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## **Exploring Links Between Engaging Customers in Value Co-Creation and Product Innovativeness**

### **Abstract**

The study examines the hypothesis that firms engaging customers in value co-creation tend to display more innovativeness. As such, it is one of the few quantitative studies on the link between these two concepts. Customer engagement in value co-creation was operationalized as a multiple scale following the DART framework by Prahalad and Ramaswamy. The DART acronym denotes four salient dimensions of enabling co-creation: Dialog, Access, Risk and Transparency. The applied innovativeness metric was revenue share from new and modified products. Data were collected from 432 managers of manufacturing and service SMEs. Statistical data analysis methods included EFA, CFA and multiple regression modeling.

The major finding is the existence of a significant positive effect between engaging customers in value co-creation and innovativeness. In particular, certain DART dimensions, such as Dialog, elements of Access and Risk, coincided with increased levels of innovativeness. Among the study's limitations, two are particularly pertinent. First, different conceptualizations of customer engagement in value co-creation could yield different results in terms of effect magnitudes, although the authors believe that the direction of relationships should remain the same. Second, the research considered

customer engagement from the perspective of managers, which could induce bias. Hence, it may be worthwhile to examine how customers evaluate their own engagement.

In terms of practical application, to enhance innovativeness, firms should intensify their efforts to engage customers in day-to-day operations. However, not all aspects of co-creation provide equal benefits – it appears that more involved actions on the part of the company are needed to produce noticeable positive effects.

From a theoretical viewpoint, the findings empirically validate the business relevance of engaging customers in value co-creation. Unlike many other studies of the co-creation stream, this paper relies on a large, representative sample of manufacturing and service firms.

**Keywords:** value co-creation, DART model, service dominant logic, innovation, SMEs  
**JEL:** L14, L15, L23, O32

## Introduction

Our current knowledge driven economy is characterized by intense competitive pressures and the growing power of consumers, who have become more empowered by the ubiquitous presence of the Internet and related information technologies. In this setting, two themes are often cited as promising sources of lasting business success: engaging customers through value co-creation and perpetual innovation.

Co-creation with customers has become an increasingly important topic in the management and marketing literature concerning Service-Dominant Logic (SDL). An extensive literature review on value co-creation by Ranjan and Read [2014] identifies two types of research on this topic depending on the assumed understanding of value co-creation. It can be occurring either (1) in the process of experiencing the offer by the customer, or (2) when customers are engaged in value proposition development.

Accordingly, there are two manifestations of value co-creation. One is observed during the process of consuming/using a product by a customer (value-in-use), while the other occurs when firms and its customers work jointly on developing a value proposition (referred to by many authors as co-production). It should be noted that we purposefully avoid using the term co-production as somewhat misleading. Vargo and Lusch posit that the customer is always a co-producer while consuming the product [Vargo, Lusch, 2006, p. 18], obviously having in mind value-in-use, while Ranjan and Read [2014] define the term as direct or indirect “co-working with customers” or participation in the product/service design process, which is perhaps more appropriately referred to as value proposition co-creation.

Many authors suggest that companies can expect to gain multiple benefits from increased customer engagement in value co-creation, including strengthening brands, rising customer loyalty, attracting new customers [Piligrimiene et al., 2015; Saarijarvi

et al., 2013], as well as reducing various expenses to offer more differentiated products at lower prices [Hippel von, 2005; Arakji, Lang, 2007]. Co-creation can also enhance innovation through sharing, aggregating and recombining knowledge on the Internet [Brynjolfsson, McAfee, 2014], or by effective participation of customers in the designing and manufacturing of new products [Payne et al., 2008; Chen et al., 2012].

Some authors, however, have doubted whether a balanced, harmonious relationship between a firm and consumer is commonplace, and – more importantly – if co-creation consistently yields satisfactory business outcomes. Admittedly, in the new Internet-driven economy control over co-creation is visibly shifting to consumers, who can significantly influence brand value perceptions by mobilizing a powerful force – customer communities – to share their insights and experiences on products, brands and suppliers [Fisher, Smith, 2011]. This new consumer power can detrimentally affect “the profitability of conventional producer strategies that are based on pushing product designs that serve large segments of consumers while ignoring the service of more nuanced consumer preferences” [Lang et al., 2015].

With the caveat that value co-creation can create both threats as well as opportunities, we focus here on how engaging customers in value co-creation by Polish manufacturing and service SMEs affects their innovativeness.

The paper is structured as follows. The next section summarizes the relevant value co-creation and innovation literature. Research methods employed in data collection and statistical analysis are then discussed, and survey findings presented. The paper's conclusions come next, along with suggestions for further research.

## Literature Review

### Evolving Nature of the Concept of Value

Use of the term “value” can be traced back to works by Plato and Aristotle but, as a concept, its meaning has changed throughout the years in various disciplines. Gummerus [2013] notes the common criticism that “value is one of the most misused terms” [Leszinski, Marn, 1997], and value research remains “an area of continuing ambiguity” [Woodall, 2003; Sánchez Fernández, Iniesta-Bonillo, 2007]. Our current, rapidly changing business environment has facilitated new approaches to value and how it is created in the management and marketing literature, along with efforts to better order and understand multiple approaches to value and their contexts. To that end, Ng and Smith [2012] presented a comprehensive literature review on value, contrasting traditional and modern approaches. Within the traditional stream, they identified five distinct value perspectives; that is, (1) utility, (2) economic worth, (3) perceived satisfaction, (4) net benefit and (5) a means towards a goal. Regardless of their differences, all of these views perceive

value as an intrinsic quality of an object, with passive and subjective customers that do not actively participate in value creation. Ng and Smith point out that this traditional value perception dates back to Adam Smith [1776], who distinguished between “value-in-use”, or the utility of some specific item, and “value-in-exchange”, representing the price commanded in the market. Smith also originated the concept of value embedded and distributed in tangible goods. Starting in the 1990s a new perspective on value began to gain ground [Holbrook, 1994, 1999, 2006]. This modern approach considers value as formed through the customer’s personal experience.

### **Value in Service Dominant Logic**

The experience-based concept of value stands in opposition to this traditional interpretation in that – among other things – it postulates a different role for customers, who become value creators and equal partners to companies. Here, value is not embedded in a manufacturing or distribution process but is instead derived from product use and interactions between companies and customers [Vargo, Lusch, 2006]. The recent interest in experiential value co-creation observed in marketing literature was triggered by Vargo and Lusch [2004], who authored the foundations of Service-Dominant Logic (SDL). Similar to Holbrook [1987], Vargo, Lusch and Morgan [2006] claimed that customers create value by engaging in the process of product acquisition, usage and disposal. According to SDL proponents, companies cannot offer value as such, but rather value propositions [Frow, Payne, 2008] that become realized value when customers experience them in a unique context at a given time. This notion is reflected in how SDL looks at physical goods, which it assumes are akin to services because customers really buy the ensuing service that a tangible good provides when used [Vargo, Lusch, 2004]. Accordingly, SDL treats all offerings as services, which require consumption or use by a customer to yield value. One consequence of this approach, proffered by Lusch and Webster Jr. [2011], is a shift in marketing focus from sales and profit optimization to supporting customers in their value co-creation activities. This outlook is consistent with Gummesson’s opinion that “value creation is only possible when a good or service is consumed. An unsold good has no value, and a service provider without customers cannot produce anything”. [2002].

Though SDL has its critics (for example Campbell et al. [2013]), it has encouraged many academics to leave the constraints of the traditional marketing domain and contribute to the emerging paradigm [Li, Petrick, 2007; Warnaby, 2009; Löbler, 2011; Brodie et al., 2011; Laczniak, Santos, 2011; Karpen et al., 2012; Edvardson, Tronvoll, 2013; Edvardson et al., 2013]. This lively academic interest suggests the importance of further research in this area.

### **Engagement in Co-Creation**

In this paper, in keeping with SDL [Vargo, Lusch, 2008], we understand co-creation as customer participation in developing a value proposition, named by Gustafsson et al.

[2012] as “innovation co-creation” or “co-creation for others”, and experience co-creation (“co-creation for use”) while realizing the value embedded in the value proposition through consumption or use. Specifically, the focus is on customer engagement in product innovations – setting up the specifics of the offering, and interacting with the company by sharing experiences. As such, the key to true co-creation is the notion of engagement, which indicates the depth of customer involvement. Among many relatively similar meanings of the term in marketing literature, we chose the one by Vivek et al. [2012], which is the most consistent with our research framework. Accordingly, consumer engagement is “the intensity of an individual’s participation and connection with organization’s offerings and activities initiated by either the customer or the organization” [Vivek et al., 2012].

Regardless of its role in SDL, customer engagement has been a popular research topic. Indeed, Marketing Science Institute listed it as a key research priority in the years 2010–2012 [Brodie et al., 2011]. Numerous authors perceived customer engagement as a strategic factor to enhance business performance directly [Voyles, 2007; Neff, 2007] or indirectly through supporting product innovation [Hoyer et al., 2010]. Kumar et al. [2010] pointed to a variety of ways customer engagement can support firms. Also, the concept of engagement was given a prominent role by authors studying customer experience [Pralhad, Ramaswamy, 2000].

In this study we considered the impact of customer co-creation from the perspective of a company’s efforts to engage customers, assuming that the more favorable environment is offered to customers, the more they are willing to get engaged. We did not investigate customers’ perceptions of being engaged by companies. Instead we study company efforts to practice co-creation with customers. Our literature review suggests that the DART model [Pralhad, Ramaswamy, 2004a] was arguably the most complete system, which considers co-creation in terms of a firm’s core activities, but also includes various supportive functions that could impact customer experiences. The DART model is described next.

## The DART Model

Consistent with the co-creation mindset, Prahalad and Ramaswamy proposed their DART model as an aid for companies to enhance the customer role in the value creation and innovation processes [Pralhad, Ramaswamy, 2004a]. Their focus, arguably, is fostering conditions for building an effective communications platform with customers, which is an essential prerequisite for intense customer involvement with a company. Practically, the merit of DART lies in indicating the range of capabilities necessary for successful co-creation. In doing so, it specifies four main building blocks or competence groups that companies need to develop, and the “DART” acronym refers to those four components:

1. **Dialog** representing ongoing, unrestricted communication between a company and consumers performed on equal terms.

2. **Access** comprises tools and procedures that facilitate co-creation and increase freedom of choice for customers.
3. **Risk assessment** are measures that allow customers to fully evaluate the risk involved in accepting a value proposition.
4. **Transparency** is the extent to which a firm has managed to mitigate information asymmetry in relations between the company and its customers.

It should be noted that, when Prahalad and Ramaswamy first proposed this framework, they included so-called “dimensions of choice” to complement the DART model [2004a] by representing additional factors that can shape the overall co-creation experience by accounting for various modalities in product offerings. These modalities, or options, concerned customers’ ability to choose the most suitable distribution channels, communication variants, pricing, payment and financing methods. To keep our co-creation model simple and in agreement with several other authors [Albinsson et al., 2011, 2016; Ruso Spina et al., 2012], we opted against distinguishing dimensions of choice as a separate taxonomy, and instead to embed them within the Access component of DART. This extended the meaning of Access to include additional personalization options enhancing individual customer experience. The lack of separate dimensions of choice can also be found in later works by Prahalad, Ktishnan and Ramaswamy [Pralhad, Krishanan, 2008; Ramaswamy, 2008], which seems to further validate this decision.

Despite other attempts at conceptualizing and operationalizing co-creation [e.g. by Grönroos, 2009; Yi, Gong, 2013; Ranjan, Read, 2014] DART seems to be the most complete system. Unfortunately, previous attempts to test it empirically relied mostly on qualitative evidence.

## Customers as a Source of Innovation

Many insights about the role of customers in innovative firm processes are found in the works of Eric von Hippel [1976, 1977, 1986, 1988, 1994, 1998, 2001, 2005], who focused on user-centered innovation. According to him, due to information asymmetry “users and manufacturers know different things” [2005]. While users are acquainted with context-of-use information, specialized manufacturers have generic solution information. This is why users, led by their personal experiences, can suggest novel product functionalities, while manufacturers tend to offer improvements to better serve well-known needs. While using products, customers form opinions on their utilities and shortcomings. They also develop ideas for entirely new products or modified versions. Consequently, inviting customers to share their knowledge – before a competitor does so – is an important managerial task.

To increase competitiveness, firms tend to acquire valuable knowledge from multiple external sources (including customers) and combine it with internal knowledge resources. In this way, customer engagement in value proposition development is consistent with

the open innovation model, which is advanced by its proponents as an alternative to the vertical integration of the R&D function [Chesbrough, 2003]. Henry Chesbrough defined open innovation as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for the external use of innovation” [Chesbrough et al., 2006]. Dialog with customers as one source of knowledge may bring multiple benefits to the company, not the least of which are decreasing failure rates of new products due to a better understanding of the market and customer needs [Hippel von, 2005].

Works by other authors, Ranjan and Read [2014] indicate that customer engagement in developing a value proposition (co-production) requires collaboration [Lusch et al., 2007], dialog [Aarikka-Stenroos, Jakkola, 2012; Grönroos, 2012], interactivity, deep engagement and a willingness to share knowledge [Pralhad, Ramaswamy, 2004c]. Establishing and maintaining such collaboration and dialogue requires the involved parties to exhibit trust and openness. DART incorporates this basic willingness of customers to cooperate and share knowledge in an interactive, engaged dialogue.

Fisher and Smith point out that cooperation with customers may be fraught with difficulty. Many consumers are reluctant to have a close dialog with companies. Rather, they prefer to communicate with other peers. According to the authors, this is when “... companies need to turn into listeners and find ways to effectively eavesdrop on consumer conversations...” [2011], both on-line and off-line.

## Previous Research on Co-Creation and Innovativeness

In previous studies, the relationship between co-creation and innovativeness was primarily concerned with the consequences of involving customers directly in companies' innovation processes. The reported results were usually positive, the share of innovative products was higher and new products failure rates lower in firms that sourced novel ideas as well as other insights from their customers (an extensive review of works in this area can be found in Bogers et al. [2010]). To the best of our knowledge, the experience co-creation has not yet been adequately investigated in the innovation context on a large, representative sample of service and manufacturing companies. One of the few published works that did try to quantitatively identify links between experience co-creation and innovativeness used a statistical analysis of keywords on the web pages of a purposeful sample of 273 companies [Tanev et al., 2011]. The reliance on keywords, though a legitimate research method, has such limitations as omitting actual metrics of innovation activities of firms, and the non-representative sample did not permit generalization to a larger number of businesses.

Another study exploring links between co-creation and innovative performance considered the impact of customer dialog on innovativeness of Taiwanese IT-service

companies. This research surveyed 149 managers and found that firms more involved in dialog had better innovative outcomes [Hsieh, Hsieh, 2015]. Two major limitations of the study, however, included a narrowly defined industry focus, and establishing the level of innovative performance on the basis of Likert-scale items (the same method as for the other elements of the model), which might bias the results due to common measurement variance.

The brief literature overview outlined above indicates a knowledge gap, which is made more apparent by the presence of conceptual papers hypothesizing positive effects and attempting to explain possible mechanisms of the impact of experience co-creation on innovativeness [Tanev et al., 2009; Tanev, Frederiksen, 2014]. Addressing this knowledge deficiency, we use DART to reflect a wide range of co-creation practices.

With regard to innovation activity outcomes, our focus was on broadly considered product innovations, which comprise any modification to existing product or service structure, functional features, aesthetics, utility, as well as the introduction of entirely new offerings. In particular, as a measure of innovative success we used revenues from new and modified products as a percentage of sales for the year (2013) preceding data collection. This and similar metrics were employed in several other studies that measured the performance of innovation processes [e.g. Zeng et al., 2010; Ebersberger et al., 2012].

The growing prominence of co-creation practices in business and continuing, critical role of innovation to sustain competitive success makes it important to know how those two concepts interact. For that purpose, **we argue (from the literature and our own observations) that a stronger involvement in activities enabling customer engagement in value co-creation is associated with higher levels of innovativeness.** We set out to verify this hypothesis in the remainder of the paper by first discussing employed research methods, reporting the findings, and presenting our conclusions.

## Research Method

### Sample Characteristics

Data for the study were collected in July and August 2014 through CATI interviews and encompassed 432 cases for a response rate of approximately 30%. The interviewed managers represented small and medium Polish food manufacturing enterprises ( $n = 206$ ), as well as hospitality, tourism (travel agents) and catering services ( $n = 226$ ). To ensure representativeness, the sample was drawn from a database comprising virtually every manufacturing and service company in Poland, maintained by a research agency that was hired to administer the survey.

In the study, due to different interaction patterns with customers, a distinction was made between two groups of firms: manufacturers and service providers. As a rule, service personnel can directly observe customers using services and propose innovations based

on these observations. Manufacturers, however, typically lack this first-hand contact and need to purposefully inquire customers about their experiences with products, and provide them with a convenient and effective means for sharing those opinions. This distinction sets up an interesting comparison on the variables of value co-creation and innovativeness, and provides a partial basis to assess whether the patterns analyzed here are broadly applicable or rather specific to the manufacturing and service industries.

## DART Measurement Scale

The central part of the research instrument was a multi-item Likert scale for establishing the extent of co-creation involvement according to the DART framework.

**TABLE 1. Statements used for measuring a firm's involvement in the four aspects of the DART model**

<b>DART component 1: DIALOG</b>
D 1: We systematically engage in dialog with consumers of our products/services.
D 2: We use special means to encourage consumers to have dialog with us.
D 3: One objective of our dialog with customers is generating ideas for new and modified products/services.
D 4: Dialog with consumers enables us to learn about their experiences with our products/services.
<b>DART component 2: ACCESS</b>
A 1: Consumers can freely choose the time of product delivery/service provision.
A 2: Consumers can decide about certain elements of our products/services that influence their utility and/or the way they look.
A 3: Consumers can always choose their preferred payment method.
A 4: Consumers can always choose their preferred method of communicating with us.
A 5: Consumers can readily learn the specifics of our offer.
A 6: Information about our offer is easily available for consumers on our web site.
<b>DART component 3: RISK ASSESSMENT</b>
R 1: Consumers can entirely consciously make their purchasing decisions because we inform them fully about the benefits of our products/services.
R 2: Consumers can entirely consciously make their purchasing decisions because we inform them fully about the risks from using our products/services.
R 3: We discourage from buying those consumers for whom we believe our products/services are not appropriate.
R 4: We encourage consumers to learn detailed information about using our products/services.
R 5: We modify user manuals and/or other information based on negative feedback from consumers about their product/service experiences.

<b>DART component 4: TRANSPARENCY</b>
T 1: All information that we disseminate is reliable.
T 2: Information published on our web site is up to date.
T 3: We follow an open information policy since we have nothing to hide.
T 4: We immediately reply to questions from our current and potential customers.
T 5: We don't try to hide when we are blamed for something; we address such charges openly.
T 6: If we happen to make mistakes, we admit to them publicly.

Source: own study.

In developing the statements for the scale we were guided by several earlier works, in particular Mazur and Zaborek [2014], Albinsson et al. [2011, 2016], Ruso Spena et al. [2012], Prahalad and Ramaswamy [2000, 2004a, 2004b, 2004c]. Specific reasons for the content of the listed items are discussed below.

### *Dialog Indicators*

In writing about dialog, Prahalad and Ramaswamy stressed its systematic, active and engaging character. This view was reflected in items D 1 and D 2. One objective of communicating through dialog is for both parties to learn about how to facilitate – among other things – better cooperation. It would not be valid to ask managers for their impressions of what insights their customers gained from dialog. But assuming a symmetrical, two-way relationship – which is implied by the very term dialog – an adequate proxy of dialog outcomes is obtained by asking managers what they learned from customers. This is addressed by D 3 and D 4. Also, it is worth noting that the word “dialog” is commonly understood in Polish (the language of the interviews) as a special kind of very close, fair and symmetrical communication, which accurately reflects the co-creation meaning of the word.

### *Access indicators*

Consistent with Prahalad and Ramaswamy, who posit that access starts with information and tools [2004a], here Access is about letting consumers flexibly determine the preferred, personalized shape of an offer. This approach is equivalent to what Ruso Spena et al. adopted in their research; that is: “Access covers how interaction empowers customer access to knowledge, tools, information and experience” [2012]. As such, to account for various modalities of choice, our questionnaire focused on: product or service features (A 2), distribution systems (A 1), payment methods (A 3), and information (A 4, 5 and 6). Our stronger emphasis on the information component corresponds to Prahalad and Ramaswamy’s focus on knowledge and information sharing in DART.

*Risk Assessment indicators*

In the original DART specification [Pralhad, Ramaswamy, 2004a] Risk Assessment was perceived as a means to lower “the probability of harm to the customer”. It seems that this goal can be accomplished by enabling consumers to make informed choices, which will result in a positive experience. Thus, consumers ought to have the right to learn about pertinent benefits and dangers involved in using a product (R 1 and 2), and the company should take a proactive stance in sharing this knowledge with its consumers (R 3 and 4). A correct implementation of the Risk Assessment function requires listening to customer feedback and implementing changes accordingly (R 5).

*Transparency indicators*

In keeping with Prahalad and Ramaswamy, Risk Assessment and Transparency contribute jointly to fostering trust, which is a foundation of fruitful value co-creation practices. Thus, their advice to managers was “When in doubt disclose” [2004c]. Since the role of Transparency in DART is to highlight the need to end information asymmetry in firm-customer relations, our questionnaire pertains to the quality of information offered to customers (T 1 and 2) and a company’s commitment to solving the problem of information asymmetry (T 3 through 6).

To sum up the overview of scale items, it should be noted that the DART framework, despite being a way to conceptualize value co-creation, does not have a fully validated set of scale items for use in quantitative research. In addition, there is a debate on the underlying structure of the latent variables [Mazur, Zaborek, 2014]. In particular, in the face of extant empirical evidence it is unclear if the scope and configuration of DART is best represented by only four constructs – as originally proposed by Prahalad and Ramaswamy [2004a] – or it is a more complex composition with more hidden variables accounting for more detailed aspects of co-creation. A likely reason for this uncertainty is that DART was first developed through case studies, and most subsequent research was also of the qualitative nature. Qualitative methods are known to use different scale validation techniques compared to a quantitative approach – in essence, qualitative researchers do not consider covariance matrices, but have to rely instead on various pattern matching schemes, as suggested by Yin [2011]. Hence, a measurement framework working well in the qualitative context may prove deficient in surveys. For this reason, the first step in statistical analysis involved us investigating the underlying structure of the scale items with exploratory factor analysis.

## Methods of Statistical Analysis

To test the hypothesis of a positive link between the involvement of firms in value co-creation with consumers and innovativeness, we used exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and multiple linear regression.

The purpose of the maximum likelihood EFA with SPSS 22 was to determine if the theoretical structure of the four latent DART variables also held for our data. As it turned out, the analysis identified seven hidden variables that correspond to Dialog, Transparency, two aspects of Access, two aspects of Risk and one new factor that we named Responsiveness. Responsiveness in communication between a firm and consumers means that there are no delays in the information flow, the contents of web pages and other media are up to date, and consumers can count on immediate replies and reactions. Consequently, in the second step, we relied on this latent variable structure to build and validate the measurement model via CFA, with the AMOS 22 software (see Table 2 for results). Once the measurement model yielded acceptable fit metrics the factor scores were saved as new variables and used as predictors in the multiple regression model, which concluded our statistical analysis.

An explanation is in order as to why we decided against building a full structural equation model (SEM) to verify the hypothesis. The main reason was that the graphical displays for the equivalent SEM would be too complex, and their adequate presentation too extensive for the scope of this paper. Moreover, in the context of this research once the CFA was completed, the SEM would not offer any substantive benefits over a multiple regression analysis. Specifically, one would have to present two models separately for manufacturing and service companies. Each would have to accommodate a large set of rather confusing covariance links between the seven first order factors. Also, the multiple regression made it easier to represent interactions between predictors, which we suspected could be present in the data.

## Research Findings

As the starting point the CFA results will be reported. Here, the major issue was to see if manufacturing and services firms exhibited distinct differences in their respective DART measurement models. If not, then a single pooled measurement model could be used; otherwise two models would be needed. To address this issue a measurement invariance test was performed. In the test two models were statistically compared: the first with each group having independently estimated parameters (the so called unconstrained model assuming that the two types of firms are different) and the second having the same regression weights for both groups (i.e. the specification with constrained measurement

weights assuming that both groups of companies were described by the same DART model). A resulting significant chi-square value of 22.066 ( $p = 0.016$ ) indicated that the firms could not be pooled together and treated as a single group and instead the two models should be estimated separately. The unconstrained model had a significantly better data fit than the constrained one, but this should not be taken to mean that each and every parameter was different across both models. In Table 2, the significance of specific pairwise differences was indicated whenever critical ratios fell beyond the range of  $-1.96$  and  $1.96$  and, in these cases, regression weights were marked in bold.

**TABLE 2. CFA measurement model of DART framework for manufacturing and services firms**

Indicator content	Regression weights from the parent construct to the indicator	
	for manufacturers	for services
<b>Dialog</b> (Manufacturers: AVE = 0.62, Cronbach's Alpha = 0.81, MSV = 0.18; Services: AVE = 0.56, Cronbach's Alpha = 0.76, MSV = 0.48)		
D 1: We systematically engage in dialog with consumers of our products/services.	0.92	0.89
D 2: We use special means to encourage consumers to have dialog with us.	0.98	0.89
D 3: One objective of our dialog with customers is generating ideas for new and modified products/services.	<b>0.59</b>	<b>0.45</b>
D 4: Dialog with consumers enables us to learn about their experiences with our products/services.	0.58	0.66
<b>Access 1</b> (Manufacturers: AVE = 0.54, Cronbach's Alpha = 0.68, MSV = 0.14; Services: AVE = 0.60, Cronbach's Alpha = 0.62, MSV = 0.09)		
A 1: Consumers can freely choose the time of product delivery/service provision.	<b>0.74</b>	<b>0.98</b>
A 2: Consumers can decide about certain elements of our products/services that influence their utility and/or the way they look.	<b>0.68</b>	<b>0.48</b>
<b>Access 2</b> (Manufacturers: AVE = 0.51, Cronbach's Alpha = 0.65, MSV = 0.22; Services: AVE = 0.28, Cronbach's Alpha = 0.61, MSV = 0.56)		
A 3: Consumers can always choose their preferred payment method.	<b>0.41</b>	<b>0.28</b>
A 4: Consumers can always choose their preferred method of communicating with us.	<b>0.76</b>	<b>0.58</b>
A 5: Consumers can readily learn the specifics of our offer.	<b>0.88</b>	<b>0.66</b>

Indicator content	Regression weights from the parent construct to the indicator	
	for manufacturers	for services
<b>Risk 1</b> (Manufacturers: AVE = 0.72, Cronbach's Alpha = 0.71, MSV = 0.31; Services: AVE = 0.56, Cronbach's Alpha = 0.64, MSV = 0.53)		
R 1: Consumers can entirely consciously make their purchasing decisions because we inform them fully about the benefits of our products/services.	0.69	0.72
R 2: Consumers can entirely consciously make their purchasing decisions because we inform them fully about the risks from using our products/services.	<b>0.98</b>	<b>0.77</b>
<b>Risk 2</b> (Manufacturers: AVE = 0.52 Cronbach's Alpha = 0.82, MSV = 0.31; Services: AVE = 0.61, Cronbach's Alpha = 0.79, MSV = 0.35)		
R 3: We discourage from buying those consumers for whom we believe our products/services are not appropriate.	0.74	0.80
R 4: We encourage consumers to learn detailed information about using our products/services.	0.77	0.84
R 5: We modify user manuals and/or other information based on negative feedback from consumers about their product/service experiences	0.64	0.69
<b>Transparency</b> (Manufacturers: AVE = 0.44, Cronbach's Alpha = 0.63, MSV = 0.25; Services: AVE = 0.28, Cronbach's Alpha = 0.48, MSV = 0.56)		
T 1: All information that we disseminate is reliable.	<b>0.78</b>	<b>0.68</b>
T 3: We follow an open information policy since we have nothing to hide.	<b>0.88</b>	<b>0.71</b>
T 5: We don't try to hide when we are blamed for something; we address such charges openly.	<b>0.48</b>	<b>0.32</b>
T 6: If we happen to make mistakes, we admit to them publicly.	<b>0.43</b>	<b>0.23</b>
<b>Responsiveness</b> (Manufacturers: AVE = 0.68 Cronbach's Alpha = 0.82, MSV = 0.25; Services: AVE = 0.51, Cronbach's Alpha = 0.75, MSV = 0.46)		
A 6: Information about our offer are readily available for consumers on our web site.	0.89	0.84
T 2: Information published on our web site is up to date.	0.81	0.76
T 4: We immediately reply to questions from our current and potential customers.	<b>0.77</b>	<b>0.49</b>
<b>Overall fit metrics for the entire measurement model:</b> Chi-squared/df=1.344; GFI=0.908; AGFI=0.869; CFI=0.928; RMSEA=0.028; PCLOSE=0.876.		

Source: own study.

According to the threshold levels given in Garson [2012], the general fit indices shown at the bottom of the table imply that the measurement model fits the data well, meaning that the covariance matrix computed from the model closely resembles the empirical covariance matrix. However, indicators obtained for individual constructs clearly point to some deficiencies in the model. Most notably, it is clear that DART is better suited for manufacturing companies than for service providers. Among manufacturers, each construct has a satisfactory level of average variance extracted from its indicators (AVE of more than 50%) and there are no issues with discriminant validity (AVE is always greater than MSV, standing for maximum shared variance). For service companies some constructs are rather difficult to interpret due to low AVE coefficients, and AVE being lower than MSV. Specifically, the factors Risk 2 and Transparency explain little variance in its indicators and are too similar to other factors. This finding is consistent with our previous research on DART [Mazur, Zaborek, 2014], where – while using a different sample – it was concluded that the DART framework works better for manufacturing companies, possibly because it was originally developed through a qualitative investigation of several manufacturing firms. Even though services firms are generally worse represented by the model, for factors other than the problematic Risk 2 and Transparency reliability and validity is at least adequate, and Dialog and Risk 1 have their measurement models equivalent to manufacturers' (as indicated by insignificant differences between regression weights). This could imply that those two aspects of value co-creation are universal and valid regardless of the nature of business operations.

As a general note, the regression weights in Table 2 should not be interpreted as telling what indicators are more prevalent among which types of firms, nor that manufacturing firms are involved more in value co-creation. Rather, they show where the DART model is more accurate and reliable.

When interpreting the “split” factors labeled Risk 1 and 2, and Access 1 and 2 it appears that Risk 1 encapsulates more passive aspects of addressing the danger and inconvenience involved in purchasing wrong products or inadequate services, as it entails providing correct information to consumers. In contrast, Risk 2 is more proactive, since it requires specific actions targeting particular needs and circumstances of individual customers. Access 1 concerns practices that can provide substantial benefits to customers, such as home delivery or custom made products. Access 2 components involve more intangible characteristics of the offer, relying primarily on the availability and the efficient transfer of information. Hence, it indicates that dividing Risk and Access was grounded in substantive reasons, and was not merely driven by statistical criteria.

A better understanding of the components of the DART measurement model can be gained from Table 3 displaying Pearson correlation coefficients between pairs of latent variables.

**TABLE 3. Bivariate correlations between elements of the DART model for manufacturing and services**

Pairs of correlated variables			Manufacturing	Services
Dialog	<-->	Access 1	0.254	0.252
Dialog	<-->	Access 2	0.399	0.415
Dialog	<-->	Risk 1	0.142	0.211
Dialog	<-->	Risk 2	0.089	0.165
Dialog	<-->	Transparency	0.072	0.188
Dialog	<-->	Responsiveness	0.069	0.089
Access 1	<-->	Access 2	0.274	0.342
Access 1	<-->	Risk 1	-0.029	-0.012
Access 1	<-->	Risk 2	0.159	0.074
Access 1	<-->	Transparency	0.055	0.136
Access 1	<-->	Responsiveness	0.017	0.054
Access 2	<-->	Risk 1	0.206	0.372
Access 2	<-->	Risk 2	0.455	0.311
Access 2	<-->	Transparency	0.305	0.427
Access 2	<-->	Responsiveness	0.556	0.577
Risk 1	<-->	Risk 2	0.523	0.571
Risk 1	<-->	Transparency	0.192	0.378
Risk 1	<-->	Internet use	0.094	0.16
Risk 2	<-->	Transparency	0.051	0.14
Risk 2	<-->	Responsiveness	0.123	0.102
Transparency	<-->	Responsiveness	0.537	0.622

Source: own study.

Correlations displayed in the table suggest that all estimated latent variables are parts of a single interconnected system. Also, correlational patterns for manufacturers and service providers are roughly similar, pointing to a broad equivalence of this aspect of the measurement model. One particular insight concerns the Responsiveness variable. This construct was introduced to accommodate part of unexpected correlational patterns that emerged in the structural equation analysis. Based on its associated Likert-scale items, it could be interpreted as the capacity of a company to keep its information flows up-to-date, which implies reacting quickly to consumer feedback and frequently amending the content of their web pages and other means of communication. From the correlation coefficients in Table 3 it seems that Responsiveness is not an intrinsic and exclusive part of any single DART element but it is related to all of them – either directly (Transparency and Access 2) or indirectly (the rest of constructs through links with Transparency and

Access 2). Statistically, the measurement model is more robust if the three manifestations of Responsiveness are brought together under a distinct latent variable. This has also a substantive appeal, since Responsiveness seems to be enabled by the use of Internet technologies and in the literature many aspects of value co-creation are believed to be facilitated by the rise of the internet. This obvious link of Responsiveness with the main driving force of value co-creation justifies – in our view – the inclusion of this variable in our model.

To facilitate further analysis, the regression weights of Table 2 were used to create factor scores for each firm in the sample, which resulted in 7 new variables representing the respective aspects of value co-creation. These new variables were entered into a regression equation as predictors. In addition, to control for two important characteristics of firms, the regression model was complemented by an economic sector variable (0 for manufacturing and 1 for services) and the size of the company measured by the number of employees. The final model specification step was to check for interactions between economic sector and other variables and input significant interaction terms into the equation. The resulting model is depicted in Table 4.

**TABLE 4. Parameter estimates of the multiple regression model**

Parameter	B	Std. Error	t	p-values	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
<b>Intercept</b>	24.894	1.915	13.002	<b>.000</b>	21.130	28.658	.299
<b>Dialog</b>	4.290	1.662	2.581	<b>.010</b>	1.022	7.558	.016
<b>Access 1</b>	3.802	1.719	2.211	<b>.028</b>	.422	7.182	.012
Access 2	-4.169	3.370	-1.237	.217	-10.795	2.457	.004
Risk 1	1.418	2.302	.616	.538	-3.107	5.943	.001
<b>Risk 2</b>	5.197	1.814	2.864	<b>.004</b>	1.630	8.763	.020
Transparency	-1.527	2.733	-.559	.577	-6.899	3.845	.001
Responsiveness	3.487	3.371	1.034	.302	-3.141	10.115	.003
<b>Economic Sector</b>	14.962	2.868	5.217	<b>.000</b>	9.324	20.600	.064
No. of Employees	1.405	1.267	1.109	.268	-1.086	3.896	.003
<b>Responsiveness* Economic Sector</b>	-7.035	3.280	-2.145	<b>.033</b>	-13.484	-.587	.011

Notes: Dependent Variable: Percentage of New and Modified Products in Total Revenues; R-squared for the model = 0.181.

Source: own study.

As indicated by the R-squared, the whole set of predictors accounted for 18.1% of the variance in the dependent variable. Further investigation of the model quality did not reveal any issues with multicollinearity, non-normal distribution of residuals or heteroscedasticity.

There were six significant parameters in the model: the intercept, Dialog, Access 1, Risk 2, Economic Sector and the interaction between Responsiveness and Economic Sector. Effect sizes of individual predictors can be determined from eta squared coefficients, which reflect the proportion of unique variance in the dependent variable explained by each predictor [Field, 2013]. The variable with seemingly the strongest effect on the Percentage of New and Modified Products was Economic Sector, which was a dichotomous attribute coded 0 for manufacturing and 1 for services. Here, with all other predictors held constant, the share of revenues from new and modified products generated by service providers was, on average, 14.96 percentage points higher than the share of manufacturers. The second most important predictor was Risk 2, closely followed by Dialog 1, and Access 1. For these aspects of value co-creation the b values were positive, meaning that increased levels of involvement, *ceteris paribus*, corresponded with higher levels of innovativeness. Relatively weakest was the effect of interaction speed, whereby increased Responsiveness was more characteristic of less innovative service companies (coded as 1 on the Economic Sector variable), while in manufacturing firms Responsiveness was not linked with any systematic differences in innovativeness. The intercept had a practical interpretation since all metric predictors (here, non-dichotomous) were standardized before entering into the model, and the only categorical variable – Economic Sector – could legitimately take the 0 value. As such, the intercept was the percentage of new and modified products in the revenues for a hypothetical manufacturing company with all metric predictors set to their means (the mean is 0 for a standardized variable). This number (24.89%) was very close to the average for all manufacturers (23.99%) and was quite distinct from the mean for service companies (38.95%).

To summarize, **there was a significant positive effect between involvement in value co-creation operationalized by the DART model and innovativeness. However, not all aspects of VCC were associated with higher levels of innovation, which gives only partial support to the research hypothesis.**

## Discussion

The study findings are in general agreement with Gustafsson et al. [2012], who surveyed 334 managers to investigate communicative aspects of value co-creation in terms of frequency, direction, modality and content (it should be noted, though, that in contrast to our project the scales employed by these authors were more concerned with innovation co-creation than experience co-creation). They found that the frequency, direction and content of communication with customers corresponded to higher innovation success rates when innovations were incremental. For radical innovations, only the frequency of communication mattered. Even though we did not distinguish in our survey between

radical and incremental innovations, it seems certain that the vast majority of innovations in the investigated industries were of the latter kind.

Considering that dialog is “a form of reflective conversation that enables actors to alter managers’ mental models through conscious, critical exploration” [Jacobs, Heracleous, 2005] it is not surprising that its association with innovation was positive. After all, innovation – especially that of a strategic kind – calls for shifts in existing mental models. Intense dialog with customers was formerly found to be conducive to more intense and effective innovation practices (e.g. see a case study by Ayuso et al. [2006]), however this evidence was qualitative in nature, and so not directly comparable to the current research.

One previous quantitative study that found dialog with consumers supportive of better innovative performance was a survey of 149 managers of Taiwanese IT firms [Hsieh, Hsieh, 2015]. There the assumed concept of dialog (dubbed “dialogic co-creation”) encompassed three subconstructs labeled as “customer initiative”, “provider initiative” and “continuity”. The Likert-type indicators employed to estimate the three subconstructs suggest that the domain of the dialog construct also partially included the DART elements of Transparency and Access. The findings show that the impact of dialog co-creation is significant, positive and occurs through mediating variables of “company-customer relationship”, “knowledge valuation” and “customizing capacity”. Thus, the outcomes are similar to those of our study, except here the model was framed without mediating variables assuming only direct regression paths between DART and innovativeness. This consistency of findings, despite methodological differences, suggests that dialog with consumers is a real, beneficial process that transcends cultural and industrial boundaries.

Another significant predictor in the model (Access 1) involved highly interactive practices that engaged consumers in the process of determining features of their desired offerings. Such interactions, in addition to providing increased utility to customers, are information rich for firms, which naturally leads to a higher chance of acquiring useful insights for product innovation. This observation of stronger positive effects on the innovative function of deep involvement with consumers is consistent with previous case study research identifying multiple benefits of engaging customers through highly-interactive Web 2.0 tools, both in terms of innovation and day-to-day business operations [Martini et al., 2014; Martinez Garcia, 2013]. Notably, the two cited papers investigated food and beverage industry firms (the same as the manufacturers in our study), making it more likely that our findings are quantitative reflections of similar underlying mechanisms.

The Risk 2 variable represents the active involvement on the part of the company to ensure that its products are bought only by customers who can fully benefit from their features, sometimes at the cost of discouraging those customers for whom the products would not be suitable. Such an attitude and behavior promotes trust, facilitates dialog, and gives additional opportunity to glean insights from customers, which can inspire creative ideas for modifications and completely novel offerings.

Interestingly, in the present research service firms showed a mildly negative association between Responsiveness and revenues from innovative products. One possible explanation is that many service companies in hospitality, tourism and catering rely on daily face-to-face dialogue with customers. These direct interactions provide ample opportunities for dialog with consumers, making for richer communication than internet exchanges. The lack of a positive impact of Responsiveness on innovativeness may be true when only very simple communication tools are used. More advanced communication techniques frequently result in valuable innovations. One such example can be found in a multiple case study of seven hotels, where high Responsiveness from the use of social media and other deeply involving on-line applications helped boost customer satisfaction and generate ideas for product innovation [Shaw et al., 2011].

## Academic and Practical Implications

From the academic perspective, our study provides further empirical evidence for the validity of the DART model, suggesting that its actual measurement structure could involve 7 instead of 4 hidden variables. Moreover, this conceptualization of co-creation appears to be more suitable for describing manufacturers than service providers but, in terms of its Dialog and Risk 2 components, both industries seem to show similar patterns of association. Evidence was also found of positive links between engaging customers in co-creation and innovativeness. As such, the obtained findings provide empirical support for one of the key foundational premises of SDL by showing that value co-creation could lead to business benefits derived from more and better ideas for product modifications and new concepts.

From a practical viewpoint, this study suggests that managers should consider increasing firm interactions with customers before, during and after product purchases. This may not only enhance customer experiences and product satisfaction, but also stimulate innovativeness. It is worth noting, though, that not all forms of co-creation provide equal benefits – it seems that only more active, involved efforts by a company can produce noticeably positive effects. These include conducting regular, two-way conversations with customers, offering them meaningful product configuration options and openly informing them of the risks and disadvantages of goods and services, even at the expense of losing those buyers who will find the offering inadequate to their needs. In the long run, however, this approach could increase a company's reputation, bringing in new customers and strengthening the loyalty of the existing ones.

## Limitations and Further Research

One limitation of this study is how we operationalized the value co-creation concept. Admittedly, the DART model is not perfect and a different approach could bring different results. However, considering that dialog, or its close equivalents, are the central elements of any co-creation concept, we are convinced that with alternative methods of operationalizing the possible differences will likely concern only the magnitude of the effect sizes and not the overall direction of relationships, which should remain positive.

The research design employed, even though it allowed us to estimate the general effect patterns, did not show precisely in which processes, e.g. technology and product development, manufacturing or commercialization, the insights from customers were used. Overcoming this limitation could be a valid objective of new research that may – for example – follow the framework outlined by Theyel [2012].

Also, the fact that the study was carried out in a single country and on a small set of industries (food, beverage, hotels and travel services) does not guarantee that the same patterns exist across other countries and industries. Finally, asking managers about their companies via quantitative interviews (though widely used in management science) may induce certain biases. It seems that several in-depth case studies on companies similar to those involved in the conducted survey could yield interesting, complementary insights about the underlying causal mechanisms linking co-creation with innovativeness. In addition, it would be worthwhile to attempt to replicate our research on samples drawn from different industries and countries. As the final suggestion for a follow-up study, it would be highly informative to run a survey with competing operationalizations of value co-creation to evaluate their validity and reliability, and attempt to develop a new, possibly more accurate, synthetic measurement approach.

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### Notes

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