Consumer Empowerment Through Internet-Based Co-creation

JOHANN FÜLLER, HANS MÜHLBACHER, KURT MATZLER, AND GREGOR JAWECKI

JOHANN FÜLLER is a Researcher at the Innsbruck University School of Management, a Research Affiliate at the MIT Sloan School of Management, and CEO of Hyve AG, an innovation and design company specializing in virtual customer integration. His research interests are in the field of open innovation, consumer co-creation, online communities, and virtual consumer integration into new product development.

HANS MÜHLBACHER is Professor of Business Administration at Innsbruck University School of Management. He has held visiting professor positions at universities in France and the United States. His major research interests are in the fields of strategic marketing, multicultural branding, and virtual customer integration. He is the associate editor for International Business of the *Journal of Business Research* and member of several editorial boards of international journals.

KURT MATZLER is Professor of Strategic Management at Innsbruck University School of Management. His primary research interests are innovativeness and co-creation. He is academic director of the Executive MBA program at the Management Center Innsbruck (MCI) and partner of IMP, an international strategy consulting firm with its headquarters in Innsbruck, Austria.

GREGOR JAWECKI is a Project Manager for the company Hyve AG, where he has specialized in the integration of innovative online communities into new product development. He holds a degree in Business Administration with specialization in marketing from the Innsbruck University School of Management. His research focus lies in the analysis of innovative consumer behavior in online communities, particularly the process and motives, as well as the tools that are available for companies to benefit from creative online consumer groups.

ABSTRACT: Cost-efficient and multimedia-rich interaction opportunities offered by the Internet and the existence of online communities have made virtual co-creation a suitable means of creating value and improving the overall success of new products. Information technology enables new forms of producer–consumer collaboration in new product development processes. However, little research exists on consumers' experiences during virtual co-creation tasks. Drawing on the literature on organizational behavior, we introduce the construct of consumer empowerment to describe consumers' perceived influence on product design and decision making. This paper presents the first large-scale empirical study investigating how consumers are empowered through Internet-based co-creation activities. To analyze the impact of applied interaction tools, 727 consumers having taken part in virtual co-creation projects were asked about their experienced tool support, their perceived empowerment, how much they enjoyed the

Journal of Management Information Systems / Winter 2009–10, Vol. 26, No. 3, pp. 71–102.

0742–1222 / 2010 $9.50 + 0.00.
DOI 10.2753/MIS0742-1222260303

task, and their readiness to participate in future co-creation opportunities. The results show that consumers engaging in co-creation feel more or less empowered. The level of experienced empowerment depends on the design of the applied virtual interaction tool, the related enjoyment of the virtual interaction, the participants' task and product involvement, as well as their creativity and lead-user characteristics. The design of the interaction tool determines to what extent consumers with varying capabilities are able to solve the assigned co-creation task. It determines the consumers' perceived empowerment and experienced enjoyment. Both the levels of perceived empowerment and enjoyment have a strong impact on the consumers' willingness to participate in future virtual new product development projects. These findings contribute to a better understanding of antecedents and consequences of successful consumer co-creation. They provide recommendations on how to design a compelling virtual new product co-creation experience.

KEY WORDS AND PHRASES: co-creation, empowerment, new product development, online communities, open innovation, user innovation, virtual customer integration.

IN THESE TIMES OF ONLINE COMMUNITIES, Web 2.0, and Second Life, the postmodern view of the active and productive consumer [42] is becoming a reality. In information systems (IS) research, it has been argued that the dramatically decreasing costs of information technology (IT) are changing the economics of decision making, shifting power down the hierarchy and leading to decentralized organizations [85]. A new era of peer production has been reached [127]. Various Internet-based tools such as configurators and tool kits enable consumers to actively engage in co-creation activities and participate in new product development (NPD) projects [37, 109, 122]. Due to cost-efficient and multimedia-rich interaction opportunities offered by the Internet and the existence of online communities, virtual co-creation has become a suitable means of creating value and improving the overall success of new products [6, 37, 40, 48, 68, 76, 83, 96, 101, 118, 122]. Consumers are invited to actively participate in the creation of new products by generating and evaluating new product ideas; elaborating, evaluating, or challenging product concepts; discussing and improving optional solution details; selecting or individualizing the preferred virtual prototype; testing and experiencing the new product features by running simulations; and demanding information about or just consuming the new product. Consumers can take on the role of co-creators [75, 80, 92, 101].

Examples from a wide variety of industries and companies show that Internet-based product development indeed can lead to innovative products [9, 47, 96]. Virtual customer integration, therefore, represents "one of the most promising areas of development . . . that the new virtual customer environments make possible" [102, p. 124]. In a virtual environment, consumers communicate their knowledge through an electronic interface with no direct personal contact. They do not get immediate personal feedback. Thus, the virtual environment must be created in a way to enable and motivate consumers to play an active role in NPD as well as to make them participate in further NPD projects.

This paper investigates how consumers engaging in virtual co-creation perceive their engagement. Drawing on the literature on organizational behavior, we introduce the construct of consumer empowerment to describe consumers' perceived influence on product design and decision making. Defined as the individual experience of increased self-determination and efficacy, empowerment generally leads to increased trust in the empowering the person or organization and an enhanced tendency to repeat the empowered behavior [12, 33, 39].

IT enables new forms of producer–consumer collaboration in NPD processes. It allows relaxing the conventional assumption of separation between producers and consumers [9]. Grounded in the collaboration with the use of IT, the co-production mode has emerged as an important and growing method of production. Customers can assume a number of different roles in the NPD process [92]. In the ideation phase, customers can serve as a resource, and interactive multimedia tools, virtual brainstorming, or virtual focus groups, and the like support the users in creating new ideas. In the design and development phase, customers can assume the role of co-creators, and tools such as Web-based conjoint analysis, virtual user design, Internet-based design competitions, tool kits, and so forth allow users to express their preferences and to design their own products. In the test and launch phase, IT tools such as virtual concept testing can help to provide valuable feedback on products.

Therefore, IS research as an interdisciplinary, applied discipline takes an important role in shaping co-creation. Drawing on Baskerville and Myers's [19] vision of IS research as a reference discipline, Nambisan [92] demonstrates how IS research can serve as a reference platform for NPD research. Recent IS research has started discussing how IT tools can enhance the efficiency and effectiveness of virtual NPD and how new ITs can radically change the nature of consumer participation in NPD [93]. Nambisan [93] argues that IS theory can contribute to a better understanding of the interaction processes in the computer-mediated and community-oriented environment of new product co-creation. He delineates four avenues of research on the interface between IS and NPD: (1) process management (e.g., IT tools that support NPD process development and management), (2) project management (e.g., IT tools that facilitate the management of complex project portfolios and implementation of complex workflow management capabilities), (3) information/knowledge management (techniques that support information sharing with multiple entities in a distributed innovation environment), and (4) collaboration and communication (e.g., tools that support cross-functional cooperation and co-creation of entities with different IT capabilities). IS research should indicate how the characteristics of the computer-mediated environment shape NPD interactions, how data visualization and visual interactive modeling influence customers' knowledge creation activities, and how Web interface design shapes the nature and intensity of interactions between customers and the Web and influences human emotions [93].

So far, literature in marketing and NPD has addressed some of these issues: the challenges of how to select customers as innovators (e.g., [124]), how to create appropriate incentives to motivate customers to freely share their knowledge with the producer (e.g., [53]), and how to create and apply tools to capture customers' tacit and explicit

knowledge in a virtual setting [56, 128]. Literature in the fields of virtual consumer integration [46], open source software [57, 79, 107], consumer articulation on opinion platforms [58], and user innovation [45, 53] has identified a number of extrinsic and intrinsic motivations of customers to participate in NPD. However, little research exists on consumers' experiences during virtual NPD (e.g., [94, 95]). While several studies explored the impact of tools and technologies on effective problem solving [116, 117] or suitable means of saving time and money [37, 115], their impact on individuals' experiences has been rather neglected. We do not know what makes consumers feel enabled to participate in virtual NPD and to contribute their knowledge to NPD, or what makes that participation enjoyable to the extent of being repeated.

Our research sheds light on the impact of the design of the co-creation tool on consumers' ability to get a realistic understanding of the innovation task, to articulate creative ideas, and to contribute knowledge to NPD. We explore the impact of experienced tool support on participants' perceived empowerment and enjoyment of the task. Trust in the empowering organization and the intention to participate in future NPD projects are considered as potential consequences of perceived empowerment and enjoyment. The influence of personal differences in terms of involvement with the product category or the development task as well as lead-user characteristics and the influence of consumers' creativity on perceived empowerment are explored.

Following Nambisan's call for research that indicates how the characteristics of a computer-mediated environment shape NPD interactions and how Web interface design influences human emotions [93], the results of our empirical study reveal the importance of IT tool support as a trigger of consumers' experienced empowerment and enjoyment of virtual NPD tasks. The study also shows the impact of experienced empowerment and enjoyment on consumers' intentions concerning participation in future virtual NPD processes. Consequently, to effectively support co-creation of customers with different IT capabilities, IT tools should make customers experience both increased self-determination and efficacy and make them enjoy their participation.

Empowerment and Virtual Co-creation

THE CONCEPT OF EMPOWERMENT HAS BEEN APPLIED in various contexts such as political studies (e.g., empowerment through citizen participation) [27, 111]; management studies (e.g., employee empowerment through increased control and self-efficacy) [32, 104, 112, 113, 114]; IS research (e.g., employee empowerment in the context of process reengineering) [51, 106]; and consumer research (e.g., empowerment through increased access to information and greater choice) [38, 59, 131]. In the IS literature, empowerment is seen as "one of the most important themes in the economic history of the next century" [85, p. 142].

In management studies, empowerment is often equated with the sharing of power with subordinates and with participative management. In this sense, empowerment describes the perceived power or control that an individual actor or organizational subunit has over others [12]. Beyond the concept of perceived relative power, empowerment can be conceptualized as any means strengthening a person's perception

of self-determination [39] and self-efficacy [17] and reducing conditions contributing to feelings of powerlessness [33]. While a sense of powerlessness leads to lack of responsibility and demotivation [33], empowerment as raising peoples' experience of self-determination and efficacy together with the related enjoyment of a task determines initiation of an activity and increases persistence of task performance [16].

Bandura [16] identified four means to strengthen a person's experienced self-efficacy: (1) positive emotional support, such as playing or having fun during experiences generally associated with stress and anxiety; (2) words of encouragement and positive persuasion; (3) observing others' effectiveness; and (4) actually experiencing the successful mastering of a task, as the most effective means. Consequently, in management literature, a number of actions have been suggested to support empowerment, for example, to express confidence [28], to set challenging and inspiring goals [23], to provide autonomy [26], and to provide a culture of collaboration instead of competition [64].

In consumer and IS research, the Internet has gained attention as a technology for increased empowerment [34, 42, 54, 77, 99, 129]. In this context, empowerment refers to how the new technologies enable people to interact with the world on different levels (personal, dyad, group, or community) and to do or to achieve things that they found difficult to do or to achieve before [4]. According to Kozinets et al. [77], cyberspace grants ultimate power, enabling its audience not only to observe a reality but also to enter and actually experience it as if it were real. Shankar et al. [108] argue that the Internet provides bloggers an accessible medium and a willing audience to which they can demonstrate their creative empowerment by expressing their own opinions and observations about any matter relevant to them. Due to the increased information base, greater choice, and more control, the Internet is considered to be a consumer-empowering technology [108].

The Internet enhances empowerment of the individual through two processes: the reframing of one's identity (e.g., by interacting with others, role-playing, learning, and testing of one's own social skills) and increasing self-efficacy and skills [5]. The latter of these two is particularly relevant for Internet-based co-creation. In analogy to employee empowerment and consumer empowerment on the Internet, virtual co-creation can be interpreted as an enabling activity, strengthening a person's experience of self-determination and self-efficacy. There are several ways through which self-efficacy can be increased [97], of which mastery experiences are the most effective ones [5, 97]. Research in computer sciences has shown that the Internet allows people to engage in activities that allow them to learn and practice skills in a nonthreatening environment [5], which means that the psychological cost of failure is much lower than in offline environments.

Numerous tools that are available via computer-mediated communication strive to increase perceived user self-efficacy and self-determination. Web-based co-creation tools such as configurators, user design [37], and tool kits [128] allow consumers to actively participate in NPD and design their own products according to their desires and needs. Such co-creation tools enable consumers to realistically experience virtual prototypes in real-world usage scenarios long before they really exist [47]. Displaying

design and feature options, engineering constraints, and price effects in real time and easy-to-use drag-and-drop options supports consumers in creating their ideal product. Consumers themselves determine how "their" final product looks and which components are used. Such tools may lead to both actual and perceived empowerment of the individual [5].

The literature on Web-based virtual customer integration tools [37] provides rather technical insights into the appropriate design of co-creation solutions. According to the tool kit approach [128], for example, to let consumers transfer their knowledge into real products quickly and easily, a tool must allow user-friendly operation, offer module libraries, provide "trial and error" functionality, and define a possible solution space. So far, however, little is known about how the design of co-creation tools affects consumers' perceived empowerment.

Consumers' actual or perceived influence on new product design and decision making reflects participative management. Technologies and interaction tools enabling consumers to virtually engage in meaningful and challenging NPD tasks, to effectively share their knowledge with producers, to feel they are autonomously contributing in the way and to the extent they like, to experience a culture of collaboration and to believe that their input will be seriously considered may provide those consumers with a sense of mastery. Thus, participants in virtual co-creation may feel empowered. As the management literature has shown, the experience of empowerment enhances individuals' motivation to repeat the task where they felt empowered. Therefore, perceived empowerment should increase participants' intentions to participate in future NPD projects.

Conceptual Framework

In considering the theoretical background on empowerment, a number of variables may influence consumers' perceived empowerment when engaging in virtual co-creation activities during NPD. Our framework (see Figure 1) provides a detailed view of the proposed relationships among experienced tool support, perceived empowerment, task involvement, product involvement, and the intention of future participation in virtual NPD tasks. Enjoyment and trust are considered as potential mediators of these relationships. The level of creativity of consumers participating in the virtual NPD process as well as their lead-user characteristics are added as potential moderators of some of the proposed relationships. In the following, the hypothesized relationships are derived from the literature.

Main Effects

Tool Support

Effective interaction tools that enable consumers to actively engage in virtual co-creation must provide two essential functions: (1) allowing realistic product understanding and (2) enhancing consumers' creative articulation. Before consumers can make competent contributions, they need a sound understanding of the innovation

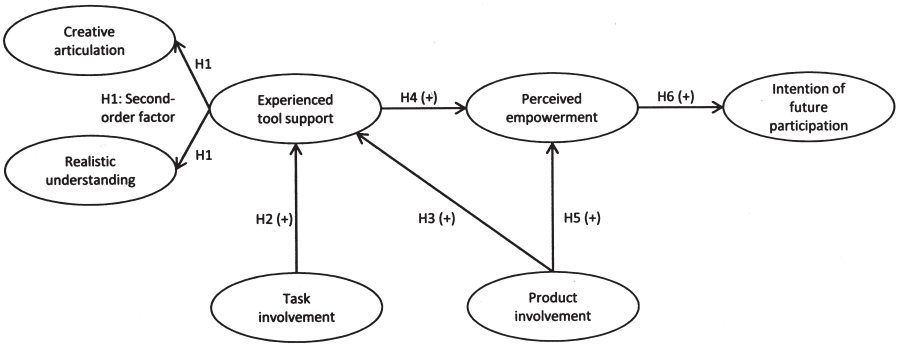

Figure 1. Hypothesized Main Effects

problem to be solved. Tool kits, for example, must enable consumers to actively experience and modify innovative products long before they actually exist [69, 105]. Unlike abstract symbols, words, and numbers, virtual prototypes help consumers draw from vivid mental images of future products and make decisions based on actual present and not on past experiences [84]. Moreover, consumers have to be given the means to share their creative ideas and knowledge, which are often hard to articulate and difficult to transfer [126]. Getting a realistic product understanding and being able to creatively articulate one's ideas are closely interrelated. Therefore, in line with Web site research demonstrating that Web site quality consists of higher-order factors [73], we assume that a common second-order factor, called *experienced tool support,* will underlie the two constructs (Figure 2).

Hypothesis 1: Experienced tool support (as second-order factor) underlies realistic product understanding and creative articulation.

Involvement

According to Thomas and Velthouse [114] as well as Spreitzer [112], a person's motivation to perform and maintain a behavior in a given situation depends on the person's perceived competence, choice potential, and impact as well as the meaningfulness of a task. Realistic product understanding and the potential for creative articulation provided by an online tool should increase a participant's perceived competence, choice potential, and impact on NPD. However, how strongly participants in virtual NPD tasks feel being supported by a tool will also depend on their intrinsic motivation for its use. In general, cognitively engaging and creative tasks are considered as intrinsically interesting [2]. Thus, customers engaging in virtual co-creation during NPD may be interested in the virtual innovation task. They may want to come up with new ideas, solve stated problems, or evaluate proposed solutions, independent of the respective product category. Individuals who are intrinsically motivated consider their virtual contribution to NPD as a meaningful activity of value for its own sake inherently rewarding [40].

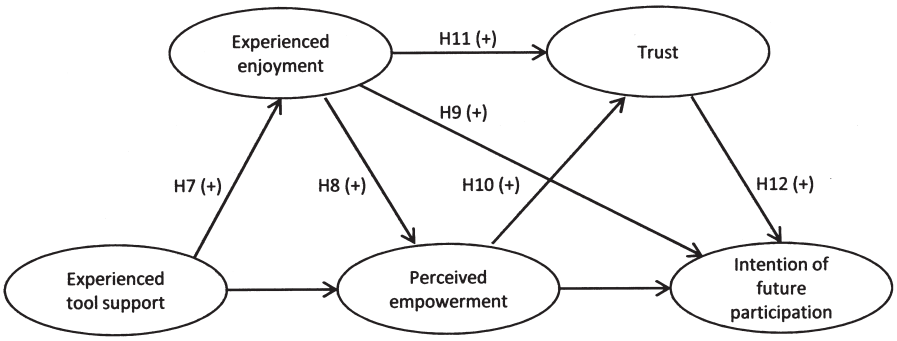

Figure 2. Hypothesized Mediating Effects

The perceived personal relevance of an object or activity to a consumer [132] determines the person's involvement with that object or activity. When highly involved with a virtual innovation task, customers may feel especially supported by the co-creation tools provided as they help them to better articulate their needs and to transfer their knowledge. Consumers not so deeply involved in a virtual innovation task might feel less supported by such tools as the act of innovating is of little interest and is less relevant to them.

Hypothesis 2: Task involvement has a positive effect on perceived tool support.

Consumers involved with a certain product category pay attention to all kinds of stimuli concerning products belonging to that category [70]. Consumers with high levels of product involvement tend to be information seekers, innovators, or opinion leaders [25]. Often, they possess specific skills and mastery. Therefore, highly product-involved consumers engaging in virtual co-creation activities may feel competent to make valuable contributions. Participants more highly involved with the product category may perceive to be more effectively supported by the tools provided.

Hypothesis 3: Product involvement has a positive effect on perceived tool support.

Perceived Empowerment

Perceived empowerment is conceptualized as consumers' perceived influence on the product design and decision making [112]. When consumers feel enabled and competent to solve the product development task assigned to them, when they feel they have some impact on the NPD decisions, they may feel empowered [33]. Participants may sense that they actively contribute to NPD, and that producers take them seriously. Consumers who feel empowered should consider their virtual participation as more than just taking part in an ordinary online survey.

An online tool that allows realistic product understanding and enhances consumers' potential of creative articulation supports consumers in solving the assigned task. Such a tool increases consumers' perceived competence and feeling of active

participation. It may be considered as empowering technology [77, 108]. We hypothesize that the stronger consumers' perception of support offered by the provided tool to master an NPD task, the more the tool will contribute to the consumers' perceived empowerment.

Hypothesis 4: Experienced tool support has a positive effect on perceived empowerment.

Furthermore, it has been shown that higher involvement leads to focused attention during computer-mediated interactions [95]. Highly product-involved consumers may consider themselves experts [25] whose knowledge and insights are unique [110]. They may think that their knowledge or opinion makes a difference; that it has an important impact.

Hypothesis 5: Product involvement has a positive effect on perceived empowerment.

In the context of virtual participation of customers in NPD, empowerment leads to consumers' feeling of being enabled and competent to solve the product development task assigned to them. They also feel that they have some effect on NPD decisions. Empowerment raises the individuals' conviction of self-efficacy, determines initiation of an activity, and increases persistence of task performance [16]. Conversely, a sense of powerlessness leads to lack of responsibility and demotivation [33]. Therefore, we suppose that consumers who perceive themselves as empowered are more likely to be willing to participate in future virtual NPD projects than less-empowered consumers.

Hypothesis 6: Perceived empowerment has a positive effect on consumers' intention to participate in future NPD tasks.

Mediating Effects

Enjoyment

Following Bandura [16], perceived empowerment together with the related enjoyment of a task determine the initiation of an activity and increase persistence of task performance. Individuals engage in tasks such as playing chess, dancing salsa, rock climbing, or gardening because the activity is considered as playful, interesting, challenging, and meaningful [39]. Csikszentmihalyi [35] emphasizes the playful element of innovation creation. It is the innovation task that provides hedonic value [57]. In the domain of virtual NPD, Jawecki [67] has found that enjoyment motivates online community members to contribute to joint innovation tasks. Following Prahalad and Ramaswamy [101], participants who are fueled by enjoyment experience a rewarding activity [39].

Interaction tools have an influence on NPD task enjoyment. Research has shown, for example, that enjoyment-driven participants prefer visual tools [47]. Participants in virtual NPD tasks who feel supported by the provided interaction tools may perceive their task as enjoyable [44] (Figure 3). Therefore, we propose:

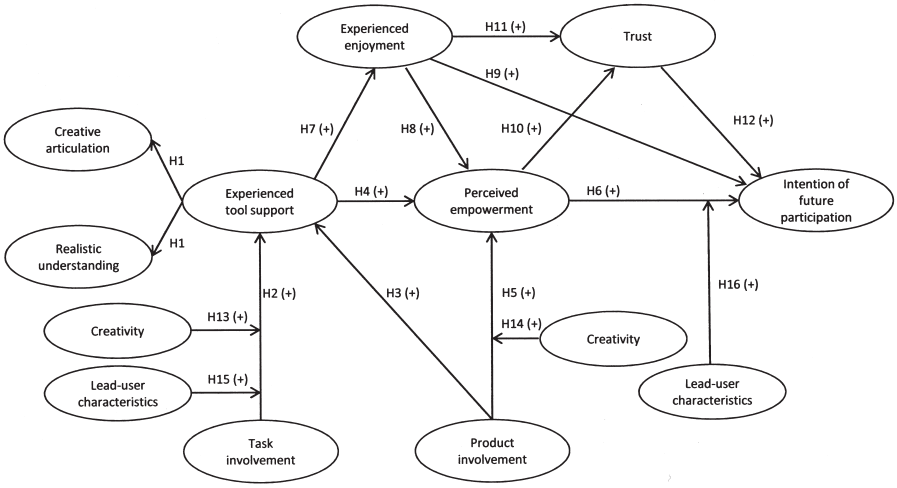

Figure 3. Conceptual Framework of Perceived Empowerment—Antecedents and Consequences

Hypothesis 7: Experienced tool support has a positive effect on experienced enjoyment.

The enjoyment experienced by consumers may strengthen their feeling of active participation and having a say in NPD [108]. That is, enjoyment may increase consumers' perceived empowerment. Or as one of the managers interviewed by Conger regarding empowerment practices remarked, "You gotta have fun in this business" [32, p. 18].

Hypothesis 8: Experienced enjoyment has a positive effect on perceived empowerment.

According to Belk et al. [21], enjoyable tasks offer a state of "jouissance" that people try to maintain. Thus, enjoyment of a task is important for a person's tendency to repeat that task.

Hypothesis 9: Experienced enjoyment has a positive effect on consumers' intention to participate in future virtual NPD tasks.

Trust

Literature in management and organizational theory argues that empowerment is an antecedent of trust. Trust has been defined as "a willingness to rely on an exchange partner in whom one has confidence" [89, p. 315]. Tzafrir et al. [120] show that empowerment is an exchange process, where managers share power with their subordinates. Delegating idea generation and decisions to employees when simultaneously providing them with the needed resources helps to build or reinforce employees' trust in their

organization [22, 49]. That is, perceived empowerment in terms of self-determination and self-efficacy leads to trust in the empowering organization.

Trust has also become a major focus in IS research [22, 49, 119]. In online environments, trust is considered as an important determinant of attitudes and behavior toward a supplier [36] fostered through unbiased, high-quality content, member embeddedness, and high levels of member interaction. Trust achieved through meaningful and information-rich interactions [87, 88] leads to the establishment of positive community–company relationships [14, 40, 100]. Therefore, consumers participating in virtual NPD who feel empowered will develop increasing trust in the cooperating firm.

Hypothesis 10: Perceived empowerment has a positive effect on trust in the empowering organization.

As valuable interactions positively relate to trust [7], we assume that a rewarding and enjoyable co-creation experience will cultivate trust in the company that consumers' are interacting with. Indeed, Hwang and Kim [66] hypothesized a direct relationship between enjoyment and e-trust. They showed empirically that in the context of customer self-service systems, the Web site users' enjoyment influences integrity and ability, two dimensions of e-trust. Hence, we formulate:

Hypothesis 11: Experienced enjoyment in the virtual product development task positively influences trust toward the provider of that task.

Finally, trust is an important condition for building and sustaining relationships [36, 72, 90]. Consumers trusting a company have a higher propensity of buying its product or service again [11]. Similarly, consumers will have a stronger intention to virtually participate in a company's future NPD if they have a higher level of trust in that company:

Hypothesis 12: Trust has a positive effect on consumers' intention to participate in future virtual NPD tasks.

Moderating Effects

Hon and Rensvold [63] have shown that individuals' perceived empowerment in working contexts is dependent on their personal characteristics. Therefore, we assume that personal characteristics moderate consumers' perceived empowerment. In this study, we examine the moderating effect of consumers' creativity and lead-user characteristics on the framework described above.

Creativity

The effect of consumers' creativity [2] on the suggested theoretical framework seems to be especially interesting as creativity—an essential prerequisite for innovative solutions—makes consumers a promising external resource for a producer's NPD [78,

81, 127]. Amabile [2] has pointed out four facets of a creative personality—expertise, creative cognitive style, personality traits, and motivation. Because of their tighter and more complex semantic network [1], experts may find it easier to actively experience innovative products and to express their creative ideas. At the same time, if they are motivated by the innovation task [41], such expert participants in virtual NPD may experience stronger IT tool support than others. Therefore, we hypothesize:

Hypothesis 13: Consumer creativity has a positive effect on the relationship between task involvement and experienced tool support.

Experts in a product category are highly involved with that product category [123]. They generally have more highly developed skills concerning the product and related activities. Moreover, creative cognitive style—that is, originality, imagination, metaphoric thinking, verbal capabilities, independent judgment, inclination to novelty [74, 130], and innovation motivation—will allow creative customers to use their skills in a way to feel more effective, enabled, and competent to solve the product development task assigned to them. Hence,

Hypothesis 14: Consumer creativity has a positive effect on the relationship between product involvement and perceived empowerment.

Lead-User Characteristics

Von Hippel [123] has defined lead users as user experts on the forefront of development in a product category who have a vested interest in the development of that product category in order to satisfy their own needs and who have the capability to imagine improvements of existing products. As such, lead users have become known to be a valuable resource, especially in the fuzzy front end of NPD [127]. It is interesting to investigate whether participants in virtual NPD possessing lead-user characteristics react differently to the opportunity of virtual co-creation than nonlead users.

Consumers who are involved with a virtual NPD task and have participated in NPD tasks before should be able to actively experience innovative products and to express their creative ideas more easily. Therefore, we formulate:

Hypothesis 15: Lead-user characteristics of a consumer have a positive effect on the relationship between task involvement and perceived tool support.

Following von Hippel, lead users display two important characteristics: "1. Lead users face needs that will be general in a marketplace, but they face them months or years before the bulk of that marketplace encounters them, *and* 2. Lead users are positioned to benefit significantly by obtaining a solution to those needs" [125, p. 107]. Lead users expect high rents from a solution to their need. This expectation drives them to actively attempt solving the need [125]. Hence, customers with lead-user characteristics who feel empowered will be more inclined to participate in future NPD tasks of their interest. Thus, we propose:

Hypothesis 16: Lead-user characteristics of a consumer have a positive effect on the relationship between perceived empowerment and future participation intention.

Study

THE POPULATION OF THE STUDY CONSISTED OF CONSUMERS who had actually participated in at least one virtual NPD co-creation project. Ten different virtual co-creation projects were covered, such as the development of the DiGGiT snowboard backpack, modular and adjustable running shoes, a baby carriage, a mobile phone for kids, and modular furniture. The NPD projects were selected in a way to cover various interaction tools applied for different product categories, innovation activities, process stages, and levels of innovativeness. Before taking part in the NPD co-creation projects, individuals had to register online. Subjects for the study were recruited from these lists of participants.

An online survey was used for data collection. An online pretest with 25 participants and subsequent telephone interviews with those participants led to an adjusted questionnaire. Data collection with the adjusted questionnaire was conducted within three weeks.

Because the list of participants was available for each co-creation project, customers could be contacted directly referring to NPD projects they had participated in. If customers participated in more than one project (less than 5 percent), they were asked about the latest project. No incentives were given for participation. E-mails with a link to the online questionnaire were sent to 4,714 consumers, of which 1,390 were undeliverable. In total, 3,320 consumers were contacted and 825 complete questionnaires returned. This corresponds to a response rate of 24.8 percent of the contacted consumers, and a response rate of 17.5 percent of all e-mails sent out.

As some projects had been conducted more than a year earlier, consumers were provided with a short visual and verbal overview of the project they were attending to refresh their memory. Seven hundred twenty-seven consumers were included in data analysis, as they confirmed being able to remember their participation in detail (value ≥ 3 on a five-point scale anchored by (1) "I cannot remember at all" and (5) "I can remember in great detail"). To test possible nonresponse effects as described by Armstrong and Overton [10], first, early, and late respondents (first third versus last third) were compared. No significant differences were found. In a second step, the distribution of age, gender, and education as measured at the conducted virtual NPD projects was compared to the respective distribution of respondents in the survey. No significant differences could be found either. Fifty-three percent of the survey participants were male and 47 percent were female. On average, participants were 35.06 years old (standard deviation [SD] = 9.49 years) and well educated. Of the participants surveyed, 30.1 percent held a college degree and 37.9 percent held a postgraduate degree. Almost half of the participants (N = 354; 42.9 percent) reported that they had already had an idea for a new product or product modification. Only a handful of respondents (N = 46; 5.6 percent) had actually realized their idea.

Measures

Table 1 shows all measures applied in this study. Except for demographic variables and respondents' previous ideas, five-point Likert-type scales were applied. Similar to Ugboro and Obeng [121], experienced empowerment was operationalized as consumers' participation in decision making, measured with two items. To measure the perceived level of tool support, a second-order construct consisting of two subcomponents was developed—realistic product understanding and potential for creative articulation. Both measures consist of two items. The items to measure product understanding were derived from the "diagnosticity" scale developed by Kempf and Smith [71]. Product involvement was measured by two items expressing the interest facet of the multidimensional product involvement construct developed by Kapferer and Laurent [70]. Four items of the hedonic component of enduring involvement developed by Higie and Feick [62] were used to measure Internet-specific innovation task involvement. Similar to Hertel et al. [61] and Hennig-Thurau et al. [58], future participation intention was measured with a single item.

Three items adopted from Ghani and Desphande [50], originally used to measure the experienced flow in human–computer interaction, were used to measure perceived enjoyment. Trust was measured with two items adopted from Chaudhuri and Holbrook [30].

To determine consumers' creativity, we calculated a creativity index consisting of domain-specific skills, innovation task motivation, and creative cognitive style. These measures are frequently used to examine consumers' creativity [2]. Four items adopted from the skills scale suggested by Novak et al. [95] were used to measure domain-specific skills. Three items of the curiosity component of Price and Ridgway's [103] user innovativeness scale were applied to measure innovation task motivation. Two items of Pallister and Foxall's [98] innovation factor were used to measure consumers' cognitive style as the main ingredient of the creativity-relevant process component. The creativity index was formed as follows:

$$\text{Creativity Index} = \text{Domain-Specific Skills} * \text{Task Motivation} * \text{Creativity Processes}.$$

In the domain of user innovation, previous innovation activities are considered as one of the most important characteristics of lead users. In line with Herstatt and von Hippel [60], Lüthje [82], and von Hippel [124], we measured consumers' lead-user characteristics by asking whether they had ever improved existing products or had ideas for new products before (yes or no). This dichotomous item was used to distinguish between the group of lead users and nonlead users.

Results

Data were analyzed using structural equation modeling (Amos 7.0). First, the measurement model was assessed to evaluate the internal consistency and reliability of the applied constructs. Due to low reliability, the following three items from the original scales had to be deleted: "From my point of view, it was just a regular online survey"

Table 1. Summary of Applied Measures

Constructs and measures	Mean	Standard deviation	Standardized loading	Error terms	α	Average variance extracted
Experienced empowerment					0.71	0.52
I had the feeling of active participation at new product development.	3.36	1.04	0.68	0.58		
This project gave me the feeling that I am taken seriously.	3.51	0.97	0.71	0.49		
Tool support: realistic product understanding					0.72	0.57
The design of the virtual co-creation tool helped me . . .						
. . . to get an understanding of the functionality and benefit of the new product.	3.65	0.95	0.67	0.50		
. . . to make a more realistic judgment of the new product.	3.57	0.98	0.83	0.29		
Tool support: creative articulation					0.82	0.70
The design of the virtual co-creation tool helped me . . .						
. . . to get inspired.	3.53	1.16	0.85	0.38		
. . . to better articulate my ideas.	3.36	1.07	0.83	0.36		
Task involvement					0.82	0.54
Dealing with innovations on the Internet is . . .						
. . . stimulating.	3.70	1.04	0.74	0.46		
. . . enjoyable.	3.93	0.96	0.74	0.40		
. . . exciting/fun.	3.52	1.05	0.76	0.45		
. . . interesting.	4.35	0.80	0.72	0.28		

(continues)

Table 1. Continued

Constructs and measures	Mean	Standard deviation	Standardized loading	Error terms	α	Average variance extracted
Enjoyment: participation was . . .						
5 = fun . . . 1 = not fun	4.32	0.82	0.76	0.28		
5 = exciting . . . 1 = dull	3.47	0.81	0.70	0.34		
5 = enjoyable . . . 1 = not enjoyable	4.02	0.80	0.81	0.11		
Product involvement					0.84	0.76
This product category is very important to me.	3.88	1.03	0.98	0.03		
This product category is an important part in my life.	3.76	1.09	0.74	0.54		
Creativity index						
Creative cognitive style					0.82	0.62
I am an inventive kind of person.	3.10	1.17	0.92	0.21		
I consider myself to be creative and original in my thinking and behavior.	3.72	0.98	0.63	0.59		
Domain-specific skills					0.79	0.51
I consider myself as very knowledgeable to contribute to product developments.	3.40	0.99	0.73	0.43		
I possess profound know-how (e.g., concerning technology, materials, market understanding, product design) relevant for virtual new product development.	2.89	1.20	0.74	0.66		

How would you rate your skills to contribute to (virtual) new product developments, compared to a professional product developer?	2.11	0.86	0.74	0.33		
How would you rate your skills to contribute to (virtual) new product developments, compared to the leisure activity you are best at?	2.56	0.90	0.63	0.47		
Innovation task motivation					0.79	0.62
I am very curious about how things work.	4.47	0.74	0.47	0.41		
I like to build my own equipment/things.	3.35	1.25	0.90	0.31		
I like to fix and improve things.	3.47	1.28	0.91	0.29		
Trust						
Producers which virtually integrate consumers in NPD					0.87	0.77
. . . are trustworthy.	3.97	0.86	0.83	0.22		
. . . mean it honestly.	3.76	0.84	0.92	0.10		
Lead-user characteristics						
Have you ever improved existing products or ever had ideas for new products before?						
Intention to participate in future NPD projects						
I am interested to participate in further virtual NPD projects.	4.25	0.92	—	—	—	—

Notes: $N = 727$; 1 = strongly disagree .... 5 = strongly agree

(experienced empowerment), "For me, this product category does not matter" (product involvement), and "I have original ideas" (creative cognitive style).

Cronbach's alphas and average variances extracted (AVE) delivered satisfactory results (Table 1), exceeding recommended cutoff criteria [15]. As we cannot assume any single-item measure to be error free [52], the reliability of "intention to participate in further virtual NPD projects" has been set to 0.70, assuming that the reliability of this measure is not lower than the level of reliability of other items in the model. If the estimated reliability of this single-item measure had been left at 1, the observed correlations would have understated the "true" relationship [52].

Following the procedure suggested by Fornell and Larcker [43], discriminant validity was tested by comparing the AVE of each construct with the variance shared with other constructs (squared correlations). Correlations and AVEs are provided in Table 2. Discriminant validity is given, as squared correlations do not exceed the AVEs. As assumed, creative articulation and product understanding together may represent "perceived tool support" as a second-order factor. According to Bagozzi [13], second-order models are especially useful when first-order factors are distinct but contain significant shared variance.

To evaluate the overall causal model, multiple fit indices were examined: the ratio of chi-square to degrees of freedom (df), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), the normed fit index (NFI), and the root mean squared error of approximation (RMSEA). Satisfactory fits are obtained when the GFI, AGFI, CFI, and NFI are greater than or equal to 0.9, and the RMSEA is less than or equal to 0.08 [24, 31]. Due to the expected effect of the large sample size on chi-square significance [8], the ratio of chi-square to degrees of freedom was chosen as the preferred fit measure [20]. This ratio should be less than or equal to 5. The test statistics of the final second-order model provide the following results: $\chi^2/df = 2.73$, GFI = 0.951, AGFI = 0.931, CFI = 0.963, NFI = 0.943, and RMSEA = 0.049. Because all indices are met, overall, the model indicates a good fit to the data. Further, alternative models with additional paths, such as product involvement on perceived enjoyment, were calculated to obtain support for the validity of the final model. No additional paths were significant. And the chi-square values of the alternative models did not significantly improve the model fit.

Tool Support as Second-Order Factor

To test Hypothesis 1, we compared two models of our conceptual framework, one consisting of the two first-order factors product understanding and creative articulation, and the other comprising tool support as a second-order factor of these two first-order factors. Table 3 depicts the overall fit indices for the first- and second-order model. Following Burnhan and Anderson [29], AIC_0, BCC_0, and BIC_0 were used to compare the two nonnested models and to evaluate the second-order structure. The analysis provides strong evidence for the second-order structure as the difference measures AIC_0, BCC_0, and BIC_0 are all > 10. Further, all paths from the second-order factor to the first-order factors satisfy all requirements. From this result, we conclude that tool

Table 2. Pearson Correlations and AVE

	1	2	3	4	5	6	7	8
1. Trust	1							
2. Future participation	0.27	1						
3. Task involvement	0.26	0.44	1					
4. Product involvement	0.25	0.27	0.19	1				
5. Enjoyment	0.34	0.39	0.36	0.21	1			
6. Empowerment	0.49	0.31	0.36	0.28	0.51	1		
7. Creative articulation	0.30	0.27	0.33	0.24	0.46	0.48	1	
8. Real product understanding	0.34	0.23	0.26	0.21	0.35	0.42	0.49	1
AVE	0.51	-	0.54	0.76	0.63	0.52	0.70	0.57

Note: 7 and 8 are first-order constructs of tool support.

Table 3. Model Comparison

	First-order factor model	Second-order factor model
χ^2/df	4.087	2.730
GFI	0.930	0.951
AGFI	0.899	0.931
CFI	0.934	0.963
NFI	0.915	0.949
RMSEA	0.065	0.051
AIC_0		159.9
BIC_0		169.1
BCC_0		160.0

Notes: $AIC_0 = AIC_{m1} - AIC_{m2}$; $BIC_0 = BIC_{m1} - BIC_{m2}$; $BCC_0 = BCC_{m1} - BCC_{m2}$.

support as a second-order factor represents creative articulation (61 percent of variance) and provided product understanding (52 percent of variance).

Main Effects

The results given in Figure 4 provide support for all hypotheses tested, with the exception of Hypotheses 11 (experienced enjoyment–trust) and 12 (trust—intention of future participation). The model accounts for 76 percent of variance in experienced empowerment.

Task involvement has a positive effect on experienced tool support ($\beta = 0.50$, $p < 0.001$), as predicted by Hypothesis 2. Product involvement influences experienced tool support ($\beta = 0.23$, $p < 0.01$) and perceived empowerment ($\beta = 0.13$, $p < 0.01$), supporting Hypotheses 3 and 5. Experienced tool support has a positive effect on experienced enjoyment ($\beta = 0.70$, $p < 0.001$) and perceived empowerment ($\beta = 0.72$, $p < 0.001$), as stated by Hypotheses 4 and 7. As predicted by Hypotheses 8 and 9, experienced enjoyment influences perceived empowerment ($\beta = 0.13$, $p < 0.10$) and the intention of future participation ($\beta = 0.32$, $p < 0.001$). Perceived empowerment, as predicted by Hypotheses 6 and 10, positively influences future participation intention ($\beta = 0.35$, $p < 0.001$) and trust ($\beta = 0.71$, $p < 0.001$).

Surprisingly, the relationship between enjoyment and trust is not significant, rejecting Hypothesis 8. Therefore, the mediating effect of empowerment on this relationship has been tested. Following Baron and Kenny's [18] logic, a variable (*m*) mediates the relationship between two other variables (*a* and *b*) when variable *a* (in our case, enjoyment) influences the mediating variable (empowerment) and when the mediating variable influences variable *b* (trust). A mediating effect occurs when the relationship between *a* (enjoyment) and *b* (trust) becomes insignificant when the mediating variable is introduced in the model. Without considering empowerment in the model, the relationship between enjoyment and trust was highly significant ($\beta = 0.42$, $p < 0.001$, explaining 17 percent of the variance of trust). When empowerment as a mediator

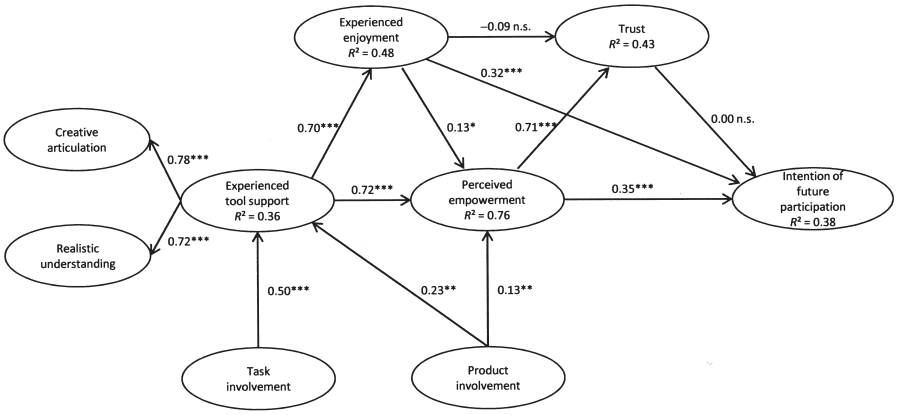

Figure 4. Parameter Estimates for Final Structural Model
Notes: Overall fit of the model: $\chi^2 = 330$; df = 121; $\chi^2/df = 2.73$; NFI = 0.943; CFI = 0.963; GFI = 0.951; AGFI = 0.931; RMSEA = 0.049; n.s. = not significant; *** $p < 0.001$; ** $p < .01$: * $p < 0.10$.

was introduced, this relationship became nonsignificant, while enjoyment significantly influenced empowerment and empowerment significantly influenced trust. Hence, there is an indirect relationship between experienced enjoyment and trust, fully mediated by perceived empowerment.

Moderating Effects

To test the effect of moderators, models different only with respect to the effect of one dimension were compared. Two models, one imposing equality constraints on all dimensions across the subgroups and a general model allowing all of the parameters to vary freely across the subgroups, were compared. As these are nested models with the general model having one degree of freedom less than the restricted model, the χ^2 value will always be lower for the general model than for the restricted model. If χ^2 improves significantly when moving from the restricted to the more general model, the dimension has a differential effect on the overall model and can be seen as a moderator. Significance is assessed on the basis of the χ^2 difference between the models with the use of a χ^2 distribution with one degree of freedom. In the first step of the moderator analysis, an overall χ^2 difference test for each of the moderator variables was conducted.

The analyses for both creativity and lead-user characteristic as moderating variables provide significant χ^2 difference effects (Tables 4 and 5), suggesting that the null hypothesis, which assumes that these variables do not have any effect on the relationship between the constructs, can be rejected.

The results show that creativity plays a moderating role in the model ($\Delta\chi^2 = 21.821$, $p < 0.05$). Task involvement has a stronger effect on perceived tool support for more creative than less creative consumers ($\Delta\chi^2 = 8.873$, $p < 0.01$), supporting Hypothesis 13.

Table 4. Moderating Effects of Creativity

	Creativity		χ^2 difference
	Low	High	(Δdf = 1)
TI → TS (H13)	0.406	0.523	8.873**
	(5.414***)	(6.976***)	
PI → EM (H14)	0.030	0.206	6.658**
	(0.499 n.s.)	(4.234***)	

Notes: *t*-values are shown in parentheses. $\Delta\chi^2$ for all parameters set equal across subgroups (Δdf = 10): 21.821*(0.016). TI = task involvement; TS = tool support; PI = product involvement; EM = perceived empowerment; n.s. = nonsignificant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5. Moderating Effects of Lead-User Characteristics

	Previous idea		χ^2 difference
	No	Yes	(Δdf = 1)
TI → TS (H15)	0.419	0.628	5.306*
	(6.371***)	(7.998***)	
EM → FP (H16)	0.585	0.672	4.196*
	(8.813***)	(7.617***)	

Notes: *t*-values are shown in parentheses. $\Delta\chi^2$ for all parameters set equal across subgroups (Δdf = 10): 20.787*(0.023). TI = task involvement; TS = tool support; EM = perceived empowerment; FP = interest in future participation. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As predicted by Hypothesis 14, the relationship between product involvement and perceived empowerment differs between creative consumers and less creative consumers ($\Delta\chi^2 = 6.658$, $p < 0.05$). For creative consumers, product involvement has a significant effect on perceived empowerment; for less creative consumers, product involvement becomes insignificant. For less creative people, it seems to be less important to contribute to NPD and to feel empowered, especially or simply if they are highly involved in the product.

Lead-user characteristics play a moderating role ($\Delta\chi^2 = 20.787$, $p < 0.05$), too (Table 5). Having had new product ideas (an important lead-user characteristic) moderates the relationship between task involvement and perceived tool support ($\Delta\chi^2 = 5.306$, $p < 0.05$). Hence, Hypothesis 15 is supported. For consumers possessing lead-user characteristics, the effect of task involvement on perceived tool support is stronger. Lead-user characteristics also moderate the relationship between empowerment and future participation intention in virtual NPD ($\Delta\chi^2 = 4.196$, $p < 0.05$), as predicted by Hypothesis 16. For lead users, empowerment has a greater impact on their interest in further participation.

Discussion and Implications

Co-production emerges as a new form of collaboration between consumers and companies. Through the use of IT, consumers can assume new roles throughout the NPD process. This study was performed to investigate how consumers participating in virtual co-creation activities during NPD perceive their engagement and to explore the antecedents and consequences of consumers' perceived empowerment during virtual co-creation. The research was supposed to shed light on (1) the impact of the co-creation tool's design on the ability of consumers to get a realistic understanding of the innovation task, to articulate creative ideas, and to contribute knowledge to NPD; (2) the impact of experienced tool support on participants' perceived empowerment and enjoyment of the task; and (3) the impact of perceived empowerment and task enjoyment on the intention to participate in future virtual NPD projects. The resulting contribution to IS literature is twofold: the findings on perceived tool support provide new insights into information sharing with multiple partners in a distributed environment. The findings concerning the impact of perceived empowerment and experienced enjoyment add to our knowledge on emotions during virtual communication triggered by tool support.

The results of the empirical study reveal the importance of IT tool support as a trigger of consumers' experienced empowerment and enjoyment of virtual NPD tasks. Consumers' feeling to actively contribute to NPD, their perception that they are taken seriously, as well as the enjoyment they experience depend to a large extent on the interaction tool that is used. Interaction tools have to support consumers in understanding the new product at hand—its functionality and value—and to articulate their ideas. Consumers' understanding of the problem and the ease of expressing creative ideas support the participants' sense of mastery. Co-creation tools that support consumers in solving their task make them feel empowered and enjoy the participation experience. As a consequence, consumers may be more innovative [113] and willing to put in the effort and persistence required to make valuable contributions (e.g., [114]).

Similar to active citizen participation in democratic political decision making [27], co-creation requires certain qualifications from its participants. Only if consumers are qualified may they feel a sense of control and self-determination [129]. While citizens have to possess certain social resources and intellectual capabilities [111], consumers engaging in co-creation have to possess domain-specific knowledge and creativity-relevant processing skills [2]. Co-creation tools that lower the level of qualifications required for participation or that enable less skilled consumers to make valuable contributions can be considered as empowering tools. From this perspective, selecting and designing appropriate interaction tools must be considered essential for successful co-creation projects.

When designing interaction tools, the selection of consumers participating in the co-creation task has to be taken into consideration. The results of this study show that potential task involvement of participants, their creativity, and experience in generating new product ideas have considerable influence on experienced tool support. Higher involvement with the task increases perceived tool support. Creativity in general

and having had new product ideas before make a difference in this relationship. For creative consumers and consumers possessing lead-user characteristics, the effect of task involvement on perceived tool support is stronger. Consumers who are interested in innovation activities and are creative consider virtual environments as more supportive to complete their tasks than nonlead users and less creative people. This seems plausible as creative users and lead users have a higher need to articulate their needs and to transfer their knowledge [2, 127]. They want to develop their innovation skills and love to feel a sense of mastery [16].

As this study shows, the literature on empowerment may serve as a useful theoretical basis when designing effective and efficient co-creation tools and consumer-related IS in general. Suggestions for the design of effective tool kits, such as providing trial and error functionality as a means of immediate feedback on success or failure; intuitive user interfaces as a means of providing behavioral control [65]; or unrestricted solution spaces to provide the user with maximal decision-making control [65] can be derived and explained from an empowerment perspective. Although several studies have explored the impact of tools and technologies on effective problem solving [116, 117] or suitable means of saving time and money [37, 115], their impact on individuals' perceived empowerment has been rather neglected. The findings of this research suggest active consideration of the empowerment potential when designing virtual co-creation tools in the future.

This large-scale empirical study demonstrates that co-creation activities on the Internet contribute to perceived consumer empowerment; that is, consumers' perceived influence on product design and decision making. The results confirm Firat and Venkatesh's [42] statement that virtual, digital simulations create the possibility of reempowering consumers. Internet tools empower consumers not only to observe a reality but to create a new one by themselves [77]. In the case of co-creation, the Internet helps consumers to come up with their own innovations. In this sense, virtual co-creation serves as a "technology of self" [44].

The empowerment felt by consumers depends on the design of the virtual interaction tool, participants' product involvement, and enjoyment of the virtual interaction. Co-creation tools enabling consumers to solve an assigned task, such as to generate innovative product concepts, to a large extent determine their perceived empowerment and the enjoyment they experience. Confirming Bloch's [25] conclusion that product enthusiasts seem to have a stronger need for mastery, consumers involved in the assigned task and in the product category that the co-creation project is dealing with feel even more supported by co-creation tools and have stronger feelings of empowerment. These findings are in line with Deci and Ryan's [39] point that intrinsic interest supports an enjoyable experience.

Confirming Conger and Kanungo's [33] remark that empowerment is related to personal characteristics, the relationship between product involvement and perceived empowerment differs between more creative and less creative consumers. For creative consumers, product involvement has a significant effect on perceived empowerment. Such consumers tend to perceive their participation as more active and their input as more significant. For less creative consumers, the impact of product involvement

becomes insignificant. It seems to be less important for less creative people to contribute to NPD and to feel empowered, even if they are highly involved with a product category.

Consumers engaging in virtual co-creation projects will rarely be able to determine the final design of a product. Most often, suggestions of only a rather small number of consumers can be considered for mass-produced goods [47]. Hence, consumers' effective power and influence on decision making seems to be low. However, as shown in Bucy and Gregson's [27] study on media participation and mass democracy, actual power and influence on decision making may be irrelevant for individuals' perceived empowerment. These authors note that even if individuals' influence in policymaking is minimal, when participating in political discussions they really feel empowered. In analogy, consumer empowerment during co-creation results from the experience of participation, a derived sense of self-efficacy and enjoyment and not from the actual strength of influence on product policy [27]. Therefore, consumers' perceived empowerment during co-creation may be considered as symbolic and thought of as a ritualized and quasi-religious act [91]. However, as more and more consumers engage in co-creation activities, jointly innovate, and start producing and selling self-developed products, they may become increasingly powerful [86]. To make them feel empowered and enjoy co-creating new products together with companies may be of special importance in the future.

This study confirms Hayes's [55] report that empowerment creates positive perceptions. Perceived empowerment positively influences consumers' trust in the provider of the virtual co-creation task and enhances their intention to participate in future virtual NPD projects. Similar to employee empowerment [121], consumer empowerment creates and increases loyalty. Consumer empowerment may serve as a catalyst for creative outputs [3]. The impact of perceived empowerment on intentions for future participation in virtual NPD projects is higher for lead users than nonlead users. As they naturally engage in innovation activities, they are also interested in further innovation projects once they feel taken seriously and have the feeling of being actively involved. As co-creation is voluntary, even for lead users an enjoyable and rewarding experience seems to be particularly important. It is the consumers who decide if and with whom they want to interact and share their ideas and knowledge. In this sense, our results empirically support Prahalad and Ramaswamy's [101] accentuated argument for a rewarding and enjoyable experience during co-creation. The great importance of appropriate IT tools for providing such an experience points at reinforced research for developing new virtual consumer integration tools. For innovation managers intending to integrate consumers into their innovation process, virtual consumer co-creation based on powerful tool support may serve as more than a customer relationship management tool. As a rewarding and empowering activity, co-creation may present a new value proposition and become a marketable, consumable product [42].

Finally, the results of this study demonstrate the potentially important role of virtual interaction tools and technologies in consumer empowerment and empowerment in general. So far IT technologies and tools have been rarely discussed in the context of consumer, citizen, or employee empowerment literature. If such tools and technologies

were mentioned at all, the discussion remained at a rather abstract level. This study suggests focusing more research on the impact of IT tools and technologies on empowerment in different contexts. For example, equipping employees with enabling tools and technologies may serve as empowering strategy. As countless tools and technologies that have existed for many years have not been anywhere near as empowering as the Internet, it would be especially interesting to see which components make the Internet so empowering and what functionalities of Internet-based tools have the most impact on perceived empowerment.

Conclusion

THIS PAPER PRESENTS THE FIRST LARGE-SCALE EMPIRICAL STUDY demonstrating the way in which Internet-based tools and technologies contribute to consumers' perceived empowerment in virtual new product co-creation activities. The paper contributes to our knowledge concerning information and knowledge management as well as collaboration and communication. Virtual co-creation by customers means information sharing with multiple entities in a distributed innovation environment. Co-creation is based on cooperation of people with different IT capabilities. To effectively support virtual co-creation of customers with different IT-related capabilities, Internet tools must make customers experience increased self-determination and efficacy and make them enjoy their participation. Due to varying levels of involvement with the innovation task and the product category at hand as well as personal differences in creativity and lead-user characteristics, the experience of consumers confronted with a certain tool will be different. Therefore, IS managers should not only be aware of the importance of developing and selecting the appropriate IT tool but should also carefully select the consumers to be invited in co-creation projects.

As the present study covers diverse projects, the findings should be broadly applicable to current virtual co-creation projects in consumer markets. However, the study also comes up with many, so far unanswered, questions, such as: What other variables influence consumers' experienced empowerment? What is the effect of experienced empowerment on the creativity, quality, and quantity of consumers' contributions? Does the experienced empowerment create commitment and evoke consumers' interest in the new virtual product? These and further questions may be addressed by future research investigating virtual co-creation.

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