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Exploring Strategies for Capturing Customer's Tacit Knowledge in Customer Integration Methods

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ABSTRACT

In many instances, customers are seen as one of the key resources for new product development (NPD), as they often have deep product knowledge, either in the form of explcit or tacit knowledge. Firms' NPD departments are highly interested in internalizing these forms of customer knowledge with the help of customer integration methods, such as Ideas Competitions, Lead-User-Workshops etc. However, research analyzing how these methods enable transfer of customer's tacit knowledge – which can hardly be expressed – has been neglected. Thus, scholars are constantly calling for research that focuses on understanding the tacit knowledge transfer processes by means of customer integration methods. This research identifies a total of 15 methods with the help of a systematic literature review. By then systematically analyzing these methods, authors found that six of these methods make use of two major strategies to internalise customer's tacit knowledge: Story Telling-Strategy and Observing Customer Activities-Strategy. The rest of these methods do not allow for capturing customer's tacit knowledge at all. Based on these insights, authors derived valuable implications for NPD practice on how each of these methods can leverage tacit knowledge from customers more efficiently.

KEYWORDS

Co-Creation, Crowdsourcing for Innovation, Customer Integration, Knowledge Management, New Product Development, Open Innovation

INTRODUCTION

Faced with an increasingly dynamic environment primarily due to advancing competitiveness, new technologies as well as shorter product and innovation cycles, the success of a company is mainly determined by its innovative abilities (Dahan, Soukhoroukova, & Spann, 2010; Schreyögg & Sydow, 2010). Thus, the continuous development and market introduction of new products have a crucial impact on the economic success of an enterprise and its performance (Blundell, Griffith, & Van Reenen, 1999; Ernst, 2002). However, various empirical studies highlight the high failure rates of new products, especially in consumer markets (see e.g., Ayers, Gordon, & Schoenbachler, 2001; Cooper, Edgett, & Kleinschmidt, 2004; Crawford, 1987; Ernst, 2002). It is therefore obvious that management is highly interested in detecting ways that enable the development of successful innovations.

A review of old and recent literature reveals that the reduction of innovation failures and the improvement of the return on funds invested in new product development (NPD) are mainly determined by the capability of these innovations to meet customers' wants and needs (e.g., Coelho, Augusto, Coelho, & Sa, 2010; Davidson, 1976; Martin & Bush, 2003; Moore, 1982). In the course

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of time, it has been recognized that the creation of successful innovations requires the compounding of knowledge from various perspectives, including especially the knowledge of customers, as these are most suitable for revealing their wants and needs (Bergman, Jantunen, & Saksa, 2009; Joshi & Sharma, 2004; Leonard & Sensiper, 1998). Customer knowledge has become indispensable for developing innovative products (Sawhney, Prandelli, & Verona, 2003; Su, Chen, & Sha, 2006).

Füller et al. (2015), Enkel et al. (2005), Lau et al. (2010), and Sandmeier et al. (2010), amongst others, suggest that absorbing customer knowledge through customer integration into NPD strengthens a company's core competencies. In the context of customer integration, customers creatively contribute and cooperate within the different phases of the innovation process (Zwass, 2010) and thereby transfer their knowledge to the R&D professionals. Since 2003, this approach is often referred to as "Open Innovation" (Chesbrough, 2003), whereas nowadays this approach is also referred to as Crowdsourcing for Innovation (Afuah & Tucci, 2012).

Over the years, various methods and practices that allow engagement of customers in NPD have been developed in practice and discussed in literature (Bartl, Füller, Mühlbacher, & Ernst, 2012; J. Füller & Matzler, 2007; Lilien, Morrison, Searls, Sonnack, & von Hippel, 2002). Existing customer integration methods are all different in their nature; however, the central purpose of all methods is to attain knowledge from customers and internalize that knowledge into innovation development.

This knowledge provided by customers can – according to the knowledge management terminology – be distinguished between tacit knowledge and explicit knowledge. Tacit customer knowledge represents internalized knowledge that an individual may not be consciously aware of, such as the way he or she accomplishes particular tasks, and that is difficult to transfer to another person by means of writing it down or verbalizing it (Nonaka & von Krogh, 2009). In contrast, explicit customer knowledge represents knowledge that the individual holds consciously in mental focus, in a form that can easily be communicated to others (Nonaka & von Krogh, 2009). In the domain of innovation research, the first one is referred to as "sticky" information (von Hippel, 1994). "Stickiness" is defined by von Hippel (1994) as "the incremental expenditure required to transfer a unit [of information] from one place to another, in a form that can be accessed by the recipient. When this expenditure is low, information stickiness is low; when it is high, stickiness is high."

Despite intensive research on the different customer integration methods, there is a lack of literature that has analyzed these practices from a knowledge management perspective. In particular, an elicitation of the strategies of transferring sticky information, respectively tacit customer knowledge is still missing. This, however, is of highly relevance since customer typically have a highly valuable tacit knowledge and sticky information gained through regular product usage (Bretschneider, Leimeister, & Mathiassen, 2015; Magnusson & Kristensson, 2009).

Against this background, this research's underlying research question can be formulated as follows:

In which way do customer integration methods capture customers' tacit knowledge?

So the aim of this paper is two-folded: In a first step authors will identify and give an overview of the existing customer integration methods that come to use within NPD. Authors accomplish this by means of a systematic literature review. Second, the researches systematically analyze these methods with a view on how these methods enable transferring sticky information and tacit knowledge of customers. By doing so, authors contribute to literature by firstly revealing the knowledge transfer strategies of customer integration practices.

THEORETICAL BACKGROUND

Customer Knowledge

Customers can be involved in different activities within NPD. For instance, customers can assess and generate innovative product ideas, or they can be involved in the creation and evaluation of first concepts or prototypes. This approach is often referred to as 'interactive value creation' (Reichwald & Piller, 2009) or 'value co-creation' (Zwass, 2010) since manufacturers and consumers intensively interact and together create value or, more specifically, new products. Thus, within customer integration, not only information regarding customer wants and needs is generated, but customers also provide various solutions concerning different activities within the NPD process.

In this context, customers are seen as a key resource as they often have high product expertise as well as experience and creativity potential gained by regular product usage (Bretschneider, et al., 2015; Magnusson & Kristensson, 2009). In this vein, Öberg (2010) describes customers as initiators, as co-producers, and an inspiration for business development.

Starting from various economic theories, and especially the resource based theory (Barney, 1991, 2001), knowledge – in general – is regarded as a scarce and valuable resource for organizations. "It includes experience, values, insights and contextual information and helps in evaluation and incorporation of new experiences and creation of new knowledge" (Indira, Suganthi, & Samuel Anand, 2012). It is known that knowledge results from processed information that is, for instance, acquired by interactions with different entities such as customers (Wallace, 2007). Within the frame of manufacturer-customer-interactions, customers can provide knowledge that is crucial for the development of new products.

Customer knowledge involves both explicit and tacit knowledge. Tacit customer knowledge represents internalized knowledge that an individual may not be consciously aware of, such as how he or she accomplishes particular tasks (Nonaka & Tackeuchi, 1995). In contrast, explicit customer knowledge represents knowledge that the individual holds consciously in mental focus, in a form that can easily be communicated to others, which means it can be readily explained and documented (Nonaka & von Krogh, 2009). On the other hand, customer tacit knowledge is difficult to articulate (Nonaka & Tackeuchi, 1995). In the domain of innovation research, the latter one is referred to as "sticky" information (von Hippel, 1994). "Stickiness" is defined by von Hippel (1994) as "the incremental expenditure required to transfer a unit [of information] from one place to another, in a form that can be accessed by the recipient. When this expenditure is low, information stickiness is low; when it is high, stickiness is high."

Tacit Knowledge in New Product Development

Sustained improvements in R&D depend on the capacity of an organization to gain new knowledge, since new knowledge helps to avoid the repetition of mistakes (Jensen & Sandstad, 1998). In this vein, Thomke and Fujimoto (2000) recognized the importance of tacit knowledge in solving the inevitable problems that occur in NPD. Mascitelli (2000) emphasized as well that under the „surface of conscious thought lies a vast sea of tacit knowledge" that can provide ideas for breakthrough innovations (Mascitelli, 2000).

However, until now the concept of tacit knowledge transfer in NPD has not been much investigated (Saban, Lamosa, Lackman, & Peace, 2000). The underlying processes for creation and dissemination of tacit knowledge in NPD are not well understood (Reger & von Wichert, 1997). So far, the study by Goffin and Koners (2011) is the only one that looked at how R&D employees reveal their tacit knowledge in practice. Goffin and Koners (2011) found that employees in NPD divisions systematically transfer their tacit knowledge through the use of metaphors and stories they are encouraged to tell. Further, tacit knowledge transfer in NPD teams is happened through so-called post-project reviews (PPRs), which are recognized as a highly effective mechanism for transferring knowledge in NPD teams (Goffin & Koners, 2011).

However, research that looks at how customer's tacit knowledge is transferred in the scope of open innovation, respectively customer integration in NPD, has been neglected. That is why scholars are constantly calling for research that focuses on understanding the tacit knowledge transfer processes in customer-firm interactions (Goffin & Koners, 2011).

INTEGRATING CUSTOMERS INTO NPD: A SYSTEMATIC LITERATURE REVIEW

Authors' first research goal is to identify and give an overview of the existing customer integration methods that come to use within NPD. The researchers accomplish this by means of a systematic literature review.

Methodology

Due to its importance regarding the progression and the eventual success of enterprises, innovation is an intensively researched area (Gianiodis, Ellis, & Secchi, 2010). Since the involvement of customers in innovation processes has gained greater importance over the years, much research has been conducted concerning various customer involvement methods. In this context, especially within the research field of open innovation, customer integration methods have been thoroughly analyzed. Given these facts, a systematic and exhaustive literature analysis becomes more and more important (Webster & Watson, 2002). According to Torraco (2005), the design of the procedure of a literature review is to be intersubjectively verifiable in order to maintain the scientific value of the literature analysis (Berkovich, Leimeister, & Krcmar, 2011). Hence, in the following, authors explicitly show the procedure used to identify the relevant literature regarding customer integration methods following the approach of Webster and Watson (2002).

The researchers deployed a three-stage approach to identify an extensive set of academic studies upon which our review is based. First, authors conducted a search of key strings in the EBSCO, Business Source Premier, EconLit, JStor and Science Direct database, as well as in the Google Scholar search engine. Authors chose these databases because they allow access to a comprehensive set of scholarly publications, especially within the research fields of marketing and (IT-) management, where innovation management is located. Authors included the portal "Google Scholar" in our search since it covers a major part of the journals and electronic publications in business economics (Mayr, 2009; Neuhaus, Neuhaus, Asher, & Wrede, 2006). In the literature, the term "customer integration" is often used synonymously to the term "customer involvement." Due to the fact that customer involvement – in contrast to customer integration – is a highly comprehensive term, which therefore is seldom explicitly used as a keyword in abstracts, authors used two different search strings: First, the search string "customer involvement OR user involvement AND innovation" was used. Thus, authors narrowed the range by adding the keyword "innovation" since authors searched for studies within innovation research. Further on, authors performed another search using the string "customer integration OR user integration OR open innovation OR user innovation."

Drawing from the sample of articles from the first stage, subsequently, in the second stage, the researches enlarged the search by using forward and backward citation indices. Authors continued this procedure until identification of an exhaustive set of studies (Gianiodis, et al., 2010).

Apart from these areas, research articles and books also depict a relevant object of analysis, as they condense substantial research findings. Hence, using the mentioned key strings, in the third stage authors also searched on Google Books.

Subsequently, the researches applied two boundary criteria to identify the relevant literature. First, concerning the identified research articles, authors solely included papers published in peer-reviewed scholarly journals, since the terms customer involvement, customer integration, and especially open innovation, have gained major attraction in the popular press and other nonacademic print media (Gianiodis, et al., 2010). Authors then analyzed each paper and book, including only those which explicitly addressed methods involving customers in the NPD process.

Results: Existing Customer Integration Methods

In total, the researchers identified 105 literature sources upon which our analysis is based. Within these papers and book sections, a total of 15 customer integration methods were identified. Five of these methods (namely, Toolkits, Idea Communities, Idea Competitions, Lead User Workshops and Focus Groups) directly relate to the context of open innovation, whereas the other ten methods (namely, Surveys, Complaint Analysis, Boundary Spanner, Empathic Design, Concept Test, Product Clinic, Security Trading of Concepts, Quality Function Deployment, Listening In and Information Pump) have its origin in the domain of marketing and therefore are covered more extensively in the marketing literature. To obtain a better understanding of the subsequent analysis of the identified customer integration methods regarding their appropriateness to internalize customer knowledge, they are at first briefly described.

The (1) Survey is the most disseminated method used in practice as well as in (market) research to gather customers' opinion, respectively customer knowledge (Reichwald, Seifert, Walcher, & Piller, 2004). Within the scope of surveys used for NPD, customers are asked to respond to various questions regarding different product ideas or product features. Here, interviews can be carried out personally, telephonically or by mail (Hemetsberger & Füller, 2009). Ordinarily, surveys are standardized due to the fact that managers try to capture an overall or average view of customer knowledge by interviewing numerous customers.

A less standardized method is the (2) Complaint Analysis, within which customers submit information according to their dissatisfaction with offered products. Contrary to surveys, the information transfer process is – in this context – initiated by the customers (Stauss & Seidel, 2005). The information received (e.g., by providing customers complaint boxes and hotlines or online complaint forums) is collected and then systematically analyzed by the company. Companies use this method predominantly to identify critical defects or quality problems of existing products in order to avoid similar flaws in the new products. Besides complaints, customers can also provide wishes, suggestions or improvement ideas regarding existing products (Berry & Parasuraman, 1991; Brockhoff, 2003).

Relevant customer information can also be gathered by direct customer contact as it is done within the (3) Boundary Spanner approach. According to this approach, field workers (i.e., sales and aftersales service employees) gather relevant customer information in the course of their discussions and negotiations with clients. They, for instance, record important consumer habits or suggestions for product improvement made by customers. The information acquired is then forwarded to the R&D department and systematically analyzed by R&D managers. Reid and De Brentani (2004), as well as Johlke et al. (2002), found that this method is appropriate for gathering information that is essential for innovation development.

In addition to these methods, in customer research the observation of customers is also a common approach. In this context, two methods are applied within NPD: Empathic Design and Product Clinic. The aim of these methods is to observe noticeable issues, behaviors and characteristics of customers while they try out a prototype of the new product, which is being developed. From these findings, specific customer needs and requirements are derived for product development. In the scope of the (4) Empathic Design method, customers are observed while using prototypes in a natural environment (Evans, Burns, & Barrett, 2002; Leonard & Rayport, 1997). As opposed to this, within the method of (5) Product Clinic, customers deal with specific products in a laboratory setting while they are observed (Wildemann, 1999). Subsequently, the participating customers are asked about their experience with the provided product. This monitoring method is applied particularly in the automotive industry (Schuh, 1991).

(6) Concept Testing is another method which is widely used in practice. Here, prototypes, design drafts and first concepts are presented to selected customers, who - in turn - evaluate the presented objects; mostly by means of standardized questionnaires (Moore, 1982). However, the customers are not observed while dealing with the prototypes or concepts. Concept Testing is typically used within software development, where selected user groups are provided a beta-version of a software product

for testing purposes (Leimeister, Böhmann, & Krcmar, 2005; Prahalad & Ramaswamy, 2000). In recent times, concept testing is increasingly performed online. Dahan and Hauser (2002), as well as Dahan and Srinivasan (2000), refer to it as 'virtual concept testing,' where prototypes are displayed and evaluated by customers on an Internet platform. For instance, Volvo presented various concept cars on an online platform as possible future automobiles, and visitors had the possibility to give their feedback after virtual presentations and test simulations via standardized questionnaires (Füller, Bartl, Ernst, & Mühlbacher, 2006).

Security Trading of Concepts, Information Pump and Listening In represent similar methods which, however, are always related with a specific game concept. Within the method of (7) Security Trading of Concepts, prototypes or concepts are traded as 'securities' in an exchange-like business situation. Here, participants (i.e., consumers) enter a concept market and initially receive a portfolio of cash (either virtual or real) and virtual stocks (i.e., products). Subsequently, the virtual market is opened for a specific time interval in which the participants are asked to maximize the value of his or her portfolio by trading with other participants (Dahan, Kim, Lo, Poggio, & Chan, 2008). The data collected within this time period is afterwards analyzed by the company. The higher the price of a product concept, the better is its chances to succeed in the market (Hemetsberger & Füller, 2009). In this way, customers' preferences can indirectly be ascertained since they indirectly express their preferences over new product concepts by trading virtual securities. (8) Information Pump is a method, within which customers are also encouraged by playful means to state their opinions and preferences regarding a product concept which is shown virtually (Prelec, 2001). In this context, participants can take on two different roles – i.e., 'declarer' or 'detective.' A declarer sees the actual prototype and makes either true or false statements about its characteristics, whereas the detective (who is not able to see the prototype) hast to determine the correctness of the statements. The main goal of this method is to gather many unconventional ideas regarding a specific concept. These ideas can in turn be used within NPD (Hemetsberger & Füller, 2009). Within the scope of the (9) Listening In method, a virtual configurator proposes customers several concepts, which are graphically illustrated and simultaneously valuated by the customers (Dahan & Hauser, 2001). Based on the valuation, the configurator develops new concepts, which are valuated again in a second round. This procedure continues for several steps. In this way, concept specifications that best reflect customer desires are captured.

In contrast to these relatively new methods, the (10) Quality Function Deployment is a rather classical, though wide-spread method for product development which was originally conceptualized in 1966 by Yoji Akao. Within this concept, it is assumed that the company already has an innovative idea and that the evolutionary development of that idea will be oriented on customer needs (Daetz, Norman, & Barnard, 1995; Huovila & Serean, 1998; Kaulio, 1998). In other words, customer needs are the basis for the further development. In the first step, customers are asked about their needs and requirements regarding the underlying innovation idea and must provide appropriate judgments with the help of a standardized questionnaire regarding any possible peculiarity of the idea, respectively regarding the product, which will result out of that innovation idea. The contribution of the different characteristics to the overall rating is determined by means of a conjoint analysis. Subsequently, the determined customer requirements are transferred in technical specifications. As a result, the use of QFD, which is based on very detailed customer requirements, provides qualified insights on the customer-oriented design of a product (Urban & Hauser, 1993).

The (11) Lead User approach is a well-established method that, in its modern form, aims to systematically identify innovative, highly advanced customers or users – so-called 'lead users' – and to integrate them in NPD by organizing workshops within the company (Eisenberg, 2011; von Hippel, 1986). Von Hippel (1988) was the first scholar who developed a concept for the deployment of the Lead User method; this concept has, however, been further refined and specified by other scholars throughout the years – e.g., by Herstatt and von Hippel (1992), Lilien et al. (2002), Lüthje et al. (2004) and Morrison et al. (2001). In the scope of such workshops, lead users generate ideas together with company staff and elaborate these into final concepts (Urban & von Hippel, 1988). Reichwald

and Piller (2009) outline four phases of the Lead User method used for a concrete NPD project: In the first step, the Lead User project is initiated by determining the project goals, the target market as well as the internal staff that conducts the project. Subsequently, a trend analysis is accomplished by means desk research, expert interviews and scenario analyses in order to identify potential future markets. The third step includes the identification of lead users by using different techniques such as pyramiding or screening. The identification of Lead Users is regarded as the most critical aspect since individuals with lead user characteristics are extremely rare (von Hippel, Franke, & Prügl, 2009). Finally, in the fourth step, the identified lead users are invited for a workshop where they discuss and develop ideas and concepts for new products.

The (12) Focus Group method is quite similar to the lead user approach. However, the difference lies in the target group which is integrated in the NPD process: Within the focus group approach, 'ordinary' customers – instead of lead users – are assembled in innovation workshops (Bristol & Fern, 1996; Dahan & Hauser, 2002). Hence, defining participants for the Focus Group workshops is regarded to be less time and work intensive. However, the participants are to be representatives for the particular target group of the new product. Further, Focus Groups consist of six to twelve customers who, most often, have an open discussion – rather than a strictly planned workshop – regarding the development of new products (Lüthje, 2003).

Ideas Competitions and Ideas Communities are two customer integration methods that are primary used to generate innovative ideas in the first stages of the NPD process. According to Leimeister et al. (2009), an (13) Ideas Competition for innovation development can be described as an invitation of a company to its customers to submit contributions to a certain topic within a predefined period of time. The submitted ideas are evaluated by a review committee, which also selects the winners of the campaign. The competitive character of an Ideas Competition motivates customers to produce a winning idea that is innovative and possibly even unique (Ebner, Leimeister, & Krcmar, 2009; Haller, Bullinger, & Möslein, 2011). Within the last years, Ideas Competitions have become very popular in academic research and business practice. Prominent examples of successful Ideas Competitions for NPD are "Innovation Jam" by IBM (Bjelland & Wood, 2008), "Emotionalize your Light" by OSRAM (Hutter, Hautz, Füller, Mueller, & Matzler, 2011), Microsoft's "Imagine Cup" (Ebner, Leimeister, Bretschneider, & Krcmar, 2008), or various Ideas Competitions on BMW's "Customer Innovation Lab" (J. Füller, et al., 2006). In their initial form, Ideas Competitions were run offline, with contributions submitted by postal mail. Nowadays, however, most Ideas Competitions are partly or even fully Internet-based (Adamczyk, Bullinger, & Möslein, 2011; A.C. Bullinger & Möslein, 2010; Hallerstede & Bullinger, 2010). In this context, the participants are provided an Internet-platform, on which they are able to submit their innovation ideas and also discuss their ideas or evaluate other participants' contributions after submission deadline. By running Internet-based Ideas Competitions, organizers are able to attain a large base of participants and lower their expenditures as well as the effort of contributors at the same time (Bullinger, Neyer, Rass, & Möslein, 2010; Leimeister, et al., 2009; Piller & Walcher, 2006). Hence, Ideas Competitions are predominantly used to broaden the number of innovative and qualitative ideas, which can be used for NPD.

The same applies to (14) Ideas Community, which are also referred to as 'Virtual Communities for Innovation' (Bretschneider, et al., 2015; Bretschneider, Rajagopalan, & Leimeister, 2012). Here, customers generate ideas and collaborate with other customers within an Internet-platform. Customers have the opportunity to submit ideas, to connect with idea contributors that submitted similar or complementary ideas and to elaborate ideas in collaboration with other members (Bretschneider, et al., 2015). Consequently, within Ideas Communities various networks are formed that collaboratively elaborate matured innovation ideas, which are more qualitative compared to those initially submitted. As a result of the usage of this method, companies will generate a rich content of viable and innovative ideas for NPD (Bretschneider, et al., 2015; West & Lakhani, 2008). Prominent examples of Ideas Communities outlined in the literature are Dell's 'IdeaStorm' and Starbucks' 'MyStarbucksIdea,' both comprising far more than 10,000 user-generated ideas (Di Gangi & Wasko, 2009; Riedl, Blohm, Leimeister, & Krcmar, 2010).

Different from the hitherto described customer integration methods, (15) Toolkits for User Innovation are mainly used for conceptualizing new products. This method proposes that customers autonomously innovate by using a special instrument – i.e., the 'toolkit' (von Hippel & Katz, 2002). These tools enable customers to create designs of new product innovations or product variations according to their individual needs and preferences. The toolkit is usually an internet platform or a software application that is provided by the manufacturer (Jeppesen, 2005). However, the provided toolkit can also include various raw materials or ingredients that are needed to construct a corresponding product (Franke & Piller, 2004; von Hippel & Katz, 2002). Eventually, the resulting concepts are used by the company as a basis for further product development.

Table 1 summarizes the identified customer integration methods.

ANALYSING CUSTOMER INTEGRATION PRACTICES FROM A KNOWLEDGE MANAGEMENT PERSPECTIVE: STRATEGIES FOR TRANSFERRING CUSTOMER'S TACIT KNOWLEDGE

A major goal of this study is to determine the identified customer integration methods' process of internalizing customer's tacit knowledge, respectively customer's sticky information. Hence, based on a thorough examination of the findings obtained from the systematic literature search, the identified customer integration methods are analyzed regarding how they enable internalizing these information types in NPD.

Table 1. Results of the literature review

Customer Integration Method	Origin	Main Reference
Surveys	Marketing, Product Design	For an overview see: Hemetsberger and Füller, 2009; Reichwald et al., 2004
Complaint Analysis,		Berry and Parasuraman, 1991; Brockhoff, 2003; Stauss; and Seidel, 2005
Boundary Spanner		Johlke et al., 2002; Reid and De Brentani, 2004
Empathic Design		Evans et al., 2002; Leonard and Rayport, 1997
Product Clinic		Schuh, 1991; Wildemann, 1999
Concept Test		Moore, 1982; Prahalad and Ramaswamy, 2000
Security Trading of Concepts		Dahan et al., 2008
Information Pump		Prelec, 2001
Listening In		Dahan and Hauser, 2001
Quality Function Deployment		Daetz et al., 1995; Huovila and Serean, 1998; Kaulio, 1998
Lead User Workshop	Open Innovation	Herstatt and von Hippel, 1992; Lilien et al., 2002; Lüthje et al., 2004; Morrison et al., 2001
Focus Group		Bristol and Fern, 1996
Ideas Competition		Adamczyk, 2011; Haller et al., 2011; Leimeister et al., 2009; Piller and Walcher, 2006
Ideas Community		Bretschneider et al., 2015; Di Gangi and Wasko, 2009
Toolkits for User Innovation		Franke and Piller, 2004; von Hippel and Katz, 2002

Observing Customer Actions

One way of detecting sticky information is offering the opportunity to 'experience' a solution (J. Füller & Matzler, 2007). This can be realized by providing tools or methods with which customers can 'try' a product concept, or even create concepts or prototypes by themselves. These tools can be IT-based, e.g., programs for product configurations, or they might consist of real modules with which various product concepts can be designed or tested (Franke & Piller, 2004). These tools and methods enable customer to experience their tacit knowledge. It is then transferred to the firm by "showing" it instead of communicating it. This means that employees of the firm observe these customers while experiencing their tacit knowledge.

These two aspects are particularly evident in the scope of three methods authors identified in our literature review; namely empathic design, product clinic and toolkits for user innovations. Here, by enabling customers to experience concepts or prototypes while testing them, customers' latent needs can be discovered. In the scope of these methods, customers are able to run trial-and-error cycles since they have the opportunity to contribute suggestions as well as to alter their solutions or prototypes after having had a critical look at them. By self-designing and simultaneously experiencing concepts and its features, customers are able to realistically assess whether the new product idea fulfills their latent needs (Franke & Piller, 2004; Jeppesen, 2005). While designing, customers usually run several iterations until they finalize their individual concept, which reflects their wants and needs. Hence, by letting customers actively experience new ideas or prototypes sticky information can be fully accessed by observing customers' activities.

In the field of knowledge management this strategy is called the personalization strategy (Smith, 2004). This strategy aims at encouraging individuals to share their tacit knowledge directly by acting in the sense of "learning by doing" (Biard, Deacon, & Holland, 1999). A tool enabling to implement this strategy is the so-called "after-action-review" (AAR). An AAR is a simple process where an individual with inherent tacit knowledge is observed while performing for example a task (Biard, et al., 1999). The observer captures the main activities manifesting in the tacit knowledge.

Accordingly, one can say that customer integration methods such as empathic design, product clinic and toolkits for user innovations are highly appropriate for transferring customer's tacit knowledge. The researches refer to this strategy as the "Observing Customer Actions"-strategy.

Story Telling

Other customer integration methods fall back on the principle of "story telling" in order to gain tacit knowledge, respectively sticky information from customers. The story telling mechanism is also a strategy used in the field of knowledge management to reveal tacit knowledge.

Especially Lead User Workshops and Focus Groups base on the principle of letting customers tell their experiences in the form of anecdotal stories; however, also within the practise of Boundary Spanner custermers are asked to tell their experiences in the form of stories and metaphors. In general, stories mirror human thoughts as humans think in narrative structures and most often remember facts in a story form. These facts - i.e., sticky information in our case - can be understood as smaller versions of a larger story, thus storytelling can supplement analytical thinking. Because storytelling requires auditory and visual senses from listeners, one can learn to organize their mental representation of a story, to recognize the structure of language, and express his or her thoughts. Based on this mechanism, storytelling in particular in Lead User Workshops and Focus Groups are effective tools because listeners become engaged and therefore recognize the inherent sticky information.

Storytelling in the mentioned customer integration practices can be seen as a foundation for transferring tacit knowledge. While the story listener is engaged, he is able to imagine new perspectives, inviting a transformative and empathetic experience. This involves allowing the firm representatives to actively engage in the story as well as observe, listen and participate and by doing so to understand customer's sticky information. So, listening to a customer can foster a shared understanding and promote innovative problem solving by means of these methods. The listener can then activate

knowledge and imagine new possibilities. Together customers and listener can seek best practices and invent new solutions.

Accordingly, one can say the methods discussed in this section are also appropriate for transferring customer's tacit knowledge. Authors refer to this as the "Story Telling"-strategy.

Codification

In the domain of knowledge management one strategy involves actively managing knowledge (push strategy) (Gupta/Sharma 2004). In such an instance, individuals strive to explicitly encode their knowledge into a shared knowledge repository, such as a database (Gupta/Sharma 2004). This is commonly known as the Codification approach to knowledge management (Gupta/Sharma 2004).

This codification approach can be recognized in the customer integration methods Ideas Competition and Ideas Community. In both forms of customer integration, customers are called to submit ideas via a so-called Web-based Ideation Platform (WBIP), which allows customers to upload an idea in a written form with the help of an Internet-based input box. All submitted ideas are collected and visualized in an adequate way to make all ideas visible to other customers.

However, as already mentioned, with regarding the tacit knowledge, people are not often aware of the knowledge they possess or how it can be valuable to others. That is why this kind of knowledge is difficult to transfer to another person by means of writing it down (Goffin & Koners, 2011). Because of this, Ideas Competitions as well as Ideas Communities, respectively the Codification approach are less appropriate to transfer customer's tacit knowledge.

Methods Allowing No Transfer of Tacit Knowledge

Our analysis shows that the methods Survey, Concept Testing, Security Trading of Concepts, Information Pump as well as Listening In and Quality Function Deployment are rather less appropriate to attain customers' tacit knowledge. As for Surveys, Concept Testing and Quality Function Deployment the only interaction between customers and R&D employees consists of letting customer complete standardized questionnaires. Within these methods, customers are not able to actively express information regarding their needs, wants or expectations in any way. Hence, the possibility of acquiring tacit knowledge is low. Further, due to their inherent gamification character, Trading of Concepts, Information Pump and Listening-In, do not allow observing customers or letting customers tell stories. They are regarded essential for acquiring customers' preferences with respect to specific products or product specifications, but they do not grant access to customers' tacit knowledge.

Main Results and Discussion

Our analysis reveals that some of the identified customer integration methods are able to reveal customer's tacit knowledge, respectively sticky information with the help of two strategies: Observing Customer Action and Story Telling. Both strategies enable transfer of customer tacit knowledge due to the fact that they allow an extensive personal contact and interaction between customers and employees of a firm. Tacit knowledge can only be revealed through practice or story telling in a particular context and a particular social environment. To some extent it is "captured" when the knowledge holder joins this context and environment. This reflects exactly what knowledge management taught us: Tacit knowledge can only be revealed through practice in a particular context and transmitted through social networks (Schmidt & Hunter, 1993).

In contrast, the Codification practice, pursued by Ideas Competitions and Ideas Communities, is not suitable for transferring customer's tacit knowledge, since it cannot be adequate articulated by written means. As knowledge management taught us, effective transfer of tacit knowledge generally requires extensive personal contact and regular interaction (Goffin & Koners, 2011), an environment, which per se is not given in the virtual context of Ideas Competitions and Ideas Communities. Customer knowledge, transferred in the scope of Ideas Competitions and Ideas Communities, is the so-called explicit knowledge that can be aggregated at a single location, stored in objective forms

and appropriated without the participation of the knowing subject (Polanyi, 1958). Tacit knowledge in contrast, is personal contextual. It is distributive, and cannot easily be aggregated (Polanyi, 1958). The realization of its full potential requires the close involvement and cooperation of the knowing subject (Polanyi, 1958).

The results of our analysis reflect exactly what Goffin and Koners (2011) found about tacit knowledge transfer in internal new product development (NPD) teams in large companies: They found that employees in NPD divisions systematically transfer their tacit knowledge through the use of metaphors and stories they are encouraged to tell. Further, tacit knowledge transfer in NPD teams in large companies is performed through so-called post-project reviews (PPRs). In their study, PPRs are recognized as a highly effective mechanism for transferring knowledge in NPD teams (Goffin & Koners, 2011). Both, metaphors and stories on the one side and PPRs on the other side, reflect exactly those strategies, namely Observing Customer Action and Story Telling, through which transfer customer's tacit knowledge is best enabled in customer integration methods.

Table 2 summarizes the results of the analysis.

MANAGERIAL IMPLICATIONS

Based on the current research, the authors derived recommendations on how managers can improve the process of transferring customer's tacit knowledge within customer integration into NPD.

Implications for Methods using Codification: Managers who are responsible for running Ideas Competitions or Ideas Communities may encourage customers not only to submit ideas in written form, but also in the form of a short video. This would allow customers not only to verbalize, but also to showcase their ideas, which in turn would allow Ideas Competitions and Ideas Communities to exploit the benefits of the "Observing Customer Action" strategy. This – in turn – should be supported by corresponding functions on the IT-based platform.

Implications for Methods using the Story Telling-Strategy: As previously mentioned, when applying the Quality Function Deployment method, customers are asked about their needs and requirements regarding an underlying innovation idea in that way that they must provide appropriate judgments with the help of a standardized questionnaire. Instead of a standardized questionnaire, R&D employees may choose an interview to research customer's needs and requirements, since this would allow for a more personalized interaction with the customer. This would enable customers to tell their experiences and thereby express their tacit knowledge in the form of anecdotal stories and metaphors; thus, enabling listeners to become more engaged and recognize the inherent tacit knowledge. The same applies for Concept Testing, where prototypes, design drafts and first concepts are presented to selected customers, who in turn evaluate the presented objects by means of standardized questionnaires (Moore, 1982). Again, instead of using standardized questionnaires, R&D employees may choose an interview, which would allow for better transferring customer's tacit knowledge.

Implications for Methods using the Observing Customer Activities-Strategy: Methods using the Observing Customer Activity strategy are nearly perfect in transferring customer's tacit knowledge. However, there is even room for improving these methods. For example, developing IT applications that support the existing methods might be a possible approach. For instance, modern virtual toolkits (e.g., 3D simulation tools) empower customers to experience innovations long before their design has been finalized, thus enabling a more effective acquisition of tacit information (J. Füller & Matzler, 2007). Furthermore, combining the use of different methods or only specific aspects of various methods might be another possible approach. For instance, Piller and Walcher (2006) introduced so called internet-based toolkits for idea competitions, where the toolkit approach is combined with Ideas Competitions. This might be a promising approach towards a more effective acquisition of customers' tacit knowledge.

Table 2. Strategies for transferring customer tacit knowledge

Transfer of Tacit Knowledge	Customer Integration Method
Observing Customer Actions-Strategy	Empathic Design
	Product Clinic
	Toolkits for User Innovation
Story Telling-Strategy	Boundary Spanner
	Lead User Workshop
	Focus Group
No Transfer of Tacit Knowledge	Ideas Competition
	Ideas Community
	Quality Function Deployment
	Surveys
	Concept Test
	Security Trading of Concepts
	Information Pump
	Listening In
	Complaint Analysis

CONCLUSION AND CONTRIBUTION TO THE BODY OF KNOWLEDGE

The underlying study, which is based on a systematic and in-depth literature review, analyzed 15 methods, which enable customer integration in NPD, according how they enable transfer of customer's tacit knowledge and sticky information to the NPD professionals.

In a first instance, this research contributes to the body of knowledge on tacit knowledge in NPD, in particular on the role of tacit knowledge in open innovation activities. As outlined, tacit knowledge is fundamental to new product development. However, up to now, researchers know far too little about the way in which NPD professionals detect customer's tacit knowledge and sticky information. This research produced novel insights by indicating two main strategies, namely Observing Customer Activities- and Story Telling-strategies.

As for the contribution to the body of knowledge on open innovation, this research has generated a comprehensive list of 15 methods with which customer knowledge can be attained within NPD. Hence, our research contributes to open innovation research by collating insights from different research disciplines (e.g., marketing, software engineering, engineering design, innovation management) and harnessing that knowledge for open innovation. The various methods identified within the literature review have been used for various purposes and in different settings, whereas within open innovation usually only four customer integration methods have been discussed – i.e., Toolkits for Innovation, Lead User Workshops, Idea Competitions, and Innovation Communities. Thus, this study enriches the field of open innovation by revealing customer interaction methods which allow customers to be involved in innovation development.

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