Woojung Chang & Steven A. Taylor

The Effectiveness of Customer Participation in New Product Development: A Meta-Analysis

Although the returns of customer participation on new product development (NPD) performance can vary substantially, the current literature lacks a systematic conceptual and empirical integration showing when customer participation is valuable in enhancing NPD performance. Building on knowledge management theory, the authors present a conceptual framework that synthesizes a variety of contingency factors. A meta-analysis empirically examines the moderating effects of contextual factors between customer participation and NPD performance. The analysis reveals that involving customers in the ideation and launch stages of NPD improves new product financial performance directly as well as indirectly through acceleration of time to market, whereas customer participation in the development phase slows down time to market, deteriorating new product financial performance. Furthermore, the benefits of customer participation on NPD performance are greater in technologically turbulent NPD projects, in emerging countries, in low-tech industries, for business customers, and for small firms. The authors discuss several theoretical and managerial implications about when to engage customers in the innovation process.

Keywords: customer participation, new product development, new product development performance, knowledge management, meta-analysis

Online Supplement: http://dx.doi.org/10.1509/jm.14.0057

The notion that firms can improve their innovation performance by tapping into customers' knowledge around needs and solutions has led firms to increasingly involve customers at various phases of new product development (NPD; Fang 2008; Gruner and Homburg 2000). In the ideation stage (e.g., idea generation, concept testing), firms engage customers to obtain their needs-related knowledge, evaluate the potential of new product ideas, and refine and often select promising ideas for further consideration (e.g., LEGO Ideas). In the product development stage (e.g., product design and engineering), customers can provide solution-related knowledge such as technical advice or design skills (e.g., Threadless.com). In the launch stage (e.g., prototype testing and market launch), customers are frequently invited to test prototypes in a real-use setting (e.g., Nokia's beta-testing community) and to help launch new products.

Some firms benefit from engaging customers in NPD. Muji, a Japanese consumer goods brand, reported that the three-year aggregate sales of products from users' ideas were five times higher than the sales of products built from professional designers' ideas (Nishikawa, Schreier, and Ogawa 2013). Yet customer participation sometimes leads to inefficient NPD processes and poor NPD performance. For example, in 2006 Netflix invited customers to design a new algorithm to improve the accuracy of its DVD movie recommendation engine. It took three years for Netflix to develop a new algorithm with customers, and even then it could not be implemented, because customer preferences had shifted from mailed DVDs to video streaming (Lakhani et al. 2014).

Indeed, many firms have found it difficult to leverage customer participation toward NPD success. One reason for this is that customers can sometimes be limited sources of innovation because of their lack of valuable creative ideas (Christensen 1997; Christensen and Bower 1996) or inability to clearly articulate their latent needs (Franke, Keinz, and Steger 2009). It can also be difficult for firms to manage customer participation because of their diminished managerial discretion (Boyd, Chandy, and Cunha 2010) and the increased complexity that comes of reconciling firms' objectives and customers' interests (Hoyer et al. 2010). However, a dearth of knowledge about the various factors that affect the impact of customer participation on NPD performance precludes guidance about *when* customer participation either can viably improve NPD performance or should be avoided (Chatterji and Fabrizio 2014). These factors are the focus of this article.

Woojung Chang is Assistant Professor of Marketing, Department of Marketing, College of Business, Illinois State University (e-mail: wchang3@ilstu.edu). Steven A. Taylor is Professor of Marketing, Department of Marketing, College of Business, Illinois State University (e-mail: staylor@ilstu.edu). The authors are grateful to the *JM* review team for their constructive comments. Robert Palmatier served as area editor for this article.

ISSN: 0022-2429 (print)
1547-7185 (electronic)

Journal of Marketing
Vol. 80 (January 2016), 47–64
DOI: 10.1509/jm.14.0057

To provide initial insights into when firms can utilize customer participation as a more effective strategy, we conceptually integrate a variety of factors that influence the effectiveness of customer participation in NPD and empirically examine the moderating effects of contextual factors between customer participation and NPD performance through a meta-analysis of 123 correlations from 39 independent samples. This study substantially contributes to the literature on customer participation in the innovation process. First, drawing on a knowledge management perspective, we provide a comprehensive conceptual synthesis of contingency factors in the customer participation–NPD performance link. From an extensive literature review, we identify four critical contingency factors—contextual factors, customer participation design factors, relationship factors, and organizational factors (see Theme 1 of the Web Appendix)—that can independently or jointly influence the effectiveness of customer participation. Aside from a few conceptual integrations about the drivers and outcomes of customer participation (e.g., Etgar 2008; Hoyer et al. 2010), there is a surprising lack of synthesis about contingency factors in the customer participation–NPD performance relationship. Thus, our conceptual integration advances a more complete understanding of customer participation by addressing the current lack of knowledge on the contingency factors.

Second, we describe the first systematic empirical synthesis, a meta-analysis of the contextual moderating factors[1] of NPD projects, industry, offerings, and country in the customer participation–NPD performance association. We find that customer participation improves NPD performance more in technologically turbulent NPD projects, in emerging countries, in low-tech industries, for business customers, and for small firms. Notably, and contrary to previous literature emphasizing the relevancy of customer participation in high-tech industries, the effect of customer participation on NPD performance is significantly lower in high-tech industries. In emerging countries and for business customers, the correlation between customer participation and new product financial performance is 81% and 65% higher than that found in developed countries and for consumers, respectively. These results offer guidance about the contexts in which firms should more actively engage customers for successful NPD.

Finally, we present evidence that in some situations, customer participation actually damages or generates nonsignificant impacts on NPD performance, which calls for a reassessment of the oft-dominant assumption that customer participation always leads to new product success. The findings of meta-analytic path analysis indicate that involving customers in the early ideation stage (total effect = .27, $p < .01$) or later launch stage (total effect = .20, $p < .01$) enhances new product financial performance directly as well as indirectly through acceleration of time to market, whereas customer participation in the development stage slows down time to market, which hurts new product financial performance (total effect = −.12, $p < .05$). The findings of scenario analyses also support the notion that involving customers in NPD may not always be an effective strategy by revealing that consumers, unlike business customers, do not facilitate speed to market; furthermore, engaging customers in emerging countries does not help develop an innovative new product. Overall, our conceptual and empirical integrations (1) highlight the idea that failing to examine contingency factors leads to an incomplete understanding of the effects of customer participation on NPD performance and (2) form valuable groundwork for further research in this domain.

[1]For this meta-analysis, we focused only on contextual factors among the four contingency factors in the customer participation–NPD performance link identified in Theme 1 of the Web Appendix because available studies in this domain are mainly related to contextual factors.

Conceptual Framework

Definitions of Customer Participation and NPD Performance

Customer participation refers to a customer's involvement in the firm's NPD process (Fang 2008). Customers have long been believed to be able to provide needs- and solution-related knowledge that the firm may lack internally (Nambisan 2002; Poetz and Schreier 2012). Whereas customers' needs-related knowledge refers to customers' input about their needs and preferences (i.e., "What is the problem?"), customers' solution-related knowledge refers to customers' input about potential ways to solve problems (Poetz and Schreier 2012). Thus, we view customer participation herein as the customer knowledge provision phenomenon whereby customers share their needs- and solution-related inputs in the firm's NPD process. We include open innovation with customers (Chesbrough 2003), innovation through the lead-user approach (Lilien et al. 2002), and crowdsourcing (Franke, Keinz, and Klausberger 2013) as customer participation because they also are characterized by integrating external knowledge from customers in the innovation process.

New product development performance refers to "the success of new product development efforts" (Troy, Hirunyawipada, and Paswan 2008, p. 136). This concept captures the performance of the NPD process and the new product and includes three aspects of success: operational, financial, and marketing performance. New product operational performance reflects how effectively and efficiently the new product is developed (e.g., new product innovativeness, speed to market), whereas new product financial performance describes how much economic return the new product realizes (e.g., sales and profits of the new product). New product marketing performance emphasizes marketing-oriented aspects such as satisfaction and loyalty within the customer–firm relationship. Because the three measures are interrelated, we expect similar patterns in the effects of customer participation on each. Thus, we test the effect of customer participation on NPD performance that combines all aspects of NPD success and further examine the possible effects of differences across the aspects of NPD performance as study-specific moderators.

Customer Participation in the Firm's Knowledge Management Process

Figure 1 presents our conceptual framework, which emphasizes contextual factors that affect the efficacy of customer participation in NPD. The framework is based on the notion that three factors shape the efficacy of the firm's knowledge management process involving customer participation: (1) the potential value of customer knowledge, (2) the difficulty (i.e., stickiness) of knowledge management, and (3) the characteristics of actors in the knowledge management process. These factors rely on contexts (i.e., NPD project, industry, offering, and country); thus, the returns from involving customers can differ across contexts (Bogers, Afuah, and Bastian 2010). Specifically, the effect of customer participation on NPD performance can be enlarged in contexts in which (1) the firm, as knowledge seeker, acquires valuable knowledge from customers, as knowledge providers (Mahr, Lievens, and Blazevic 2014); (2) the difficulty of transferring, integrating, and applying knowledge from customers in the firm's NPD process diminishes (Szulanski 1996; Von Hippel 1994); and (3) the motivation and abilities of actors (i.e., customers and the firm) related to knowledge exchange and integration are maximized (Szulanski 1996).

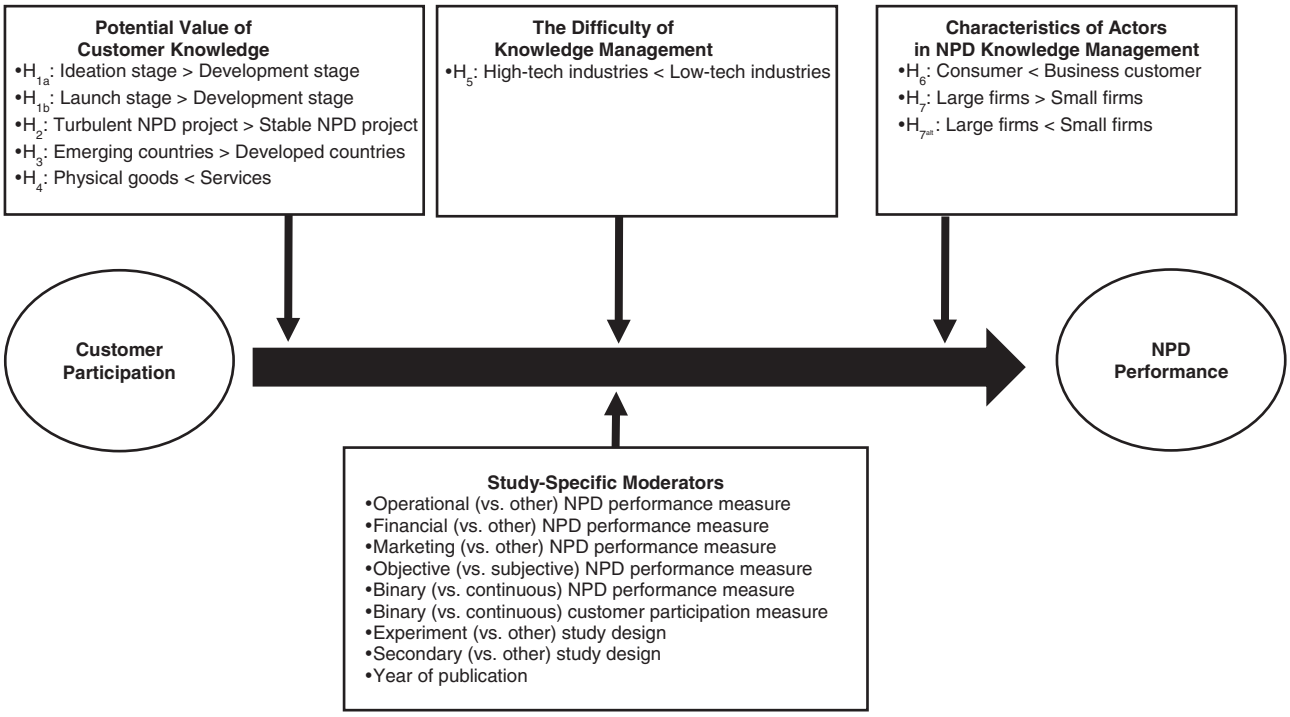
Hypothesis Development

Potential Value of Customer Knowledge

Stage of NPD process. The differences in necessary tasks and skills at each NPD phase may make customer participation more valuable in one phase than in others (Gruner and Homburg 2000). In the early ideation stage, customers provide a variety of needs-related input, comment on other customers' new product ideas, and often participate in selecting promising ideas for further consideration. It is well-established that such needs-related inputs from customers can reduce the risk of new product failure by increasing the product-market fit (Carbonell, Rodríguez-Escudero, and Pujari 2009). Engaging customers in this phase also helps the firm avoid wasting resources on low-value NPD projects that customers do not actually perceive as unique selling propositions (Ernst, Hoyer, and Rübsaamen 2010). Research has also recognized customers' diverse perspectives and wealth of information as critical ingredients in the early ideation phase (Troy, Szymanski, and Varadarajan 2001), despite the complexity inherent in a wide range of diverse ideas (Arnold, Fang, and Palmatier 2011).

In the product development stage, customers can offer useful solution-related knowledge in designing and engineering actual products (Coviello and Joseph 2012). Yet extant literature has implied that the value of customer input in this stage may be less than in other stages because of the inherent nature of the development work and development personnel's reluctance to accept customer input (Katz and Allen 1985; Un and Asakawa 2015). All tasks and knowledge in this stage are highly interdependent and contextual, such that changing one component of new products on the basis of customers' solution-related input may accidentally affect other functions negatively or may not be appropriate in the firm's current production situation (Un and Asakawa 2015).

FIGURE 1
Conceptual Framework of Current Meta-Analysis



Moreover, concerns about (1) the spillover of the firm's intellectual property (e.g., technical and engineering know-how) to customers and (2) research-and-development personnel's deep-rooted "not-invented-here" syndrome (Katz and Allen 1985), which shuns solutions from external sources, are often intensified in the development phase (Enkel, Kausch, and Gassmann 2005). The firm's engineers may try to protect their conventional leading role in innovation by being reluctant both to acquire customer input and to allow customers to take charge of the codevelopment process (Hoyer et al. 2010). Thus, even valuable customer knowledge in the development phase may be less likely to be acquired and leveraged in such a way as to maximize its value for successful NPD.

Finally, in the late launch stage, which includes activities such as prototype testing, market testing, and market launch, customers provide their firsthand feedback on product usability, product performance, potential problems specific to the prototype, and the positioning and marketing mix of the new product. These customers' reactions help the firm in making the new product error free, positioning the product better, and coming up with appropriate marketing-mix tactics (Henard and Szymanski 2001). With a specific prototype, customers are better able to provide detailed and precise solution-related inputs regarding problems in usage situations and marketing mix of the new product (Gruner and Homburg 2000). Gruner and Homburg's (2000) empirical finding and Brockhoff's (2003) claim also support the notion that the level of customer contributions in NPD follows a U-shape from ideation to development and launch stages. Taken together, we posit,

H_1: The relationship between customer participation and NPD performance is weaker in the development stage than (a) in the ideation stage and (b) in the launch stage.

Degree of technological turbulence of NPD project. Technological turbulence[2] of an NPD project refers to the rate and uncertainty of technological change in the NPD project (Souder, Sherman, and Davies-Cooper 1998). This is an NPD project–specific variable, and it can vary among different projects even in the same industry (Souder, Sherman, and Davies-Cooper 1998). First, rapid change in technologies in a turbulent NPD project can quickly render the firm's existing technologies less useful (Danneels and Sethi 2011). It can be a costly and slow process for the firm's NPD personnel to catch up with the changing technologies and develop new products internally. In such situations, engaging customers with solution-related knowledge consistent with emerging technologies can be a cost- and time-efficient strategy to secure prompt access to critical knowledge and help the firm overcome the constraints of the existing stock of technological knowledge (Danneels and Sethi 2011; Eggers, Kraus, and Covin 2014).

Second, customers' input about their uncertain needs caused by rapid technological change can facilitate the quick launch of a new product, which is a key success factor for turbulent projects. Rapid technological change leads to expeditious product obsolescence and short windows of new product opportunity, highlighting the importance of the timeliness of new products (Eggers, Kraus, and Covin 2014). Customer participation enables a firm to obtain accurate knowledge about customers' changing needs and to avoid delays resulting from a mismatch between ideas and needs, consequently speeding up time to market and helping the firm realize new innovation opportunities within the short time window (Carbonell, Rodríguez-Escudero, and Pujari 2009). The pressure of timely NPD in technologically turbulent projects requires the firm to get immediate access to customers' need- and solution-related knowledge. Thus, we posit,

H_2: The relationship between customer participation and NPD performance is stronger in a more technologically turbulent project than in a project that is less technologically turbulent.

Degree of economic development: emerging versus developed countries. Whereas developed countries are already at the forefront of technology and experience stable trends, emerging countries undergo rapid economic growth and dramatic change in market and technology development, leading to a high level of uncertainty. Gaining customer input could be more valuable to firms in emerging countries because customer knowledge can increase responsiveness to rapidly changing trends in technology and markets and can help firms cope with the market uncertainty caused by rapid change (Narver and Slater 1990).

Moreover, firms in developed countries tend to have accumulated a richer stock of resources and knowledge about their products and market using state-of-the-art information systems (Hitt et al. 2000). In contrast, many of the firms in emerging countries are relatively young or recently privatized and "may not have the sophisticated information hardware and software possessed by most developed market firms," leading to limited knowledge resources (Hitt et al. 2000, p. 452). According to the marginal information value argument, "if knowledge resources increase, the probability of diminishing returns of knowledge exchange and knowledge sharing grows" (Li and Hsieh 2009, p. 427). Thus, firms in developed countries may find the knowledge they gain from customer participation to be redundant. Although firms in emerging countries tend to have limited experience or organizational support systems for customer participation (Etgar 2008), previous research has consistently implied greater benefits of customer participation in emerging countries on the basis of the rapidity of change there and the marginal information value argument. Thus, we propose,

H_3: The relationship between customer participation and NPD performance is stronger in emerging countries than in developed countries.

The nature of developed products: goods versus services. Although research on customer participation in service innovation is relatively scarce (Carbonell, Rodríguez-Escudero, and Pujari 2009), service firms also seek customer participation in new service development. For example, the U.S. Postal Service allows customers to post new service ideas

[2]Despite the potential moderating effect of market turbulence (Jaworski and Kohli 1993), we could not include it because of the scarcity of related correlations.

about shipping and mail on its website and uses their ideas to improve and create new postal services. The unique characteristics of service imply that the effect of involving customers on NPD performance could vary between the new physical products and service development contexts (Witell, Gustafsson, and Johnson 2014). First, the more intimate interaction between a customer and a service provider, which results from services' inseparability of production and consumption, suggests that greater opportunities exist for customizing services to customers' specific needs and contexts (Schleimer and Shulman 2011). The possibility of a high degree of customization and easy adaptability relative to tangible products may make obtaining accurate knowledge about customers' specific needs more valuable to service firms.

Second, customer participation, particularly in the later phases of the NPD process for services, has greater potential to reduce the risk of new product failure (Witell, Gustafsson, and Johnson 2014). The success of new physical goods is relatively dependent on product-specific factors (e.g., product quality, product advantage), but in services, a customer's perceived evaluation of the interaction between a customer and a service provider (or service technology) plays a more critical role (Ottenbacher and Harrington 2010). Thus, new service success cannot be accomplished without customer feedback on the effectiveness of the service delivery process that is based on the interaction between a customer and a service provider. Thus, we propose,

H_4: The relationship between customer participation and NPD performance is stronger for developing services than for developing goods.

Despite these arguments, however, some scholars have claimed that the possibility of a high level of customization in services may lead the firm to appeal only to smaller customer segments, thereby constraining the firm's opportunities to gain greater financial returns from the new services (Kirca, Jayachandran, and Bearden 2005). Moreover, because the intangibility of services may make it difficult for customers to evaluate the new services before actual utilization (Szymanski, Kroff, and Troy 2007), customers may provide only unspecified or uncreative ideas in service innovation, thereby limiting the benefits of customer participation.

The Difficulty of Knowledge Management in NPD

High-tech versus low-tech industry. "High-tech" refers to an industry whose offerings are based on significant amounts of scientific and technical knowledge (Rubera and Kirca 2012). As the prevalence of lead-user methods in high-tech industries has shown (Herstatt and Von Hippel 1992), customers have the potential to offer valuable needs- and solution-related knowledge in high-tech industries (e.g., Coviello and Joseph 2012). However, the challenge is that the knowledge in high-tech industries is characterized by high degrees of complexity and tacitness that increase the difficulty of knowledge management in NPD (De Luca, Verona, and Vicari 2010). Knowledge stickiness theory[3] suggests that, all else being equal, customer knowledge in high-tech (vs. low-tech) industries may yield lower returns on NPD performance because of knowledge stickiness, or the difficulty of transferring and applying knowledge from the knowledge provider to the knowledge seeker in a usable form (Szulanski 1996; Von Hippel 1994). Specifically, even though customers have valuable knowledge, it is often difficult for them to transfer such complex and tacit knowledge to the firm's NPD team in high-tech industries (De Luca and Atuahene-Gima 2007; Szulanski 1996). A high level of knowledge complexity in high-tech industries also hinders the firm's knowledge integration because integrating complex knowledge from customers with the firm's prior stock of knowledge is more complicated and challenging (De Luca, Verona, and Vicari 2010). The consequence is a lower probability that customer inputs in high-tech industries are transferred to the firm's NPD employees, integrated, and finally utilized in the NPD project. Thus, we predict,

H_5: The relationship between customer participation and NPD performance is weaker in high-tech industries than in low-tech industries.

Characteristics of Actors in NPD Knowledge Management

Knowledge provider: consumers versus business customers. As knowledge providers, customers' motivation to actively share their knowledge in the innovation process and their ability to possess reliable and relevant knowledge can vary between business-to-business (B2B) and business-to-customer (B2C) contexts (Bogers, Afuah, and Bastian 2010). Business customers in B2B markets are more motivated to share their knowledge because they can expect more explicit benefits from participation in NPD than consumers in the B2C market, such as development of customized products for themselves, improvement of the products they sell, and exclusive rights to the customized product for a period of time (Brockhoff 2003). Furthermore, relative to consumers, business customers are believed to possess more reliable and relevant knowledge about the NPD project's goals and needs because they tend to have a high level of mutual understanding of needs and expertise as well as a shared language (Mahr, Lievens, and Blazevic 2014). Consequently, business customers can produce more relevant and feasible ideas to solve the problem at hand in the NPD process, though there is the potential disadvantage that they may not provide diverse and authentic information (Gargiulo and Benassi 2000). In summary, business customers' reliable and relevant knowledge, and their higher motivation to share this knowledge (compared with consumers), can lead to greater returns from customer participation. Thus, we propose the following:

H_6: The relationship between customer participation and NPD performance is weaker for collaboration with consumers than for collaboration with business customers.

Knowledge seeker: firm size. As knowledge seekers in the innovation process, firms may have differing levels of

[3]We appreciate an anonymous reviewer's suggestion about using the concept of stickiness.

motivations and abilities to acquire and leverage external knowledge from customers according to firm size (Lee 2011; Von Hippel 1994). Large firms are likely to possess more internal resources, including existing knowledge about their established customer base and product category as well as technical skills. This large stock of prior knowledge enhances large firms' absorptive capacity, or "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal 1990, p. 128). As a result, large firms are expected to find it easier to evaluate the potential value of knowledge obtained from customers in the NPD process, leverage the knowledge effectively, and apply it to new products (Brockman and Morgan 2003). Furthermore, large firms with more internal resources are likely to have resource slack, enabling them to better manage the knowledge creation and appropriation process in NPD (Joshi and Sharma 2004). Following this reasoning, we expect,

H_7: The relationship between customer participation and NPD performance is stronger for large firms than for small firms.

In contrast, motivationally, large firms can have disadvantages in effectively acquiring and leveraging external knowledge (Bettis and Prahalad 1995). Scholars have pointed out that a stock of existing knowledge may serve as a core rigidity, holding firms back from acquiring new external knowledge (Leonard-Barton 1992). A large firm's inertia and large stock of extant knowledge may inhibit new learning processes to acquire knowledge from customers for NPD, whereas small firms are highly motivated to complement their lack of internal knowledge through customer participation. Moreover, because large firms tend to have established NPD processes, it would be more challenging for them to integrate customers into a settled system (Schaarschmidt and Kilian 2014). Given the well-supported stream of research about the lack of motivation of some large firms to process external knowledge, we propose the following alternative hypothesis:

H_{7alt}: The relationship between customer participation and NPD performance is weaker for large firms than for small firms.

Study-Specific Moderators

We also examine the moderating effects of study-specific variables on the customer participation–NPD performance link. First, we enter study variables related to measures of key variables, including measures of customer participation (i.e., whether customer participation is assessed as a binary or continuous variable), measures of NPD performance (i.e., objective vs. subjective performance measure and binary vs. continuous performance measure), and dimensions of NPD performance (i.e., operational, financial, and marketing NPD performance). Second, we consider the type of research design (i.e., whether the correlation comes from survey research, an experiment, or secondary data research). Finally, we enter the year of publication to test whether the magnitude of the correlation of interest changes over time.

Methods

Database Development and Level of Analysis

We first identified relevant studies as of May 2014 through searches of electronic databases using ABI/INFORM Global, Business Source Complete, ProQuest Digital Dissertations, and Google Scholar. As search terms, we used "customer participation," "customer involvement," "co-creation," "co-production," and "crowdsourcing" as well as combinations of these key terms with "new product(s)," "new service(s)," and "performance." Second, we supplemented the electronic searches with manual searches of abstracts of articles published in *Academy of Management Journal*, *Administrative Science Quarterly*, *Industrial Marketing Management*, *Journal of Business Research*, *Journal of Marketing*, *Journal of Marketing Research*, *Journal of Product Innovation Management*, *Journal of the Academy of Marketing Science*, *Management Science*, *Organization Science*, and *Strategic Management Journal*. Finally, we examined the references to find overlooked studies.

In terms of inclusion criteria, we first limited our discussion to studies that measure customer participation and performance at the new product (project) level, making our unit of analysis an NPD project. Second, we retained only articles about collaborating with customers rather than with suppliers or frontline employees. Third, the zero-order correlation[4] of the relationship of interest or other statistical information that could be converted into correlations was required. Finally, multiple studies using the same sample were treated as a single study, and several independent samples from a single study were regarded as different observations.

Variable Coding

After reaching consensus on the definitions and coding criteria for the variables of interest, the two authors independently coded all the studies. The specific coding criteria for key variables appear in Theme 2 of the Web Appendix. For each variable, the initial independent coding between the two authors yielded greater than 82% intercoder reliability, which indicates a good level of interrater agreement (see Theme 2). After initial coding, we resolved discrepancies in coding results by discussion. We further checked coding quality by getting an independent coder who is knowledgeable about this topic but not involved in

[4]Our meta-analysis is based on zero-order correlations that do not account for the effects of other variables that may influence the relationship. However, because a meta-analysis combines the correlations from many studies conducted in various contexts, a meta-analytic estimate is perceived to be closest to the unknown true relationship. For that reason, most of the meta-analyses in marketing have successfully used zero-order correlations as the effect size (Eisend 2015). In addition, with correlations, we cannot exclude the possibility of reverse causality, such that high performance leads to more customer participation. However, because it is unusual that higher NPD performance of a particular new product project would lead customers to be more involved in the new product project, the issue of reverse causality is of less concern.

TABLE 1
Overview of Customer Participation–NPD Performance Relationships

Relationships	Number of Samples	Number of Effects	Number of Observations	Mean Correlation[a]	95% Confidence Interval	Q-Value	I^2	Fail-Safe N[d]
NPD performance (combined)	39	123	18,002	.26** (.29)[b]	(.22, .30) [.28, .30][b]	1135.73**	89.26	37,362
New product operational performance	31	73	10,853	.28** (.18)[b]	(.21, .33) [.16, .19][b]	819.93**	91.15	14,471
New product financial performance	26	37	5,683	.26** (.34)[b]	(.19, .32) [.32, .37][b]	241.10**	85.07	3,837
New product marketing performance	5	7	923	.14 (.17)[b]	(−1, .28) [.12, .23][b]	27.08**	77.84	19
New product performance (other)[c]	3	6	543	.22*	(.07, .36)	16.07*	68.88	37

*$p < .01$.
**$p < .001$.
[a]Random model point estimates.
[b]Values in brackets represent adjusted fixed-effects estimates for potential publication bias using Duval and Tweedie's (2000) trim-and-fill method.
[c]This category includes measures that assess new product performance using a mix of different performance dimensions that cannot be classified into one of the three discrete dimensions.
[d]The number of nonsignificant, unpublished (or missing) studies that would need to be added to a meta-analysis to reduce an overall statistically significant observed result to nonsignificance.

this study to code the moderators of all the studies. The agreement level between the coding of the two authors and the coding of the independent coder is greater than 96% for each moderator, confirming high coding quality. We resolved the few differences by discussion. As a result, we coded 123 correlations between customer participation and NPD performance from 39 independent samples reported in 35 empirical studies. We present a list of studies in this meta-analysis and detailed information in Theme 3 of the Web Appendix. The numbers of studies and effects included in this meta-analysis are comparable to those from meta-analyses in new product success contexts (e.g., 95 effects from 32 studies in Szymanski, Kroff, and Troy 2007; 146 effects from 25 studies in Troy, Hirunyawipada, and Paswan 2008). Furthermore, the maximum number of correlations in a single study is 20, which accounts for approximately 16% (20 out of 123) of the total effects. Compared with Troy, Hirunyawipada, and Paswan's (2008) 21%, the 16% of our meta-analysis indicates that a single study does not provide an excessive number of correlations.

Data Analysis

Meta-analysis approach. We began with a preliminary analysis that provides initial insights into the central tendency and distribution of the effects (Troy, Hirunyawipada, and Paswan 2008). As we show in Theme 4 in the Web Appendix, the 123 correlations between customer participation and NPD performance range from −.290 to .589, with one correlation being zero and 17 correlations being negative (M = .196, SD = .187, SE = .017). The correlation frequency is normally distributed ($Z_{skewness} = -.009, p > .05$; $Z_{kurtosis} = -.785, p > .05$).

We first calculated the mean correlation between customer participation and NPD performance to provide overall insights on the relationship. We adjusted the effects from each study for measurement error by dividing the correlation coefficients by the product of the square root of the reliabilities of the two constructs (Hunter and Schmidt 1990).[5] We then transformed the reliability-corrected correlations into Fisher's z-coefficients and weighted these coefficients by the inverse of their variance to give greater weight to more precise estimates with greater sample sizes (Borenstein et al. 2009). Finally, we computed the mean effect size by dividing the sum of the weighted coefficients by the sum of the weights and converting it from the Fisher's z metric back to correlation. Table 1 shows the calculated mean correlations between customer participation and NPD performance. For completeness, we report the mean correlations between customer participation and discrete dimensions of NPD performance in Table 1, but our moderating analysis is based on the relationship between customer participation and NPD performance that combines all dimensions.

[5]Researchers have recognized that dividing the effect size by the product of the square root of the reliabilities inflates the effect size and influences the standard errors (Lipsey and Wilson 2000). Following Hox's (2010) suggested remedy to add reliabilities as covariates, we checked the impact of the corrections for measurement errors. The findings indicate that our results are consistent in terms of the hypothesis testing except that firm size is no longer a significant moderator.

TABLE 2
Correlations Between Moderators

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Customer participation in ideation (vs. development) stage	1															
2. Customer participation in launch (vs. development) stage	–.29	1														
3. Technological turbulence	.16	.11	1													
4. Emerging (vs. developed) country	.13	–.26	.02	1												
5. Product (vs. service)	.22	–.04	.04	.01	1											
6. High-tech (vs. low-tech) industry	.07	.10	.06	.17	.68	1										
7. Consumers (vs. business customers)	–.09	.11	.21	–.49	–.07	–.27	1									
8. Small (vs. large) firms	–.18	.11	.03	.03	.00	.31	–.01	1								
9. Operational (vs. other) performance measure	.02	.02	–.04	.04	.02	.10	–.06	–.05	1							
10. Financial (vs. other) performance measure	–.01	–.01	.08	.00	.01	–.11	.09	.04	–.79	1						
11. Marketing (vs. other) performance measure	.02	–.01	–.04	.01	.12	.19	–.05	.07	–.30	–.16	1					
12. Objective (vs. subjective) performance measure	.08	.02	.00	–.12	.16	.02	.21	–.03	.00	.06	–.07	1				
13. Binary (vs. continuous) performance measure	–.08	.08	.00	–.06	.09	.06	–.16	.00	–.16	.06	–.03	–.04	1			
14. Experiment (vs. other) study	.16	–.14	.00	–.07	.11	–.21	.19	–.28	–.08	.01	–.04	–.05	–.02	1		
15. Secondary (vs. other) study	.23	.04	.00	–.10	.15	–.05	.27	–.04	–.04	.10	–.06	.49	–.03	–.04	1	
16. Binary (vs. continuous) customer participation measure	.08	–.15	.00	–.17	.22	–.00	.32	–.26	–.10	–.08	.23	.53	.15	.42	.26	1
17. Year of publication	.12	–.20	–.01	.45	–.36	–.28	–.31	.11	.03	.04	–.10	.01	–.40	–.13	.15	–.26

Notes: All correlations whose absolute values are greater than .18 (.26) are significant at $p < .05$ ($p < .01$).

Moderator analysis. To examine the potential moderating effects, we ran hierarchical linear modeling by accounting for within-study error correlation between effect sizes and regressing the Fisher's z-transformed correlations on the hypothesized moderating variables and study-specific moderators. We estimate the specific model[6] as follows:

$$Y_{ij} = \alpha_0 + \sum_{k=1}^{17} \alpha_K X_{kij} + u_j + e_{ij},$$

where Y_{ij} are z-transformed correlations in study j, α_0 is a constant, α_K are the parameter estimates of the moderators, X_{kij} are matrices of the moderators, u_j is the study-level residual error term, and e_{ij} is the measurement-level residual error term.

Check for multicollinearity. Before estimating the model, we examined potential multicollinearity among its variables. In Table 2, the correlations between product (vs. service) and high-tech (vs. low-tech) variables and between operational and financial performance measures are .68 and –.79, respectively, which indicates potential collinearity issues. However, regressing the z-transformed correlations on all 17 variables reveals that the variance inflation factors are less than 10, implying that multicollinearity does not seriously distort our findings. The model that dropped the operational performance measure and product (vs. service) variable that were not significant in our original model showed consistent results with the original model with all moderators. Thus, we kept all the variables in this model.

[6]In line with previous meta-analyses (e.g., Rubera and Kirca 2012; Troy, Hirunyawipada, and Paswan 2008), we estimated the model using the maximum likelihood method after replacing the missing values for the moderating variables with the sample mean of each moderator. Although most moderators have more than 100 (out of 123) valid effect sizes, three moderators (i.e., technological turbulence, consumers vs. business customers, and small vs. large firms) have a large number of missing values, with 33, 83, and 33 valid effects, respectively. According to the simulation results of Lopez-Lopez et al. (2014), it is acceptable to include moderators with more than 30 effect sizes. However, to analyze the potential impact of replacing many missing values, we employed bivariate regressions for each moderator with a large number of missing values, using available data without replacement. The results are similar to our results with the replaced values, except that firm size is no longer significant.

Results

The Effect of Customer Participation on NPD Performance

Table 1 reports the mean correlations between customer participation and NPD performance. At the aggregate

level, we found that customer participation is significantly positively related to all types of NPD performance except new product marketing performance. Although the small sample size (five samples) prevents us from making a clear conclusion, the results imply that the mean correlation with new product marketing performance is equal to approximately half of the correlations with the other performance measures. An investigation of the five samples that involve new product marketing performance reveals that the prior relationship (e.g., prior trust, interaction) between the firm and the customers who engaged in NPD could be a cause of the low correlation. The effects of customer participation on new product marketing performance were very small or even negative when the samples included varying levels of prior relationship between the firm and customers, whereas the effect was strongly positive for those with good prior history. These findings are notable in that they may suggest effect polarization. Customer participation can maximize the firm's good relationship with customers but may not affect or may even damage the relationship with customers who have not had a special prior connection with the firm.

Results of Moderator Analyses

Both Q-statistic and I^2 values in Table 1 suggest substantial heterogeneity (Q-value = 1,135.73, $p < .001$; I^2 value = 89.26%), confirming the need for moderator analyses (Borenstein et al. 2009). Table 3 presents the results of our moderator analyses using hierarchical linear regression. The effect of customer participation in the launch stage on NPD performance is significantly greater than that in the development stage (b = .10, $p < .05$), but the effect of customer participation in the ideation stage does not significantly differ from the effect in the development stage (b = .02, $p > .05$). Thus, we found partial support for H_1. In addition, H_2 is supported: as technological turbulence of the NPD project increases, the impact of customer participation on NPD performance also increases (b = .43, $p < .01$). As we expected in H_3, involving customers in NPD yields greater returns for NPD performance in emerging countries than in developed countries (b = .22, $p < .01$). However, in terms of H_4, we did not find evidence that the relationship between customer participation and NPD performance is stronger in service innovation than for developing goods (b = –.01, $p > .05$). One explanation for this finding may be related to Vargo and

TABLE 3
Moderators of the Impact of Customer Participation on NPD Performance

			Robustness Analyses	
		Model with Full Data	Model Without One Outlier	Model Without Three Outliers
Constant		15.35 (11.57)	14.32 (11.44)	11.10 (10.98)
Customer participation in the ideation (vs. development) stage	H_{1a}	.02 (.05)	.03 (.05)	.02 (.05)
Customer participation in the launch (vs. development) stage	H_{1b}	.10 (.05)*	.10 (.05)*	.10 (.05)*
Degree of technical turbulence in the NPD project	H_2	.43 (.12)**	.42 (.12)**	.44 (.12)**
Emerging (vs. developed) country	H_3	.22 (.07)**	.22 (.07)**	.19 (.07)**
Product (vs. service) industry	H_4	–.01 (.07)	–.02 (.07)	.05 (.07)
High-tech (vs. low-tech) industries	H_5	–.17 (.08)*	–.16 (.08)*	–.22 (.08)**
Consumers (vs. business customers)	H_6	–.23 (.07)**	–.21 (.07)**	–.24 (.07)**
Small (vs. large) firms	H_7	.19 (.09)*	.21 (.09)*	.19 (.09)*
Study-Specific Variables				
Operational (vs. other) new product performance measure		.08 (.10)	.08 (.10)	.09 (.09)
Financial (vs. other) new product performance measure		.05 (.10)	.03 (.10)	.03 (.10)
Marketing (vs. other) new product performance measure		–.12 (.13)	–.10 (.13)	–.09 (.12)
Objective (vs. subjective) performance measures		–.27 (.10)**	–.20 (.11)	–.22 (.10)*
Binary (vs. continuous) performance measures		–.27 (.20)	–.22 (.20)	–.22 (.19)
Experiment (vs. other) study design		.03 (.16)	.12 (.17)	.06 (.16)
Secondary (vs. other) study design		.35 (.12)**	.42 (.12)**	.39 (.12)**
Binary (vs. continuous) customer participation measure		.14 (.10)	.07 (.11)	.07 (.10)
Year of publication		–.01 (.01)	–.01 (.01)	–.01 (.01)
Number of effects		123	122	120
Number of samples		39	39	39
Wald χ^2 (d.f.)		57.10 (17)**	59.95 (17)**	65.97 (17)**

*$p < .05$.
**$p < .01$.
Notes: In the left-most column, the variables in parentheses are coded as 0, whereas the variables outside parentheses are coded as 1. The values in parentheses are standard errors.

Lusch's (2004) argument that because the traditional distinction between services versus manufacturing contexts has been built on a legacy of manufacturing-based theory, traditional industry categorization schemes may be decreasing in value. Further research that examines innovation from the service-dominant logic perspective is needed (Skålén et al. 2015). The results show that the effect of customer participation in high-tech industries is significantly smaller than in low-tech industries ($b = -.17$, $p < .05$), lending support for H_5. In support of H_6, involving consumers in the NPD process produces lower NPD performance than involving business customers ($b = -.23$, $p < .01$). Finally, the results provide support for H_{7alt}'s prediction that small firms utilize customer participation more effectively and generate a greater return on NPD performance than large firms ($b = .19$, $p < .05$).

Results of study-specific moderators. Study-specific moderator analyses indicate that the effect of customer participation is smaller when NPD performance is assessed by objective measures (e.g., documented sales and profits) than by subjective measures (e.g., managers' perceptions of the NPD performance; $b = -.27$, $p < .01$). Given that objective measures are regarded as relatively free of respondents' perception bias (Ford, Smith, and Swasy 1990), these results imply that the actual gains of customer participation reported in extant studies may be inflated by samples based on subjective NPD measures. We also find greater impact of customer participation in secondary study design (e.g., online crowdsourcing; $b = .35$, $p < .01$). We need to interpret the results with caution because a small number of studies in our meta-analysis are based on secondary study design. However, a common theme in these studies is that they used long-term NPD performance (vs. snapshot performance) by aggregating NPD performance over the course of a substantial time period after product launch (e.g., Nishikawa, Schreier, and Ogawa 2013). Because the full effects of new products are likely to become evident long after product introduction (Henard and Szymanski 2001), such long-term NPD performance[7] in secondary study design may capture more of the potential effects.

Robustness analysis: outlier bias. We conducted various analyses to check the robustness of our findings. The scree plot based on Huffcutt and Arthur's (1995) sample-adjusted meta-analytic deviancy statistic suggests one obvious outlier and two potential outliers in our data set. Thus, following Geyskens et al. (2009), we compare the results of the full data set with the results of the reduced data sets that exclude the one apparent outlier and the three outliers (i.e., one apparent outlier plus two potential outliers) and report the results in the "Robustness Analyses" columns in Table 3. The findings for the reduced data sets that excluded the outliers consistently provide the same conclusions as those for the full data set with outliers. Thus, we conclude that outliers have negligible effects on our results.

Robustness analysis: availability bias. We assessed potential availability bias using a recommended set of triangulation methods including (1) trim and fill, (2) cumulative meta-analysis, and (3) selection models (Harrison et al. 2014). First, Table 1 presents the mean correlations of the customer participation-dimensions of NPD performance relationships and their adjusted estimates, based on Duval and Tweedie's (2000) trim-and-fill method. The smaller adjusted estimate for new product operational performance suggests that the available studies may be biased toward large positive impacts, which could be interpreted as a form of publication bias. The larger adjusted correlations in new product financial and marketing performance could indicate another type of availability bias—that is, that smaller effects tend to be published more often for new product financial and marketing performance. However, further investigation using funnel plots reveals that the observed skew toward smaller effects is not likely to be a result of studies with smaller effect sizes being published more often but rather a result of our having included unpublished sources (e.g., dissertations) that reported smaller effects. Second, we conduct a cumulative meta-analysis that assesses the drift in effect sizes when studies in the data set are added one at a time according to their precision, calculated by the inverse of the standard error. The results identify drift in effect sizes, implying the possibility of availability bias in our data set. Finally, a selection model that calculates the adjusted meta-analytic effect size estimate by considering the statistical significance of the effect size in certain samples (Vevea and Woods 2005) shows that the availability bias in our meta–data set is not likely to be a serious issue in moderate asymmetry situations. The large fail-safe sample size in Table 1 and a nonsignificant Egger's test result ($p = .193$) consistently suggest that availability bias may not be a serious issue. Overall, caution is warranted about the possibility of availability bias in new product operational performance, but we do not expect availability bias to seriously distort our results in general.

Robustness analysis: sample selection bias. Samples from particular industries may be overrepresented in our meta-analysis because customer participation has been prevalent in some industries but not in others (Etgar 2008). To evaluate the possibility, we compared the distribution of industries in our U.S. sample data set with the overall distribution of these industries in the United States. The comparison shows that 52.8% and 33.2% of firms in our U.S. sample come from manufacturing (North American Industry Classification System [NAICS] codes: 31–33) and information industries (NAICS code: 51), respectively, compared with 4% and 1.8%, respectively, of firms in the United States. Specifically, most of our samples from information industries are from the software development (NAICS code: 511) and telecommunications (NAICS code: 517) sectors, while computer and electronic product manufacturing (NAICS code: 334) and general machinery and transportation equipment (NAICS code: 333) dominate the samples in our

[7]To explicitly analyze whether the correlation between customer participation and NPD performance depends on the performance measure (long-term vs. short-term) that assesses NPD performance, we coded a separate moderator of a long-term performance measure other than secondary study design. However, because of the multicollinearity problem, we could not include a long-term performance measure as a separate study-specific moderator in our model.

manufacturing sectors. Thus, our data set does not represent all industries, and the generalizability of our findings is limited to these industries.

Further Analyses

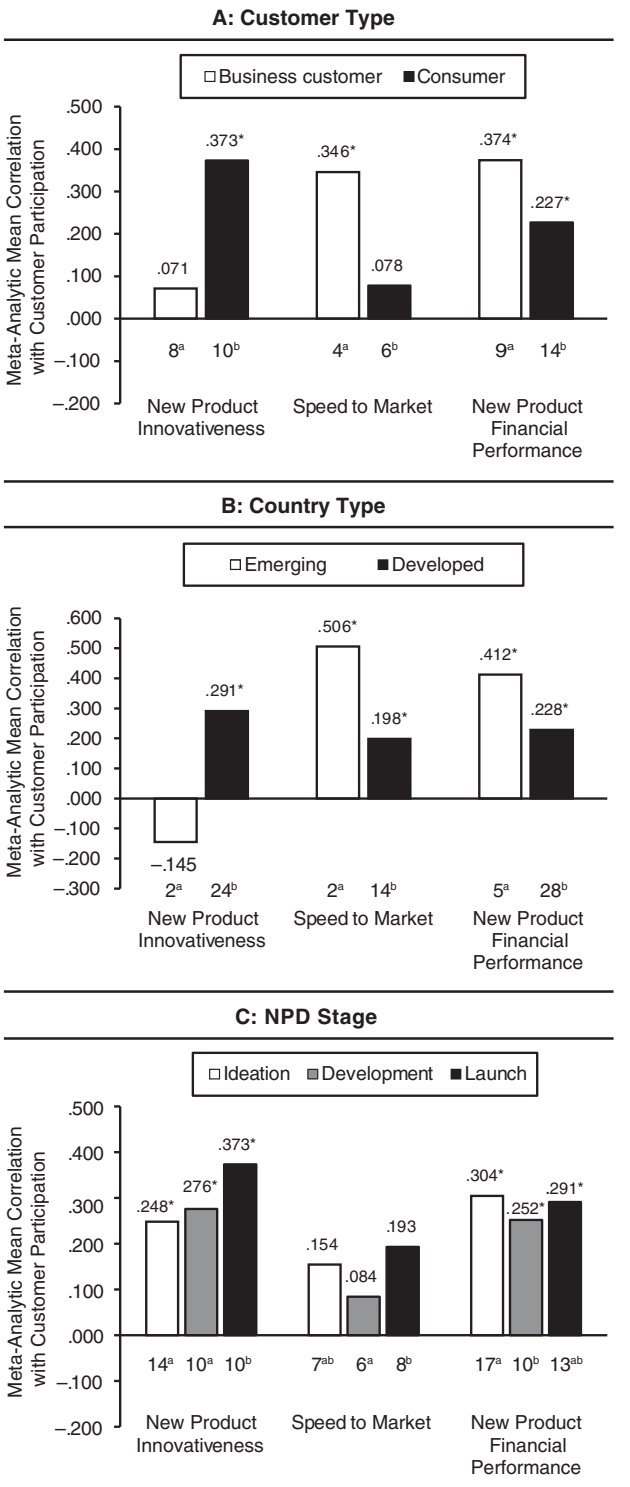
Scenario analysis. A substantial number of effects in our database reported negative correlations between customer participation and NPD performance. Post hoc inquiry shows that the negative correlations tend to be with new product operational performance (e.g., new product innovativeness, speed to market), in developed countries, in high-tech industries, or in a combination of high-tech and consumer contexts. We conducted a scenario analysis to explore combinations of situations in which customer participation hurts NPD performance and creates a trade-off among the types of NPD performance. We divided the studies according to NPD stages, type of knowledge provider (consumer vs. business customer), economic development (emerging vs. developed countries), and type of performance (i.e., new product innovativeness, speed to market, new product financial performance).[8] Figure 2 displays the meta-analytic mean correlations in the customer participation–corresponding NPD performance link in each scenario.

Notably, engaging business customers in the NPD process contributes to speeding up the new product's time to market and enhancing its financial performance but does not help develop creative new products, thus demonstrating business customers' tendency toward strategic consideration and convergent thinking style (see Figure 2, Panel A). In contrast, consumers with divergent thinking styles can help firms introduce novel ideas but do not contribute to speed to market. In addition, business customers' contribution to improving new product financial performance is 65% higher than consumers' contribution ($p < .01$). Although we recommend some caution in interpretation because of the small sample sizes, we find that customer participation in emerging countries could be a significantly more productive strategy in accelerating time to market than in developed countries ($p < .01$; see Figure 2, Panel B). In emerging countries, the return of customer participation on new product financial performance is also 81% higher than that of customer participation in developed countries ($p < .01$). However, involving customers in emerging countries may damage the introduction of an innovative new product.

Structural path analysis for NPD stages. Contrary to the literature, our moderating analysis does not support a significant difference in the effects of customer participation between the ideation and development stages. One possibility for the nonsignificant result is that the aggregation of distinct types of NPD performance may cancel out contrasting effects of customer participation between the two stages. As we show in Figure 2, Panel C, involving customers in ideation has greater effects on speed to market and

[8]We could not include a combination of high-tech (vs. low-tech) industries with types of NPD performance in this scenario analysis because of the scarcity of related correlations.

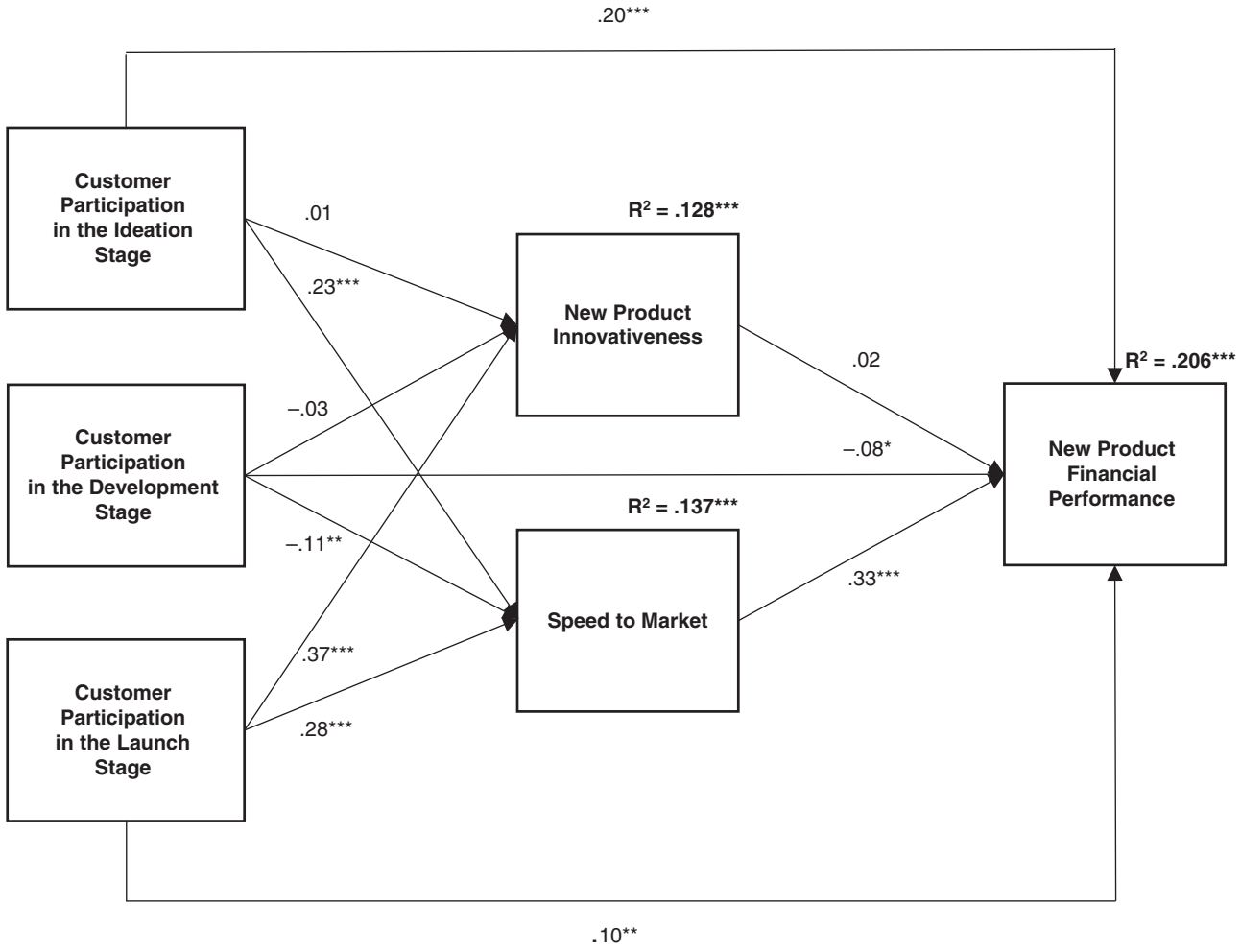
FIGURE 2
Scenario Analyses



*$p < .01$.

Notes: The numbers above the bars are the mean correlations between customer participation and NPD performance. The entries below the bars are the number of effect sizes for each scenario. For each comparison, the same superscript represents that the correlations are not significantly different, whereas different superscripts refer to a significant ($p < .05$) difference between the correlations.

FIGURE 3
Meta-Analytic Path Analysis for NPD Stages



*$p < .1$.
**$p < .05$.
***$p < .01$.
Notes: $\chi^2 = 2.39$ (d.f. = 1, $p > .10$), comparative fit index = 1.00; Tucker–Lewis index = .96; root mean square error of approximation = .04. The figure reports standardized estimates and R-squares for each dependent variable.

new product financial performance than involving customers in the development stage, but the former has a smaller effect on new product innovativeness than the latter. To elaborate more on this issue, we conducted a meta-analytic path analysis for the structural model in Figure 3. We first constructed a meta-analytic correlation matrix in Table 4 by computing mean correlations for each pair of constructs in the model. We then fixed error terms at zero and used the harmonic mean (N = 728) of the correlations' total sample sizes as the sample size for model estimation (Rubera and Kirca 2012).

Overall, the proposed meta-analytic model[9] in Figure 3 provides a good fit to the data ($\chi^2 = 2.39$, d.f. = 1, $p > .10$; comparative fit index = 1.00; Tucker–Lewis index = .96; root mean square error of approximation = .04). Notably, involving customers in the early ideation stage enhances new product financial performance directly ($\gamma = .20$, $p < .01$) and indirectly through acceleration of speed to market (indirect effect: .08, $p < .01$). Yet as the mixed arguments about customer contribution to new product innovativeness demonstrate, engaging customers in ideation does not improve new product innovativeness ($\gamma = .01$, $p > .10$). The total effect of customer participation in ideation on new product financial performance is .27 ($p < .01$).

In sharp contrast, customer participation in the development stage slows down speed to market ($\gamma = -.11$, $p < .05$) and in turn damages new product financial performance as a result of the delayed cycle time (indirect effect: −.04, $p < .05$). Involving customers in this phase also hurts new product financial performance directly at the .10 significance level

[9]We compared the model fits of several alternative models with ours. The comparison results confirm that our proposed model indicates better fit.

TABLE 4
Meta-Analytic Correlations for NPD Stages

	1	2	3	4	5
1. Customer participation in the ideation stage	1				
2. Customer participation in the development stage	.700** (6, 806)	1			
3. Customer participation in the launch stage	.518** (4, 484)	.603** (4, 484)	1		
4. Product innovativeness	.178* (10, 1,578)	.197** (6, 900)	.357** (6, 1,041)	1	
5. Speed to market	.296* (4, 511)	.217** (3, 297)	.333** (5, 590)	.169 (5, 600)	1
6. NPD financial performance	.290** (13, 1,895)	.189** (6, 917)	.268** (9, 1,173)	.132 (9, 1,282)	.409** (8, 1,715)

*$p < .05$.
**$p < .01$.
Notes: The first entry in each cell is the mean correlation for that pair of variables. Entries in parentheses are the number of estimates and observations (total sample sizes) from which the mean correlations were derived. Because these correlations are based on specific subsets (combinations) of our meta database, the number of estimates and the total sample sizes are relatively small.

($\gamma = -.08$, $p < .10$) and does not contribute to new product innovativeness ($\gamma = -.03$, $p > .10$). The total effect of customer participation in the development stage on new product financial performance is negative (total effect: $-.12$, $p < .05$). Finally, customer input in the launch phase enhances new product financial performance directly ($\gamma = .10$, $p < .05$) and indirectly through speed to market (indirect effect: .09, $p < .01$). The total effect of customer participation in the launch stage is .20 ($p < .01$).

Discussion and Implications

Theoretical Implications

Table 5 provides an overview of our key findings and implications. First, we provide a systematic conceptual and empirical integration on when customer participation generates more or less NPD performance, using a knowledge management perspective. Our study directly addresses Chatterji and Fabrizio's (2014, p. 1428) observation that "we lack theory and systematic empirical evidence about the conditions under which sourcing external knowledge from users will be most beneficial for a firm." As the first comprehensive investigation, we identify four potential contingency factors in the customer participation–NPD performance link and empirically validate the moderating effects of contextual factors through a meta-analysis. These advance our understanding of the conditions under which customer participation can be a viable strategy and form a foundation for further research.

Second, our meta-analytic path analysis clarifies both the distinct value of customer participation across NPD stages and the mechanism by which customer participation in each stage leads to new product financial performance. The differential effect in each stage that we identified is in line with Gruner and Homburg's (2000) finding, thereby reinforcing the importance of NPD stage–specific analysis. Beyond their finding, however, we shed new light on the mechanisms by which customer participation in each stage enhances or deteriorates new product financial performance. In particular, the discovery of a critical mediating role of speed to market is noteworthy. In light of the increased rate at which technology and consumer tastes are evolving, delayed time to market, with the consequent missed opportunities, is the top risk to current NPD managers (Product Development Management Association 2013). Thus, our finding of the mediating route suggests that firms can use customer participation in the ideation and launch stages as an effective way to expedite the NPD process, which in turn leads to NPD success.

However, our results did not provide support for the mediating role of product innovativeness in the customer participation–new product financial performance association, which has been long debated in the innovation literature (Christensen 1997; Poetz and Schreier 2012). The absence of a mediating mechanism through product innovativeness prevents us from arriving at a conclusion about Christensen's (1997) claim that listening carefully to customers leads successful firms to put too much emphasis on current customers' needs in existing markets, which makes the firms more likely to develop incremental innovations and eventually lose new opportunities in emerging markets. The nonsignificant finding may suggest that while Christensen's argument is still relevant in certain contexts, as Figure 2, Panel B, shows, in other situations, customers may become better knowledge providers of their current and future needs and help expand the scope of information search beyond a firm's existing markets (Rubera, Chandrasekaran, and Ordanini 2015).

Finally, our meta-analysis adds unique insights to extant literature that has emphasized the role of customer participation in high-tech industries. Von Hippel's (1986) lead-user methods and use of open innovation as a general term for obtaining external knowledge have been regarded as relevant primarily to high-tech industries (Chesbrough and Crowther 2006; Herstatt and Von Hippel 1992). However, our finding supports the notion that customer participation in low-tech industries yields greater returns on NPD performance than in high-tech industries. The key logic behind advocating the lead-user method in high-tech industries is that firms' knowledge acquisition of novel and diverse technical inputs from lead users helps the firms broaden

TABLE 5
Key Findings and Implications from Analyses

Contingency Variables	Key Results	Implications
NPD stage	Customer participation in the ideation and launch stages improves new product financial performance directly as well as indirectly through acceleration of time to market, whereas involving customers in the development phase delays time to market and in turn deteriorates new product financial performance.	We advise managers and academics alike to consider the NPD stage when implementing a customer participation strategy in NPD. In particular, in contexts in which the market is rapidly changing and interdependency among a product's parts is critical, engaging customers in the development stage should be avoided because it can significantly delay time to market and cause firms to miss market opportunities.
Technological turbulence of NPD projects	As technological turbulence of an NPD project increases, customer participation is more strongly related to NPD performance.	Degree of technological turbulence can vary across NPD projects within a firm. Thus, a firm may be better off by solving its technologically turbulent NPD projects using an open approach with customers and managing its technologically stable NPD projects using a closed, traditional innovation approach.
High-tech versus low-tech industries	The returns of customer participation on NPD performance are greater in low-tech industries than in high-tech industries.	Extant literature has emphasized the relevancy of involving customers primarily in high-tech industries because such industries gain the benefits of new knowledge acquisition from customers. However, our findings imply that, on average, customer participation could be a more effective strategy in low-tech industries because of the ease of knowledge integration and utilization in low-tech industries.
Emerging versus developed countries	In emerging countries, customer participation is more strongly associated with combined NPD performance than in developed countries. In relation to different types of NPD performance, the benefits of customer participation in emerging countries on speed to market and new product financial performance are significantly greater than those in developed markets. In contrast, involving customers in emerging countries produces a significantly smaller effect on new product innovativeness.	Customer participation in emerging countries may be an underutilized opportunity that can work as a source of competitive advantage rather than as a cost of competing. However, managers need to recognize trade-offs among different types of NPD performance when involving customers in emerging countries.
Business customers versus consumers	Overall, involvement of business customers yields notably greater benefits than engaging consumers in NPD. With regard to different types of NPD performance, business customers generate significantly greater impact on speed to market and new product financial performance than consumers, whereas the effect of business customers on new product innovativeness is significantly smaller than that of consumers.	The findings support the notion that business customers with more relevant knowledge and high motivation to share that knowledge could contribute more to NPD performance than consumers. However, managers should be attentive to business customers' disadvantage in bringing novel ideas into NPD as a result of their strategic consideration and convergent thinking style.
Small versus large firms	The effect of customer participation for small firms is significantly greater than for large firms.	Small firms with high motivation to acquire and apply knowledge from customers can utilize customer participation in NPD as a complementary strategy to make up for their lack of resources relative to large firms.

their knowledge base and develop innovative, radical products that are crucial to the success of high-tech industries (Von Hippel 1986). In contrast, our rationale for greater benefits in low-tech industries places more emphasis on knowledge integration and utilization than on knowledge acquisition. Even though customers provide novel and valuable knowledge, the difficulty of transferring, integrating, and utilizing the knowledge in high-tech industries inhibits firms from fully capturing the value of customer knowledge. Thus, contrary to prior research, our results do not negate the value of acquiring novel customer knowledge in high-tech industries but highlight the efficacy of knowledge integration and the utilization process in these industries.

Managerial Implications

First, our empirical synthesis helps firms assess whether customer participation is a viable strategy for them. Our findings suggest that small firms in low-tech B2B industries and in emerging countries should actively consider involving customers in NPD. As customer participation gains popularity (Cui and Wu 2015), many firms may jump on the bandwagon without assessing whether engaging customers is suitable for them. Our results offer initial advice to firms that face the decision of whether to adopt customer participation. Despite the value of customer input, customer participation may not be an imperative for every firm in every industry.

In practice, industry differences in adoption rates of customer participation are manifest (Etgar 2008). For example, users develop 77% of innovations in the field of scientific instruments and 67% of innovations in semiconductors and printed circuit board processing, whereas only 10% of innovations in engineering plastics are co-developed with customers (Von Hippel 1988). It is not clear whether the low adoption rate in some industries means that the value of engaging customers is small or just that customer participation is in its infancy in these industries. Our meta-analysis helps firms in industries with low adoption rates to evaluate whether they have the potential to effectively utilize customer participation and therefore should embrace it quickly.

Second, the meta-analytic path analysis provides specific guidance as to which NPD stage firms should consider engaging or avoiding customer participation. According to our findings, NPD managers are well advised to actively engage customers in the early or late NPD stages to accelerate the project and improve product-market fit. However, firms in the industries examined in our meta-analysis and in contexts in which the interdependency among the parts of a product is critical should be wary about the practice of engaging customers in the development phase. This is an imperative implication because, in practice, customers are frequently involved in the development stages of those industries. In contrast to the industry routine, NPD managers need to acknowledge the danger of delaying the project through customer participation in the development stage.

Third, these results inform NPD managers of how to obtain greater benefits from customer participation in technologically turbulent NPD projects, in contrast with previous conflicting arguments and nonsignificant empirical effects (e.g., Souder, Sherman, and Davies-Cooper 1998). This NPD project–specific exploration suggests that a firm may be better off by strategically selecting which of the firm's NPD projects should be solved using an open approach with customers and which should be managed using a more closed, traditional innovation approach. We advise NPD managers who have repetitively applied the same approach to all projects to first gauge the characteristics of the NPD project at hand, including technological turbulence, and decide whether to adopt customer participation for the given project.

Fourth, the result that small firms and business customers with high motivation to acquire or transfer knowledge gain more benefits implies that firms' top-level managers should pay more attention to how to motivate customers and NPD employees for fruitful customer participation. Researchers have recently emphasized how challenging it is to encourage NPD employees to proactively utilize customer participation given their skepticism, substantial level of stress, and dissatisfaction from involving customers in the NPD process (Chan, Yim, and Lam 2010).

Finally, our results also imply that customer participation in emerging countries may be an underutilized opportunity. This is in line with Zou, Chen, and Ghauri's (2010) finding that in China, partnering with external knowledge sources plays a more critical role in generating a firm's competitive advantage than does an internal innovation strategy. In emerging countries, customer participation is less common even in the promising industries in which customer participation could be a valuable strategy. Thus, for firms in emerging countries, it is unlikely that customer participation will become simply the cost of competing rather than a source of competitive advantage. Consequently, involving customers in emerging countries is more likely to improve the short-term outcomes of an NPD project and create a long-term competitive advantage.

Limitations and Future Research Directions

This article has some limitations that future researchers can address. First, our study focuses on the moderating effects of contextual factors in the customer participation–NPD performance link. Although our findings offer initial insights about the industries and NPD projects in which customer participation could be better suited, future researchers should thoroughly examine how other contingency factors identified in Theme 1 of the Web Appendix independently or jointly influence the effectiveness of customer participation. Future inquiry on the individual and combined effects of these contingency factors would help give a more complete understanding of the conditions under which customer participation is a beneficial strategy. In particular, it would be worth investigating the combined moderating effects of contextual and customer participation design factors to guide firms on how best to design platforms for customer participation in a given context. Theme 5 of the Web Appendix lists some example questions related to the joint impact of contextual and customer participation design factors.

Second, despite an extensive literature search, the studies in our data set predominantly come from specific industries such as software development and computer and electronic product manufacturing, which makes it difficult to apply our results directly to other industries. More research is needed to test the moderating effects of contextual factors in the customer participation–NPD performance relationship in other contexts.

Finally, the simulation results of Lopez-Lopez et al. (2014) suggest that precise estimates and predictive power of meta regression can be expected with at least 20 to 40 effects.

All our moderators except two variables, emerging (vs. developed) countries and small (vs. large) firms, provide more than 30 effects for each category of the moderators, therefore enabling us to interpret the moderating results with confidence. Yet the small effect sizes for emerging countries (N = 17) and small firms (N = 15) imply that the results relevant to the two moderators should be interpreted with caution.

References

Arnold, Todd J., Eric (Er) Fang, and Robert W. Palmatier (2011), "The Effects of Customer Acquisition and Retention Orientations on a Firm's Radical and Incremental Innovation Performance," *Journal of the Academy of Marketing Science*, 39 (2), 234–51.

Bettis, Richard A. and Coimbatore K. Prahalad (1995), "The Dominant Logic: Retrospective and Extension," *Strategic Management Journal*, 16 (1), 5–14.

Bogers, Marcel, Allan Afuah, and Bettina Bastian (2010), "Users as Innovators: A Review, Critique, and Future Research Directions," *Journal of Management*, 36 (July), 857–75.

Borenstein, Michael, Larry V. Hedges, Julian P.T. Higgins, and Hannah R. Rothstein (2009), *Introduction to Meta-Analysis*. Cornwall, UK: John Wiley & Sons.

Boyd, Eric D., Rajesh K. Chandy, and Marcus Cunha Jr. (2010), "When Do Chief Marketing Officers Affect Firm Value? A Customer Power Explanation," *Journal of Marketing Research*, 47 (December), 1162–76.

Brockhoff, Klaus (2003), "Customers' Perspectives of Involvement in New Product Development," *International Journal of Technology Management*, 26 (5/6), 464–81.

Brockman, Beverly K. and Robert M. Morgan (2003), "The Role of Existing Knowledge in New Product Innovativeness and Performance," *Decision Sciences*, 34 (2), 385–419.

Carbonell, Pilar, Ana I. Rodríguez-Escudero, and Devashish Pujari (2009), "Customer Involvement in New Service Development: An Examination of Antecedents and Outcomes," *Journal of Product Innovation Management*, 26 (5), 536–50.

Chan, Kimmy Wa, Chi Kin Yim, and Simon S.K. Lam (2010), "Is Customer Participation in Value Creation a Double-Edged Sword? Evidence from Professional Financial Services Across Cultures," *Journal of Marketing*, 74 (May), 48–64.

Chatterji, Aaron K. and Kira R. Fabrizio (2014), "Using Users: When Does External Knowledge Enhance Corporate Product Innovation?" *Strategic Management Journal*, 35 (10), 1427–45.

Chesbrough, Henry W. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Boston: Harvard Business School Press.

——— and Adrienne K. Crowther (2006), "Beyond High Tech: Early Adopters of Open Innovation in Other Industries," *R&D Management*, 36 (3), 229–36.

Christensen, Clayton M. (1997), *The Innovator's Dilemma*. New York: HarperBusiness.

——— and Joseph L. Bower (1996), "Customer Power, Strategic Investment, and the Failure of Leading Firms," *Strategic Management Journal*, 17 (3), 197–218.

Cohen, Wesley M. and Daniel A. Levinthal (1990), "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly*, 35 (1), 128–52.

Coviello, Nicole E. and Richard M. Joseph (2012), "Creating Major Innovations with Customers: Insights from Small and Young Technology Firms," *Journal of Marketing*, 76 (November), 87–104.

Cui, Anna S. and Fang Wu (2015), "Utilizing Customer Knowledge in Innovation: Antecedents and Impact of Customer Involvement on New Product Performance," *Journal of the Academy of Marketing Science*, (published electronically March 12), [DOI: 10.1007/s11747-015-0433-x].

Danneels, Erwin and Rajesh Sethi (2011), "New Product Exploration Under Environmental Turbulence," *Organization Science*, 22 (4), 1026–39.

De Luca, Luigi M. and Kwaku Atuahene-Gima (2007), "Market Knowledge Dimensions and Cross-Functional Collaboration: Examining the Different Routes to Product Innovation Performance," *Journal of Marketing*, 71 (January), 95–112.

———, Gianmario Verona, and Salvio Vicari (2010), "Market Orientation and R&D Effectiveness in High-Technology Firms: An Empirical Investigation in the Biotechnology Industry," *Journal of Product Innovation Management*, 27 (3), 299–320.

Duval, Sue and Richard Tweedie (2000), "A Nonparametric 'Trim and Fill' Method of Accounting for Publication Bias in Meta-Analysis," *Journal of the American Statistical Association*, 95 (449), 89–98.

Eggers, Fabian, Sascha Kraus, and Jeffrey G. Covin (2014), "Traveling into Unexplored Territory: Radical Innovativeness and the Role of Networking, Customers, and Technologically Turbulent Environments," *Industrial Marketing Management*, 43 (8), 1385–93.

Eisend, Martin (2015), "Have We Progressed Marketing Knowledge? A Meta-Meta-Analysis of Effect Sizes in Marketing Research," *Journal of Marketing*, 79 (May), 23–40.

Enkel, Ellen, Christoph Kausch, and Oliver Gassmann (2005), "Managing the Risk of Customer Integration," *European Management Journal*, 23 (2), 203–13.

Ernst, Holger, Wayne D. Hoyer, and Carsten Rübsaamen (2010), "Sales, Marketing, and Research-and-Development Cooperation Across New Product Development Stages: Implications for Success," *Journal of Marketing*, 74 (September), 80–92.

Etgar, Michael (2008), "A Descriptive Model of the Consumer Co-Production Process," *Journal of the Academy of Marketing Science*, 36 (1), 97–108.

Fang, Eric (2008), "Customer Participation and the Trade-Off Between New Product Innovativeness and Speed to Market," *Journal of Marketing*, 72 (July), 90–104.

Ford, Gary T., Darlene B. Smith, and John Swasy (1990), "Consumer Skepticism of Advertising Claims: Testing Hypotheses from Economics of Information," *Journal of Consumer Research*, 16 (4), 433–41.

Franke, Nikolaus, Peter Keinz, and Katharina Klausberger (2013), "Does This Sound Like a Fair Deal? Antecedents and Consequences of Fairness Expectations in the Individual's Decision to Participate in Firm Innovation," *Organization Science*, 24 (5), 1495–516.

———, and Christoph J. Steger (2009), "Testing the Value of Customization: When Do Customers Really Prefer Products Tailored to Their Preferences?" *Journal of Marketing*, 73 (September), 103–21.

Gargiulo, Martin and Mario Benassi (2000), "Trapped in Your Own Net? Network Cohesion, Structural Holes, and the Adaptation of Social Capital," *Organization Science*, 11 (2), 183–96.

Geyskens, Inge, Rekha Krishnan, Jan-Benedict E.M. Steenkamp, and Paulo V. Cunha (2009), "A Review and Evaluation of

Meta-Analysis Practices in Management Research," *Journal of Management*, 35 (2), 393–419.

Gruner, Kjell E. and Christian Homburg (2000), "Does Customer Interaction Enhance New Product Success?" *Journal of Business Research*, 49 (1), 1–14.

Harrison, Jeffrey S., George Christopher Banks, Jeffrey M. Pollack, Ernest H. O'Boyle, and Jeremy Short (2014), "Publication Bias in Strategic Management Research," *Journal of Management*, (published electronically May 28), [DOI: 10.1177/0149206314535438].

Henard, David H. and David M. Szymanski (2001), "Why Some New Products Are More Successful than Others," *Journal of Marketing Research*, 38 (August), 362–75.

Herstatt, Cornelius and Eric von Hippel (1992), "From Experience: Developing New Product Concepts via the Lead User Method: A Case Study in a 'Low-Tech' Field," *Journal of Product Innovation Management*, 9 (3), 213–21.

Hitt, Michael A., M. Tina Dacin, Edward Levitas, Jean-Luc Arregle, and Anca Borza (2000), "Partner Selection in Emerging and Developed Market Contexts: Resource-Based and Organizational Learning Perspectives," *Academy of Management Journal*, 43 (3), 449–67.

Hox, Joop (2010), *Multilevel Analysis: Techniques and Applications*, 2nd ed. New York: Routledge.

Hoyer, Wayne D., Rajesh Chandy, Matilda Dorotic, Manfred Krafft, and Siddharth S. Singh (2010), "Consumer Cocreation in New Product Development," *Journal of Service Research*, 13 (3), 283–96.

Huffcutt, Allen I. and Winfred Arthur (1995), "Development of a New Outlier Statistic for Meta-Analytic Data," *Journal of Applied Psychology*, 80 (2), 327–34.

Hunter, John E. and Frank L. Schmidt (1990), *Methods of Meta-Analysis: Correcting Error and Bias in Research Findings*. Newbury Park, CA: Sage Publications.

Jaworski, Bernard J. and Ajay K. Kohli (1993), "Market Orientation: Antecedents and Consequences," *Journal of Marketing*, 57 (July), 53–70.

Joshi, Ashwin and Sanjay Sharma (2004), "Customer Knowledge Development: Antecedents and Impact on New Product Performance," *Journal of Marketing*, 68 (October), 47–59.

Katz, Ralph and Thomas J. Allen (1985), "Organizational Issues in the Introduction of New Technologies," in *The Management of Productivity and Technology in Manufacturing,* P.R. Kleindorfer, ed. New York: Plenum Press, 275–300.

Kirca, Ahmet H., Satish Jayachandran, and William O. Bearden (2005), "Market Orientation: A Meta-Analytic Review and Assessment of Its Antecedents and Impact on Performance," *Journal of Marketing*, 69 (April), 24–41.

Lakhani, Karim R., Wesley M. Cohen, Kynon Ingram, Tushar Kethalkar, Maxim Kuzemchemko, Santosh Malik, et al. (2014), "Netflix: Designing the Netflix Prize (A)," *Harvard Business School Case* 615-015, (August 14), (accessed October 19, 2015), [available at https://hbr.org/product/Netflix–Designing-the-Ne/an/615015-PDF-ENG].

Lee, Jongkuk (2011), "The Alignment of Contract Terms for Knowledge-Creating and Knowledge-Appropriating Relationship Portfolios," *Journal of Marketing*, 75 (July), 110–27.

Leonard-Barton, Dorothy (1992), "Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development," *Strategic Management Journal*, 13 (S1), 111–25.

Li, Chia-Ying and Chang-Tseh Hsieh (2009), "The Impact of Knowledge Stickiness on Knowledge Transfer Implementation, Internalization, and Satisfaction for Multinational Corporations," *International Journal of Information Management*, 29 (6), 425–35.

Lilien, Gary L., Pamela D. Morrison, Kathleen Searls, Mary Sonnack, and Eric von Hippel (2002), "Performance Assessment of the Lead User Idea-Generation Process for New Product Development," *Management Science*, 48 (8), 1042–59.

Lipsey, Mark W. and David B. Wilson (2000), *Practical Meta-Analysis*. Applied Social Research Methods Series, Vol. 49. Thousand Oaks, CA: Sage Publications.

Lopez-Lopez, Jose Antonio, Fulgencio Marin-Martinez, Julio Sanchez-Meca, Wim Van der Noortgate, and Wolfgang Viechtbauer (2014), "Estimation of the Predictive Power of the Model in Mixed-Effects Meta-Regression: A Simulation Study," *British Journal of Mathematical & Statistical Psychology*, 67 (1), 30–48.

Mahr, Dominik, Annouk Lievens, and Vera Blazevic (2014), "The Value of Customer Cocreated Knowledge During the Innovation Process," *Journal of Product Innovation Management*, 31 (3), 599–615.

Nambisan, Satish (2002), "Designing Virtual Customer Environments for New Product Development: Toward a Theory," *Academy of Management Review*, 27 (3), 392–413.

Narver, John C. and Stanley F. Slater (1990), "The Effect of a Market Orientation on Business Profitability," *Journal of Marketing*, 54 (October), 20–35.

Nishikawa, Hidehiko, Martin Schreier, and Susumu Ogawa (2013), "User-Generated Versus Designer-Generated Products: A Performance Assessment at Muji," *International Journal of Research in Marketing*, 30 (2), 160–67.

Ottenbacher, Michael C. and Robert J. Harrington (2010), "Strategies for Achieving Success for Innovative Versus Incremental New Services," *Journal of Services Marketing*, 24 (1), 3–15.

Poetz, Marion K. and Martin Schreier (2012), "The Value of Crowdsourcing: Can Users Really Compete with Professionals in Generating New Product Ideas?" *Journal of Product Innovation Management*, 29 (2), 245–56.

Product Development Management Association (2013), "The State of Product Development in 2013: A Need for Speed and a Roadmap to Sustainable Innovation," research report, (accessed August 19, 2015), [available at http://go.planview.com/product-portfolio-management-benchmark-study/].

Rubera, Gaia, Deepa Chandrasekaran, and Andrea Ordanini (2015), "Open Innovation, Product Portfolio Innovativeness and Firm Performance: The Dual Role of New Product Development Capabilities," *Journal of the Academy of Marketing Science*, (published electronically January 11), [DOI: 10.1007/s11747-014-0423-4].

——— and Ahmet H. Kirca (2012), "Firm Innovativeness and Its Performance Outcomes: A Meta-Analytic Review and Theoretical Integration," *Journal of Marketing*, 76 (May), 130–47.

Schaarschmidt, Mario and Thomas Kilian (2014), "Impediments to Customer Integration into the Innovation Process: A Case Study in the Telecommunications Industry," *European Management Journal*, 32 (2), 350–61.

Schleimer, Stephanie C. and Arthur D. Shulman (2011), "A Comparison of New Service Versus New Product Development: Configurations of Collaborative Intensity as Predictors of Performance," *Journal of Product Innovation Management*, 28 (4), 521–35.

Skålén, Per, Johanna Gummerus, Catharina von Koskull, and Peter R. Magnusson (2015), "Exploring Value Propositions and Service Innovation: A Service-Dominant Logic Study," *Journal of the Academy of Marketing Science*, 43 (2), 137–58.

Souder, William E., J. Daniel Sherman, and Rachel Davies-Cooper (1998), "Environmental Uncertainty, Organizational Integration, and New Product Development Effectiveness: A Test of Contingency Theory," *Journal of Product Innovation Management*, 15 (6), 520–33.

Szulanski, Gabriel (1996), "Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm," *Strategic Management Journal*, 17 (S2), 27–43.

Szymanski, David M., Michael W. Kroff, and Lisa C. Troy (2007), "Innovativeness and New Product Success: Insights from the Cumulative Evidence," *Journal of the Academy of Marketing Science*, 35 (1), 35–52.

Troy, Lisa C., Tanawat Hirunyawipada, and Audhesh K. Paswan (2008), "Cross-Functional Integration and New Product Success: An Empirical Investigation of the Findings," *Journal of Marketing*, 72 (November), 132–46.

———, David M. Szymanski, and P. Rajan Varadarajan (2001), "Generating New Product Ideas: An Initial Investigation of the Role of Market Information and Organizational Characteristics," *Journal of the Academy of Marketing Science*, 29 (1), 89–101.

Un, C. Annique and Kazuhiro Asakawa (2015), "Types of R&D Collaborations and Process Innovation: The Benefits of Collaborating Upstream in the Knowledge Chain," *Journal of Product Innovation Management*, 32 (1), 138–53.

Vargo, Stephen L. and Robert F. Lusch (2004), "The Four Service Marketing Myths: Remnants of a Goods-Based, Manufacturing Model," *Journal of Service Research*, 6 (4), 324–35.

Vevea, Jack L. and Carol M. Woods (2005), "Publication Bias in Research Synthesis: Sensitivity Analysis Using A Priori Weight Functions," *Psychological Methods*, 10 (4), 428–43.

Von Hippel, Eric (1986), "Lead Users: A Source of Novel Product Concepts," *Management Science*, 32 (7), 791–805.

——— (1988), *The Sources of Innovation*. New York: Oxford University Press.

——— (1994), "'Sticky Information' and the Locus of Problem Solving: Implications for Innovation," *Management Science*, 40 (4), 429–39.

Witell, Lars, Anders Gustafsson, and Michael D. Johnson (2014), "The Effect of Customer Information During New Product Development on Profits from Goods and Services," *European Journal of Marketing*, 48 (9/10), 1709–30.

Zou, Huan, Xiaoyun Chen, and Pervex Ghauri (2010), "Antecedents and Consequences of New Venture Growth Strategy: An Empirical Study in China," *Asia Pacific Journal of Management*, 27 (3), 393–421.

WEB APPENDIX

The Effectiveness of Customer Participation in New Product Development: A Meta-Analysis

Woojung Chang & Steven A. Taylor

THEME 1. FACTORS THAT AFFECT THE EFFECTIVENESS OF CUSTOMER PARTICIPATION (CP)

Factors	Explanation	Specific Factors	Key References
Contextual Factors	The effectiveness of CP on NPD performance depends on the context in which CP occurs. Namely, the characteristics of the NPD project, industry, country, and offerings pursued to develop in NPD affect the effect of CP on NPD performance (Chatterji and Fabrizio 2014; Poetz and Schreier 2012).	•NPD project (e.g., NPD stages, technological turbulence of NPD project, project complexity)	Carbonell, Rodríguez-Escudero, and Pujari (2009); Fang (2008); Gruner and Homburg (2000); Souder, Sherman, and Davies-Cooper (1998)
		•Industry (e.g., high-tech vs. low-tech, B2B vs. B2C)	Carbonell, Rodríguez-Escudero, and Pujari (2009)
		•Offering (e.g., physical product vs. services, radical vs. incremental product, product life cycle, product criticality)	Bonner and Walker (2004)[a]; Chatterji and Fabrizio (2014); Cragin (2003); Homburg and Kuehnl (2014)
Relationship Factors	Because the NPD process through CP relies on the interplay of customer(s) and firm or interaction among customers who participate in the NPD project, relationship-related factors play a critical role in the efficacy of CP in NPD. Furthermore, because the relationships can be seen from a network perspective of various NPD participants, the characteristics of network in which firms and/or customers are involved also come into play. Relation literature, network theory, transaction cost theory, and social capital theory provide a	•Prior relationship between customer(s) and firm before the NPD project such as their collaboration history (repeated partnering), their relationship quality, and their level of trust and commitment	Athaide, Stump, and Joshi (2003); Wuyts, Dutta, and Stremersch (2004)[a]
		•Interdependence (power) between customer(s) and firm (e.g., process interdependence, power)	Lee (2011); Fang (2008); Stock (2014)
		•Characteristics of the network in which firm and customers are involved (e.g., network	Bonner (1999); Coviello and Joseph (2012); Fang (2008)

	foundation for these relationship-related factors.	connectivity, weak ties, the makeup of the network of customers)	
Organizational Support Factors	Organizational literature suggests that the benefit of CP depends on organizational strategy/structure, culture, and supporting systems/resources. There may be a more suitable organizational form or strategy for effective CP. Moreover, organizational culture as a firm's philosophy encourages or discourages certain activities and behaviors, which may facilitate CP in NPD and maximize its value. Organizational systems/resources to support effective CP in NPD could affect the magnitude of the benefit of CP.	•Organizational strategy (e.g., strategic flexibility)	Cui and Wu (2015); Nambisan (2002)
		•Organizational culture (e.g., openness, innovative culture, trial-error mindset, culture to encourage experiment)	Coviello and Joseph (2012); Naveh (2005); Stock (2014)
		•Organizational supporting system/resources (e.g., IT system, organizational personnel, NPD team)	Etgar (2008); Sawhney, Verona, and Prandelli (2005)[a]
CP Design Factors	All CP methods are not designed equal. Thus, the literature on various forms of customer participation suggests that how to design CP method (i.e., CP design factors) plays a critical role in the effectiveness of CP. Types of CP vary substantially from participation as a NPD team member to lead user method to crowdsourcing. Methods of communicating between customers and firms for NPD are also different between face-to face and through a website. Furthermore, the type of incentives to encourage customers to participate in NPD, appropriate level of incentive and so on can influence the efficacy of CP.	•Type of CP (e.g., lead user method, crowdsourcing)	Mahr, Lievens, and Blazevic (2014)
		•Type of customers (e.g., lead users, brand loyal customers, potential customers)	Brockhoff (2003); Hoyer et al. (2010)
		•Communication channels (e.g., face-to-face, on the website)	Mahr, Lievens, and Blazevic (2014); Piller, Ihl, and Vossen (2011)[a]
		•Incentives for CP (e.g., type of incentives: monetary vs. non-monetary, distribution of value)	Franke, Keinz, and Klausberger (2013)
		•Degree of freedom (autonomy) given to customers in developing and/or selecting ideas in NPD	Fuchs, Prandelli, and Schreier (2010)[a]; O'Hern and Rindfleisch (2010)[a]; Piller, Ihl, and Vossen (2011)[a]

Notes: All references except those with superscript a are included in the references of the manuscript or the list of studies included in this meta-analysis. The studies with superscript a are listed in "References in Theme 1" in the Web Appendix.

THEME 2. DEFINITIONS AND CODING CRITERIA FOR VARIABLES IN THE META-ANALYSIS

Variables	Definition	Coding criteria[a]	Inter-coder reliability
Dependent Variables			
New Product Operational Performance	Measures of how effectively and efficiently the new product is developed	Includes new product innovativeness, new product speed to market, new product (service) quality perceptions	95%
New Product Financial Performance	Measures of how much economic/financial return is realized through the new product	Includes new product sales, new product sales growth, new product market share, new product profits	97%
New Product Marketing Performance	Measures of how much marketing-oriented aspects are improved	Includes overall satisfaction, loyalty, and perceived value with the relationship between a firm and customers, and co-created new product	100%
Moderators			
Stage of NPD (For ideation stage: M = .54, SD = .501; For launch stage: M = .42, SD = .495)	Stage at which customers participate in NPD	We identified three stages: ideation, development, and launch stages (Gruner and Homburg 2000). To capture the three stages, we generated two dummy variables, ideation stage and launch stage, with development stage as a reference stage (coded = 0).	94%
Degree of technological turbulence of NPD project (M = 4.80, SD = .331 based on a 7-point scale)	The rate and uncertainty of technological change in the NPD process (Jaworski and Kohli 1993)	Since the papers in this meta-analysis including technological turbulence provide sample means for technological turbulence based on consistent measures based on Jaworski and Kohli (1993), we used the sample means as the degree of technological turbulence. Therefore, this variable is continuous.	100%
Emerging vs. developed countries (M = .15, SD = .360)	Whether customer participation takes place in emerging countries vs. in developed countries	Based on information on each country's 2013 GDP/capita provided by the International Monetary Fund (IMF), we coded countries with higher than $30,000 GDP/capita as developed countries = 0 and countries with less than $30,000 GDP/capita as emerging countries = 1.	100%
Goods vs. services industry	Whether customers participate in developing tangible goods vs.	We coded as tangible goods = 1 and services = 0.	90%

(M = .71, SD = .456)	intangible services		
High-tech vs. low-tech industry (M = .59, SD = .494)	Whether or not customer participation occurs in high-tech industries with high technological intensity (Hatzichronoglou 1997; Rubera and Kirca 2012)	Hatzichronoglou (1997) provided a list of industries that are classified as (1) high-tech, (2) medium-high tech, (3) medium-low tech, and (4) low-tech industries according to each industry's technological intensity. Based on the list, we coded high-tech industry and medium-high tech as 1, and medium-low and low-tech industries as 0.	82%
Consumers vs. business customers (M = .52, SD = .503)	The type of customers (end-use consumers vs. business customers) who participate in NPD	We coded as consumers = 1 and business customers = 0.	85%
Small firm vs. large firms (M = .45, SD = .506)	Average size of firms comprising the sample	As suggested in Rubera and Kirca (2012), we viewed firms with fewer than 500 employees as small firms (coded = 1) and firms with more than 500 employees as large firms (coded = 0[b]). For samples which are composed of firms of different size, if more than 75% of firms in the sample have fewer (more) than 500 employees based on a frequency distribution of firm size, we coded the sample as small (large) firms.	87%

[a] Samples that do not provide information about key moderators or could not be classified as one category over the other because the sample contains both categories are treated as missing values for moderators, and the missing values are replaced with the mean for each moderator following Troy, Hirunyawipada, and Paswan (2008) and Rubera and Kirca (2012).

[b] Because few papers provided the average number of firms' employees in a sample, we could not code firm size as a continuous variable using the average number of firms' employees.

THEME 3. STUDIES INCLUDED IN THE META-ANALYSIS

ID	Paper	Sample size	# of effect sizes	Type of performance	Context	Type of customer participation	Stage
1	Athaide, Stump, & Joshi (2003)	296	2	OP	NPD projects in software, environmental equipment, and factory automation systems industries in U.S.	Involvement of a particular buyer firm in a seller firm's NPD	Development
				MP			Development
2	Bonner (1999)	134	4	OP: Product innovativeness	NPD projects in computers, telecommunications equipment, medical products, and miscellaneous technical/non-technical products industries	Involvement of buyer firms in a seller firm's non-customized NPD project targeted at the entire market	All stages
				OP: Speed to market			All stages
				OP: Product quality			All stages
				FP			All stages
3	Callahan & Lasry (2004)	55	1	OP: Product innovativeness	NPD projects in computer telephony integration industry	Involvement of potential end-users of the new product	All stages
4	Campbell & Cooper (1999)	88	1	Other performance	NPD projects in chemical, electronic, industrial equipment, and information system and medical systems industries	Involvement of a particular buyer firm in a seller firm's non-customized NPD project targeted at the entire market	Not sure
5	Carbonell, Rodríguez-Escudero, & Pujari (2009)	102	20	OP: Speed to market	New service development projects in Spanish service industries including retail trade, finance, banking and insurance, health care and social assistance	Involvement of potential customers or users in a new service development project	Ideation
				OP: Speed to market			Development
				OP: Speed to market			Launch (testing)
				OP: Speed to market			Launch
				OP: Product quality			Ideation
				OP: Product quality			Development

				OP: Product quality			Launch (testing)
				OP: Product quality			Launch
				FP			Ideation
				FP			Development
				FP			Launch (testing)
				FP			Launch
				Other performance			Ideation
				Other performance			Development
				Other performance			Launch (testing)
				Other performance			Launch
				OP: Product innovativeness			Ideation
				OP: Product innovativeness			Development
				OP: Product innovativeness			Launch (testing)
				OP: Product innovativeness			Launch
6[a]	Chang (2012) Study 1	647	2	OP: Speed to market	Software development projects in U.S.	Involvement of end-users in a particular software development project on a crowdsourcing website	All stages
				FP			All stages
	Chang (2012) Study 2	159	4	OP: Speed to market	NPD projects in various industries in U.S.	Involvement of end-customers in a particular NPD	All stages
				OP: Product innovativeness			All stages

				OP: Product quality		project	All stages
				FP			All stages
7	Chien & Chen (2010)	125	2	OP: Speed to market	NPD projects in financial services industry in Taiwan	Involvement of customers in the NPD process	Ideation
				FP			Ideation
8	Cooper (1979)	195	1	FP	Industrial NPD projects in Canada	Prototype testing with customer	Launch (testing)
9	Cragin (2003)	169	3	OP: Product innovativeness	NPD projects in industrial/commercial machinery and computer equipment, electronic equipment, and transportation equipment industries	Involvement of industrial customers in a supplier's NPD process	All stages
				OP: Product quality			All stages
				FP			All stages
10	Fang (2008)	143	4	OP: Product innovativeness	NPD projects in general industrial machinery, electrical and electronic machinery, and transportation equipment industries	Involvement of customer firm in a component manufacturer's new component development project	Ideation
				OP: Speed to market			Ideation
				OP: Product innovativeness			Development
				OP: Speed to market			Development
11	Fang, Palmatier, & Evans (2008)	188	2	OP	NPD projects in general machinery, electrical and electronic machinery, and transportation equipment industries	Involvement of customer firm in a supplier's NPD project	All stages
				MP			All stages
12	Feng & Wang (2013)	214	3	OP: Speed to market	NPD projects in manufacturing industries in China such as machinery and electrical and electronic	Involvement of a major customer in a NPD project	Ideation
				OP			Ideation
				FP			Ideation

					machinery		
13	FitzGibbon (1998)	52	6	OP: Speed to market	Custom software development projects in Canada.	Client participation in planning, testing and design reviews and code inspection in a custom software development project	Ideation
				OP: Speed to market			Launch (testing)
				OP: Speed to market			Development
				MP			Ideation
				MP			Launch (testing)
				MP			Development
14	Gustafsson, Kristensson, & Witell (2012)	334	1	FP	NPD projects in manufacturing and service sectors including machine industry, pulp and paper, fabricated metal goods, machinery and equipment, renting and real estate, construction services, consumer services, and business services	Involvement of customers in a NPD project	Ideation
15[a]	Homburg & Kuehnl (2014) – product sample	125	1	FP	New physical product development projects	Involvement of customers in a new physical product development project	Not sure
	Homburg & Kuehnl (2014) – service sample	132	1	FP	New service development projects	Involvement of customers in a new service development project	Not sure
16	Hsu, Hung, Chen, & Huang (2013)	103	3	OP: Product quality	Information system development projects in Taiwan	Involvement of user representatives	Not sure
				Marketing performance			Not sure
				OP			Not sure

17	Johnson (2007)	170	6	FP	New radical medical device development projects in U.S.	Involvement of physician, nurse, end-user and patient	Ideation
				FP			Development
				FP			Launch
				OP: Product innovativeness			Ideation
				OP: Product innovativeness			Development
				OP: Product innovativeness			Launch
18	Knudsen (2007)	557	2	OP: Product innovativeness	NPD projects in food and beverages, paint and varnishes, telecom equipment, telecom services, and computer services in Europe	Involvement of customer firms	Ideation
				OP: Product innovativeness			Launch
19	Lai, Chen, & Yang (2012)	208	1	FP	NPD projects in livelihood, chemical, information and electric, and metal machinery industries in Taiwan	Involvement of customers in early stage of NPD	Ideation
20	Langerak & Hultink (2005)	233	2	OP: Speed to market	NPD projects in manufacturing sector such as machinery and electrical equipment and measuring instrument	Involvement of lead users	Launch (testing)
				FP			Launch (testing)
21	Lasry (2000)	55	12	OP: Product quality	NPD projects in computer telephony integration industry in Canada	Involvement of end users	Ideation
				OP: Product quality			Development
				OP: Product quality			Launch (testing)
				OP: Product quality			Launch
				FP			Ideation

				FP			Development
				FP			Launch (testing)
				FP			Launch
				OP: Product innovativeness			Ideation
				OP: Product innovativeness			Development
				OP: Product innovativeness			Launch (testing)
				OP: Product innovativeness			Launch
22	[b]Lau (2011)	251	1	OP: Product innovativeness	NPD projects in electronics, toys, and plastics industries in Hong Kong	Involvement of customers in a NPD project	Development
	[b]Lau, Yam, & Tang (2010)	251	1	FP			Development
23	Lilien, Morrison, Searls, Sonnack, & von Hippel (2002)	47	3	OP: Product innovativeness	3M's funded NPD projects	Involvement of lead users in idea generation process	Ideation
				FP			Ideation
				Other performance			Ideation
24	Lin & Huang (2013)	179	6	OP	NPD projects in telecommunications, electro-optical, electronic components, integrated circuits industry in Taiwan	Involvement of customer firms in a NPD project	Ideation
				OP			Development
				FP			Ideation
				FP			Development
				OP: Product innovativeness			Ideation
				OP: Product innovativeness			Development
25	Melton & Hartline	160	6	OP	NPD projects in financial,	Involvement of customers in a new	Ideation
				OP			Development

	(2010)			OP	health care, and education service industries in U.S.	service development project	Launch
				FP			Ideation
				FP			Development
				FP			Launch
26	Mishra & Shah (2009)	189	2	OP	NPD projects in electronics, machinery, and automotive industries in six countries	Involvement of customers in a recent major NPD project	Ideation
				FP			Ideation
27	Naveh (2005)	62	2	OP: Product innovativeness	NPD projects from one large hi-tech electronics organization	Involvement of major customer firms in a NPD project	Not sure
				OP			Not sure
28[a]	Nishikawa, Schreier, & Ogawa (2013) – furniture sample	43	2	OP: Product innovativeness	NPD projects in Muji, Japanese consumer goods manufacturer/retailer	Involvement of end users on the Muji's crowdsourcing website	Ideation
				FP			Ideation
	Nishikawa, Schreier, & Ogawa (2013) – health & beauty division sample	53	1	FP			Ideation
29	Schirr (2008)	144	1	FP	New service development projects in U.S. bank industry	Involvement of individual customers	All stages
30	[b]Sethi (2000)	141	2	OP: Product innovativeness	NPD projects in consumer product manufacturing industries such as appliances, toys, processed food	Involvement of end consumers in the product concept and design process	Ideation
				OP: Product quality			Ideation
	[b]Sethi &	141	1	FP			Ideation

	Nicholson (2001)				products and household products		
	[b]Sethi, Smith, & Park (2001)	141	1	OP: Product innovativeness			Ideation
31	Smets, Langerak, & Rijsdijk (2013)	63	2	OP: Product innovativeness	Collaborative customized product development projects between a large plastics manufacturer and its industrial customers	Involvement of a customer firm in a customized product development project	Ideation/development
				FP			Ideation/development
32	Souder, Sherman & Davies-Cooper (1998)	101	2	OP: Speed to market	NPD projects in chemicals, computer equipment, electronics and instruments in the U.S. and U.K.	User involvement and information flows between R&D developers and users in a NPD project	Launch (testing)
				FP			Launch (testing)
33	Stock (2014)	120	1	OP: Product innovativeness	NPD teams in electronics, mechanical machinery, automotive supply, and consumer goods industries	Involvement of a customer firm in its supplier firm NPD team	Not sure
34	Stock & Zacharias (2013)	180	3	OP: Product innovativeness	NPD projects in electronics, machinery, services, software/IT, and utilities	Involvement of a customer firm in its seller firm NPD program	Not sure
				OP: Product quality			Not sure
				MP			Not sure
35[a]	Wang, Wu, & Yang (2013) – customer sample	312	1	OP	NPD projects in the Chinese telecommunication service industry	Involvement of a customer firm in its seller firm NPD project	Ideation
	Wang, Wu, & Yang (2013) – supplier	213	1	OP			Ideation

	sample						

[a] The study provides two independent samples.

[b] These papers are based on the same sample (so we treated them as a single sample) but provide different types of correlations.

Notes: OP: NPD operational performance, FP: NPD financial performance, MP: NPD marketing performance.

The List of the Studies in the Meta-Analysis

1. Athaide, Gerard A., Rodney L. Stump, and Ashwin W. Joshi (2003), "Understanding New Product Co-Development Relationships in Technology-Based, Industrial Markets," *Journal of Marketing Theory and Practice,* 11 (3), 46–58.

2. Bonner, Joseph M. (1999), "Customer Involvement in New Product Development: Customer Interaction Intensity and Customer Network Issues," Doctoral Dissertation, University of Minnesota, United States.

3. Callahan, John and Eytan Lasry (2004), "The Importance of Customer Input in the Development of Very New Products," *R&D Management,* 34 (2), 107–20.

4. Campbell, Alexandra J. and Robert G. Cooper (1999), "Do Customer Partnerships Improve New Product Success Rates?" *Industrial Marketing Management*, 28 (5), 507–19.

5. Carbonell, Pilar, Ana I. Rodríguez-Escudero, and Devashish Pujari (2009), "Customer Involvement in New Service Development: An Examination of Antecedents and Outcomes," *Journal of Product Innovation Management,* 26 (5), 536–50.

6. [a]Chang, Woojung (2012), "The Danger of Feast Or Famine: Managing Customer Participation in Value Co-production," Doctoral dissertation, The University of Alabama at Tuscaloosa, United States.

7. Chien, Shu-Hua and Jyh-jye Chen (2010), "Supplier Involvement and Customer Involvement Effect on New Product Development Success in the Financial Service Industry," *Service Industries Journal,* 30 (2), 185–201.

8. Cooper, Robert G. (1979), "Identifying Industrial New Product Success: Project NewProd," *Industrial Marketing Management*, 8 (2), 124–35.

9. Cragin, Evan S. (2003), "The Determinants of New Product Acceptance in Industrial Channels," Doctoral Dissertation, Oklahoma State University, United States.

10. Fang, Eric. (2008), "Customer Participation and the Trade-Off between New Product Innovativeness and Speed to Market," *Journal of Marketing,* 72 (4), 90–104.

11. Fang, Eric, Robert W. Palmatier, and Kenneth R. Evans (2008), "Influence of Customer Participation on Creating and Sharing of New Product Value," *Journal of the Academy of Marketing Science,* 36 (3), 322–36.

12. Feng, Taiwen and Dan Wang (2013), "Supply Chain Involvement for Better Product Development Performance," *Industrial Management & Data Systems,* 113 (2), 190–206.

13. FitzGibbon, Chris (1998), "An Analysis of the Difference in Software Project Management Practices between Organizations Registered to ISO 9001 and Non-Registered Organizations," Masters Thesis, Carleton University, Canada.

14. Gustafsson, Anders, Per Kristensson, and Lars Witell (2012), "Customer Co-creation in Service Innovation: A Matter of Communication?" *Journal of Service Management,* 23 (3), 311–27.

15. [a]Homburg, Christian and Christina Kuehnl (2014), "Is More Always Better? A Comparative Study of Internal and External Integration Practices in New Product and New Service Development," *Journal of Business Research*, 67 (7), 1360–7.

16. Hsu, Jack S., Yu Wen Hung, Yin-Hung Chen, and Hsieh-Hong Huang (2013), "Antecedents and Consequences of User Coproduction in Information System Development Projects," *Project Management Journal*, 44 (2), 67–87.

17. Johnson, Joshua H. (2007), "The Role of the Customer in the New Product Development of Radical Innovations," Doctoral Dissertation, Vanderbilt University, United States.

18. Knudsen, Mette Praest (2007), "The Relative Importance of Interfirm Relationships and Knowledge Transfer for New Product Development Success," *Journal of Product Innovation Management,* 24 (2), 117–38.

19. Lai, Chi-Shiun, Chun-Shou Chen, and Chin-Fang Yang (2012), "The Involvement of Supply Chain Partners in New Product Development: The Role of a Third Party," *International Journal of Electronic Business Management*, 10 (4), 261–73.

20. Langerak, Fred and Erik Jan Hultink (2005), "The Impact of New Product Development Acceleration Approaches on Speed and Profitability: Lessons for Pioneers and Fast Followers," *IEEE Transactions on Engineering Management,* 52 (1), 30–42.

21. Lasry, Eytan (2000), "User Involvement in New Product Development: An Empirical Investigation," Masters Thesis, Carleton University, Canada.

22. [b]Lau, Antonio K.W. (2011), "Supplier and Customer Involvement on New Product Performance: Contextual Factors and an Empirical Test from Manufacturer Perspective," *Industrial Management & Data Systems,* 111 (6), 910–42.

[b]Lau, Antonio K.W., Richard C. Yam, and Esther P. Tang (2010), "Supply Chain Integration and Product Modularity: An Empirical Study of Product Performance for Selected Hong Kong Manufacturing Industries," *International Journal of Operations & Production Management,* 30 (1), 20–56.

23. Lilien, Gary L., Pamela D. Morrison, Kathleen Searls, Mary Sonnack, and Eric von Hippel (2002), "Performance Assessment of the Lead User Idea-Generation Process for New Product Development," *Management Science,* 48 (8), 1042–59.

24. Lin, Ming-Ji J. and Chin-Hua Huang (2013), "The Impact of Customer Participation on NPD Performance: The Mediating Role of Inter-Organisation Relationship," *Journal of Business & Industrial Marketing,* 28 (1), 3–15.

25. Melton, Horace L. and Michael D. Hartline (2010), "Customer and Frontline Employee Influence on New Service Development Performance," *Journal of Service Research,* 13 (4), 411–25.

26. Mishra, Anant A. and Rachna Shah (2009), "In Union Lies Strength: Collaborative Competence in New Product Development and its Performance Effects," *Journal of Operations Management,* 27 (4), 324–38.

27. Naveh, E. (2005), "The Effect of Integrated Product Development on Efficiency and Innovation," *International Journal of Production Research,* 43 (13), 2789–2808.

28. [a]Nishikawa, Hidehiko, Martin Schreier, and Susumu Ogawa (2013), "User-generated Versus Designer-generated Products: A Performance Assessment at Muji," *International Journal of Research in Marketing,* 30 (2), 160–7.

29. Schirr, Gary R. (2008), "New Service Development: User Collaboration in a Unique Process," Doctoral Dissertation, University of Illinois at Chicago, United States.

30. [b]Sethi, Rajesh (2000), "New Product Quality and Product Development Teams," *Journal of Marketing,* 64 (2), 1–14.

[b]Sethi, Rajesh and Carolyn Y. Nicholson (2001), "Structural and Contextual Correlates of Charged Behavior in Product Development Teams," *Journal of Product Innovation Management,* 18 (3), 154–68.

[b]Sethi, Rajesh, Daniel C. Smith, and C. Whan Park (2001), "Cross-Functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products," *Journal of Marketing Research,* 38 (1), 73–85.

31. Smets, Lydie P.M., Fred Langerak, and Serge A. Rijsdijk (2013), "Shouldn't Customers Control Customized Product Development?" *Journal of Product Innovation Management,* 30 (6), 1242–53.

32. Souder, William E., J. Daniel Sherman, and Rachel Davies-Cooper (1998), "Environmental Uncertainty, Organizational Integration, and New Product Development Effectiveness: A Test of Contingency Theory," *Journal of Product Innovation Management,* 15 (6), 520–33.

33. Stock, Ruth Maria (2014), "How Should Customers Be Integrated for Effective Interorganizational NPD Teams? An Input-Process-Output Perspective," *Journal of Product Innovation Management*, 31 (3), 535–51.

34. Stock, Ruth Maria and Nicholas A. Zacharias (2013), "Two Sides of the Same Coin: How Do Different Dimensions of Product Program Innovativeness Affect Customer Loyalty?" *Journal of Product Innovation Management*, 30 (3), 516–32.

35. [a]Wang, Yonggui, Jianfeng Wu, and Zhilin Yang (2013), "Customer Participation and Project Performance: The Mediating Role of Knowledge Sharing in the Chinese Telecommunication Service Industry," *Journal of Business-to-Business Marketing*, 20 (4), 227–44.

[a] The study provides two independent samples.
[b] These papers are based on the same sample (so we treated them as a single sample) but provide different types of correlations.

References in Theme 1

Bonner, Joseph M. and Orville C. Walker, Jr. (2004), "Selecting Influential Business-to-Business Customers in New Product Development: Relational Embeddedness and Knowledge Heterogeneity Considerations," *Journal of Product Innovation Management*, 21 (3), 155–69.

Fuchs, Christoph, Emanuela Prandelli, and Martin Schreier (2010), "The Psychological Effects of Empowerment Strategies on Consumers' Product Demand," *Journal of Marketing*, 74 (January), 65–79.

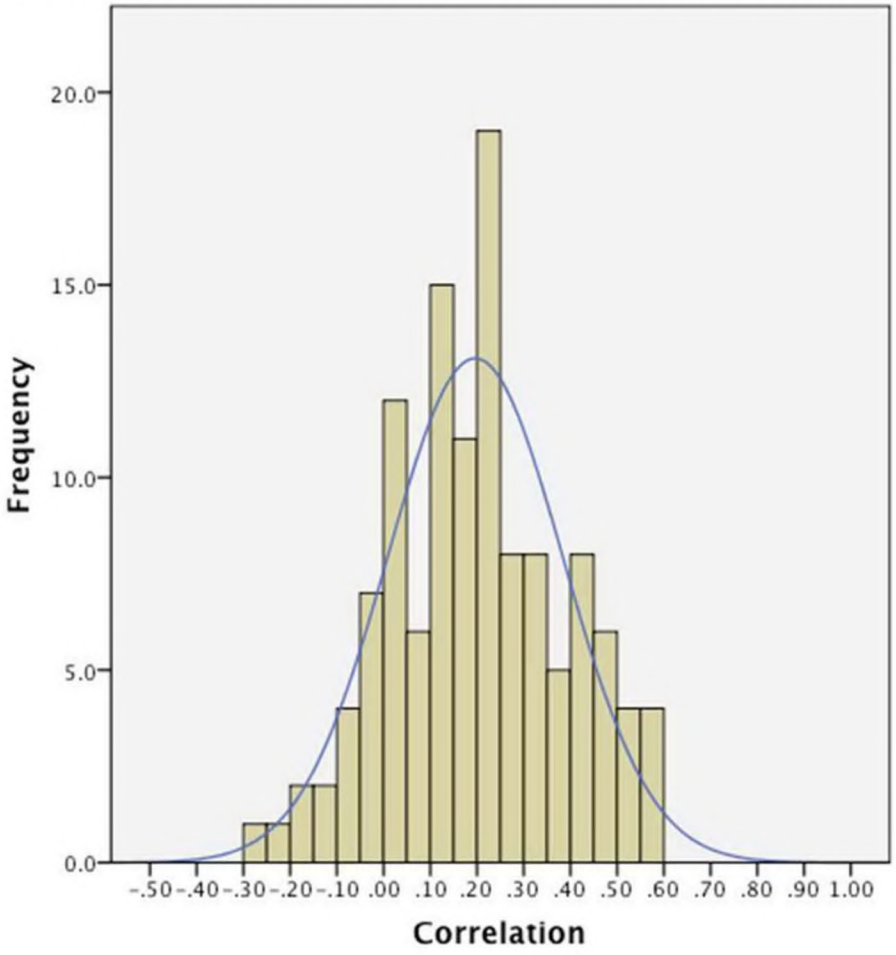
O'Hern, Matthew S. and Aric Rindfleisch (2010), "Customer Co-Creation: A Typology and Research Agenda," in *Review of Marketing Research*, Vol. 6, Naresh K. Malholtra, ed. Armonk, NY: M.E. Sharpe, 84–106.

Piller, Frank, Christoph Ihl, and Alexander Vossen (2011), "Customer Co-Creation: Open Innovation with Customers," *Wittke, V./Hanekop*, H, 31–63.

Sawhney, Mphanbir, Gianmario Verona, and Emanuela Prandelli (2005), "Collaborating to Create: The Internet as a Platform for Customer Engagement in Product Innovation," *Journal of Interactive Marketing*, 19 (4), 4–17.

Wuyts, Stefan, Shantanu Dutta, and Stefan Stremersch (2004), "Portfolios of Interfirm Agreements in Technology-Intensive Markets: Consequences for Innovation and Profitability," *Journal of Marketing*, 68 (April), 88–10.

THEME 4. FREQUENCY DISTRIBUTION OF CORRELATIONS



THEME 5. EXAMPLE QUESTIONS FOR FURTHER RESEARCH

Future Research Questions about the Joint Effects of Contextual Factors and Customer Participation Design Factors

• Interplay between NPD stage and customer participation design factors
  ○ Is the effect of customer participation in each NPD stage on NPD performance associated with type of customer participation (e.g., lead user method, crowdsourcing) or customer type (e.g., lead users, brand loyal customers, potential customers)?[a]
  ○ Is there an optimal combination of customer types in each NPD stage? Or is there a more appropriate customer type for each NPD stage?
  ○ Do suitable types of incentives (e.g., monetary, recognition) and appropriate amount of incentives that ensure customers' fairness perception about value distribution vary across NPD stage in which customers are involved?
  ○ What type of communication channel (e.g., face-to-face, on the website) is more suitable in each NPD stage?
• Interplay between product life cycle and customer participation design factors
  ○ Do the effects of customer participation on NPD performance vary across the product life cycle?
  ○ At the beginning of the product life cycle, which type of customer participation or customer type contributes more to reducing uncertainty about ideal product attributes and potential customer preferences?
  ○ In the maturity stage of the product life cycle, which type of customer participation or customer type is more beneficial to differentiate new products from competitors'?
  ○ Does the optimal level of autonomy given to customers in developing and/or selecting new ideas vary across the product life cycle?
• Interplay between type of innovation and customer participation design factors
  ○ Do the returns of customer participation on NPD performance vary when developing "new to the firm" vs. "new to the world" products?
  ○ Is an optimal level of autonomy given to customers in developing and/or selecting new ideas contingent on types of innovation (e.g., incremental vs. radical innovation, new to the firm vs. new to the world innovation)?
  ○ Is there a more suitable communication channel (e.g., face-to-face, on the website) for successful development of radical innovation?
  ○ Does the appropriate amount of incentives given to customers depend on the type of innovation (e.g., radical, incremental innovation)?

[a] We thank an anonymous reviewer for this suggestion.