner. Wirtschaftsinformatik. Vol.45(5), pp.515-519.

Rohrbeck, R., Steinhoff, F., and Perder, F. (2010) Sourcing innovation from your customer: how multinational enterprises use Web platforms for virtual customer integration. Technology Analysis & Strategic Management. Vol.22(2), pp.117-131.

Rothwell, R. (1976) Marketing—A Success Factor in Industrial Innovation. Management Decision. Vol.14(1), pp.43-53.

Sjödin, D. (2018) Knowledge processing and ecosystem co-creation for process innovation. International Entrepreneurship and Management Journal. Vol.56(2), p.285.

Stephane, S., and De Barnier, V. (2014) Consumer Co-creation as an Experience : What Are the Dimensions at Stake in an Ideation Challenge? In (ed.^eds.) EMAC Conference 2014. Valencia.

C. Campbell and J. Ma (ed.^eds.) (2016) Potential Dimensions of Customer Co–Creation, Cham, 2016//. Springer International Publishing.

Tran, M. K. (2017) Four decades of engaging customers in product innovation. In: E. Shiu, (ed.) Research handbook of innovation and creativity for marketing management. Cheltenham: Edward Elgar, pp. 91-121.

Vaisnore, A., and Petraite, M. (2011) Customer Involvement into Open Innovation Processes. Social Sciences. Vol.73(3).

Valuckiene, J., Bersenaite, J., and Tijunaitiene, R. (2017) Customer Motives To Participate As Presumption For Service Co-Creation. <u>Journal of Economics and Management Research.</u> Vol.6 pp.15-31.

Verworn, B., and Herstatt, C. (2000) Modelle des Innovationsprozesses. <u>Working paper // Technologie- und Innovationsmanagement. Technische Universität Hamburg-Harburg.</u> Vol.6.

Voorberg, W. H., Bekkers, V. J. J. M., and Tummers, L. G. (2015) A Systematic Review of Co-Creation and Co-Production: Embarking on the social innovation journey. <u>Public Management Review.</u> Vol.17(9), pp.1333-1357.

Walcher, D., and Leube, M. (2017) <u>Kreislaufwirtschaft in Design und Produktmanagement.</u> Wiesbaden: Springer Fachmedien Wiesbaden.

Walter, N., and Meissner, H. (2017) Customer Co-Creation - Wie Konsumgüterunternehmen ihre Kunden bei Produktinnovationen mithilfe von Social Media miteinbeziehen können | marke41. <u>marke41.</u>(6).

Weber, M. (2016) Effects Of Co-Creation On Non-Participants Of The Co-Creation. In (ed.^eds.) <u>MCP-CE 2016.</u> Novi Sad, Serbia.

West, J., and Bogers, M. (2017) Open innovation: current status and research opportunities. <u>Innovation.</u> Vol.19(1), pp.43-50.