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ORIGINAL EMPIRICAL RESEARCH

Value co-creation: concept and measurement

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Abstract The surge in academic and practical interest in the topic of value co-creation (VCC) highlights an equivocal understanding of its conceptual boundaries and empirical constituents. Our search of the diverse scholarly literature on VCC identified 149 papers, from which we extract the two primary conceptual VCC dimensions of co-production and value-in-use. Though the combination of these two distinct dimensions is theoretically necessary to describe VCC, 79% of the studies in our dataset consider only one or the other. Such underlying theoretical ambiguity may explain conflicting results in earlier studies and motivates our effort to offer four contributions to the literature. First, we conduct a rigorous review, integrating existing work to expose the theoretical core of VCC. Second, we utilize the results from our review to isolate the two main theoretical dimensions of VCC and expose the three conceptual elements which underlie each dimension. Third, we apply our theoretical findings to derive empirical measurement constructs for each dimension. Fourth, we refine, analyze, and test the resulting measurement index in an investigation into consumer satisfaction.

Keywords Value co-creation · Co-production · Value-in-use · Quantitative measurement · Service-dominant logic

This article is based on the first author's dissertation.

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Introduction

Value co-creation (VCC) has gained the attention of academics and practitioners as an overarching concept that describes collaboration between multiple stakeholders (Prahalad and Ramaswamy 2000). Fuelled by the influential study by Vargo and Lusch (2004) on a co-creative service-dominant logic (SDL) of marketing, research interest in VCC has grown in recent years. Yet, as theoretical and empirical work has blossomed in different directions, the theoretical roots of VCC have grown more ambiguous. Investigations of VCC in the contexts of (customer) relationships, stakeholder interactions, consumer centricism, co-design, self-service, co-production, relationship marketing, and experiential marketing (Cova 1997; Delgado-Ballester and Munuera-Alemán 2005; Fournier 1998; Holbrook and Hirschman 1982; Morgan and Hunt 1994; Oliver 1999; Pine and Gilmore 1998) have not adhered to a consistent theoretical perspective of VCC, resulting in an understanding that is equivocal at best (Cova et al. 2011; Ford 2011; Grönroos 2012; Leroy et al. 2013).

In this study, we seek to bring together extant work on VCC in order to advance the research questions of: What are the core conceptual elements of VCC? How do the underlying elements of VCC work? And how can we integrate insights from these questions to develop an empirical measurement approach that is faithful to the theoretical concept of VCC? Our exposition begins with a systematic review of the VCC literature. This first step organizes prior work according to each study's theoretical formulation of VCC. Integrating these diverse perspectives, we expose co-production and value-in-use (ViU) as the two peer, core conceptual dimensions of VCC. The former predominantly encompasses the aspect of exchange, while the latter is aligned with the view that value is always created in use, effectively bridging the theoretical chasm between the objectivity of exchange and the phenomenology of the service logic and offering much needed

theoretical rebalancing of perspectives (Leroy et al. 2013). Our review also highlights some of the problems generated by the disparity in core theoretical views of VCC. Focusing on two active dilemmas related to VCC, our review reveals that conflicting findings in the literature may stem simply from inconsistent theoretical formulations of VCC.

Motivated by and using constructs extracted from our literature review, we derive an integrated conceptual model of VCC and employ it in the development and testing of a measurement index for VCC. We assess the predictive relevance of the construct by associating it with consumer satisfaction. Discussion and conclusion follow.

VCC literature review

We reviewed prior literature related to VCC, starting with a keyword search around "co-creation" (and variations thereof) in the abstracts of research papers published between 2000 and 2012, using the ABI/INFORMS, Proquest, and Business Source Complete (EBSCO) databases to arrive at an initial pool of studies for review. We included relevant studies in marketing or marketing-related outlets. Investigations of VCC, and especially constructs such as co-production, exist in disciplines outside marketing and prior to 2000. However, the understanding of co-creation in the light of studies by Prahalad and Ramaswamy (2000) and the service logic has predominantly evolved post-2000 (the latest enumeration of the definitions of co-creation by McColl-Kennedy et al. (2012) indicates that 22 out of the 27 definitions pertain to the post-2000 period; the remaining definitions are both specific to co-production and are discussed and conceptualized in recent research). Thus, our review period focuses on the contemporary understanding of VCC as well as allied constructs, perspectives, and theories that include consumer culture theory (Peñaloza and Mish 2011; Xie et al. 2008), experience economy and marketing (Payne et al. 2009; Zhang and Chen 2008), relationship marketing (Haahti 2003; Payne et al. 2008), networks (Chandler and Vargo 2011), personality and motivation (Ferguson et al. 2010; Zheng et al. 2011), and social exchange (Dong et al. 2008; Füller 2010; Ng 2010).

We read the abstract of each paper identified in our search, filtering against two criteria. First, we assessed the pertinence of the research work to the concept of co-creation; second, we compared each study with already selected studies, seeking contributions that either added to or differed from theoretical co-creation elements we had already identified. The objective of our review was to inventory the conceptual domain of VCC. We found 53 articles across 26 journals that met our criteria and formed our content database of potential VCC constructs. In 21 of these studies, SDL or a related framework was indicated as the explanatory foundation of VCC, consistent with recent research in the field (Grönroos 2011). Focusing on SDL, our search identified conceptualizations of VCC spanning the co-creative efforts of firms, employees, customers, stockholders, government agencies, and other entities, but sharing the common thread that value is always determined by the beneficiary (sixth foundational principle of SDL; Vargo and Lusch 2004). Since SDL has emerged as a basic framework for research on VCC, we specifically examined the theoretical foundations of the SDL literature. As our review progressed, the concepts of co-production and ViU repeatedly emerged as the two major dimensions of VCC. Seeking to comprehensively map the conceptual domain of VCC, we expanded our literature search to specifically include both of these constructs. Thus, the content database comprised a total of 101 studies.

Value co-creation

In VCC, consumers assume an active role and create value together with the firm (Kohler et al. 2011; Prahalad and Ramaswamy 2004a) through direct and indirect collaboration across one or more stages of production and consumption (Hoyer et al. 2010; Payne et al. 2008; Payne et al. 2009; Roggeveen et al. 2012; Tynan et al. 2010). Engagement, interaction, self-service, and experience are recognized as the important elements of the joint creation of value (Bendapudi and Leone 2003). However, VCC is superordinate to such elements of co-production and customization as it extends beyond the production chain to the consumption and value delivery chain (Kristensson et al. 2008; Lusch and Vargo 2006; Prahalad and Ramaswamy 2004a; Sharma and Sheth 2004). Further, though contemporary researchers (McColl-Kennedy et al. 2012) have cataloged as many as 27 different definitions, these can be classified into one of two elements of VCC that we term co-production and ViU. Such delineation of theoretical dimensions of VCC is supported in earlier studies that broadly describe VCC as a cumulative effect of co-production and consumer competences (Chunyan et al. 2008; Etgar 2008; Grönroos and Voima 2013; Kristensson et al. 2008; Lusch and Vargo 2006; Lusch et al. 2007; Möller et al. 2008; Ordanini and Pasini 2008).

Theoretical dimensions of VCC

When there are few products and consumers' needs are simple, well-defined, and bounded within a choice-set, the firm can objectively understand the needs of consumers (Anderson 1983; Arndt 1985; Hunt 1976, 1990; Zinkhan and Hirschheim 1992). Therefore, market research offers an avenue to communicate and assess needs and propositions. This is the simplest and most distant form of co-creation between firm and consumer. More proximal efforts to engage consumers in co-creation include active participation in new product development (Chien and Chen 2010; Droge et al. 2010), engagement

in service delivery (Auh et al. 2007), service recovery (Dong et al. 2008; Heidenreich et al. 2014), and content providers' creation of online communities (Dholakia et al. 2009). However, these primarily co-productive interventions still consider consumers as exogenous targets and as resources of the firm (Arnold and Fischer 1994; Belk et al. 1988; Belk et al. 1989; Hirschman 1986; Thompson et al. 1989), incompletely characterizing VCC between firms and consumers.

VCC also describes the way actors behave, interact, interpret, experience, use, and evaluate propositions based on the social construction of which they are a part (Ligas and Cotte 1999; Lusch and Vargo 2006; Prahalad and Ramaswamy 2004b; Round and Roper 2012). Value can extend into future processes beyond the instant realm of exchange, or without the "direct" intervention of another party (e.g., through use, social relation, and joint construction) (Edvardsson et al. 2010; Peñaloza and Venkatesh 2006; Szmigin and Foxall 2000). This aspect of VCC as a lived or joint reality of use and experience is captured by the second dimension of VCC as the ViU construct.

Building on these two distinct elements of VCC, we develop a more nuanced conceptual view of each in order to explain the mechanisms of how they underpin VCC, and ultimately to source, group, and sort empirical elements associated with each. This process also enables a preliminary examination of our conceptual development thus far as it demands a clear and distinct articulation of sub-constructs that define co-production and ViU.

Co-production

Co-production consists of direct or indirect "coworking with customers" (Hu and McLoughlin 2012; Nuttavuthisit 2010) or participation in the product/service design process (Auh et al. 2007; Dato-on and Beasley 2005; Etgar 2008; Fang et al. 2008; Lemke et al. 2011). Customer participation might be evidenced in a facilitation role at the periphery of a firm's processes (Auh et al. 2007), or in an active role through the application of knowledge and sharing of information with the firm (Boselli et al. 2008; Ordanini and Pasini 2008). Co-production is also characterized by customer interaction through acts of mutual exchange, physical and mental activities, and access to mutual expertise (Ertimur and Venkatesh 2010). More generally, co-production is a set of activities carried out by economic and social actors within networks (Achrol and Kotler 2012; Vallaster and von Wallpach 2012; Vargo and Lusch 2008). It is executed through collaboration (Lusch et al. 2007) and dialog (Aarikka-Stenroos and Jaakkola 2012; Grönroos 2012) to integrate mutual resources into value configuration (Ballantyne and Varey 2008). Dialog in the activity of co-production indicates interactivity, deep engagement, and the ability and willingness to act on both sides (Prahalad and Ramaswamy 2004b).

As customers outlay resources in the co-production processes, it is considered both a cooperative act of joy and satisfaction, and an exploitative ploy of a profit-maximizing firm (Arvidsson 2011; Chen et al. 2011). Predominantly, in co-production, the locus of control of the process resides with the firm, which defines the nature and extent of co-production (Vargo and Lusch 2004). It, however, does not rule out the possibility of customers being psychologically involved in the co-production process (Krishna and Morrin 2008; Troye and Supphellen 2012). Several studies highlight equity in the form of mutualism, openness, and non-command relations (Arvidsson 2011; Ordanini and Pasini 2008) as an important ingredient of co-production. Equity describes the extent to which external stakeholders can feel a sense of ownership in the process. Thus, our literature review exposes three underlying elements of co-production that can be organized according to the categories of knowledge sharing, equity, and interaction (see also Table 3).

Knowledge (sharing) Knowledge sharing is the basic operant resource that comprises sharing consumers' knowledge, ideas, and creativity (Zhang and Chen 2008) in the articulation and expression of current and future needs. Sharing information from the repositories of accumulated previous learning, ideas, creativity, and real-life situations and roles between the firm and the consumer builds competence in the process and co-creates value (Maglio and Spohrer 2008). Sharing information results in better outcomes as compared to what would be achieved by working independently due to reconciliation, shared inventiveness, and better expression and evaluation of needs (Enz and Lambert 2012; Grover and Kohli 2012; Powell and Swart 2010; Ramirez 1999). The integrated perspectives that emerge due to knowledge sharing activate skills at various points in time and help address dynamic concerns, co-creating value (Fisher and Smith 2011).

Equity A firm's willingness to share control in favor of consumer empowerment and the consumer's desire to contribute to their role in co-creation activities is the essence of equity (Bolton and Saxena-Iyer 2009; Fisher and Smith 2011; Hoyer et al. 2010). Equity is manifested in the firm's customer centricism (Prahalad and Ramaswamy 2002), willingness to share control (Fisher and Smith 2011; Heiko et al. 2010), and provision of a facilitative environment (Payne et al. 2009; Storbacka and Nenonen 2011). Equity resists centralization tendencies to set in motion amorphous flows and unpredictable connections that enable joint action and congruence of interest and goals that in turn result in value actualization and superior integration of resources (Cova and Salle 2008; Echeverri and Skålén 2011; Fisher and Smith 2011; Grönroos 2008; Gummesson 2008; Karpen et al. 2012; Mele 2011; Peñaloza and Mish 2011; Vargo et al. 2008).

Interaction Interaction is the primary interface between parties undertaking co-production. It is an opportunity to understand, share, and serve needs, and to simultaneously assess and adapt resource commitments (Merz et al. 2009; Prahalad and Ramaswamy 2004a). Several studies have highlighted that the active role of customers in joint production is driven by their interactive and synchronous engagement (Edvardsson et al. 2011; Ordanini et al. 2011) and constructive participation (Chen et al. 2011; Hunt et al. 2012). Interaction manifests itself through participation (Grönroos and Ravald 2011; Kohler et al. 2011; Pongsakornrungsilp and Schroeder 2011), dialog (Payne et al. 2008), and engagement (Zhang and Chen 2008), and it enables intricate exchange by raising the possibility of generating solutions (Aarikka-Stenroos and Jaakkola 2012; Bagozzi et al. 2012). The praise, criticism, and suggestions about a product or service that are exchanged during interaction raise involvement of entities and improve sensing, responding, and bridging of spatial and temporal gaps in transactions (Archpru et al. 2011; Chan et al. 2010; Ramani and Kumar 2008; Verbeke et al. 2008). Consequently, combinations and solutions that achieve new and unique purposes are made possible (Ballantyne and Varey 2006). Lastly, interaction is also a source of value in itself because it has a discursive nature and it triggers social practices (Nambisan and Baron 2007; Vallaster and von Wallpach 2012).

As VCC considers customers endogenous to the process, it encompasses more than co-production, self-design, self-service, creativity, and new product development (Dahl and Moreau 2007; Moreau and Herd 2010). Hence, irrespective of the extent of co-production during the creation or delivery of a product or service, VCC is not fully defined or determined unless the result is used by customers (Sandström et al. 2008). In that light, we complete the conceptualization of VCC with the dimension of ViU.

Value-in-use

While value can be derived through interaction with the firm and its offerings, it can also arise through a process of consumption, which may be mostly independent of the company's intervention or exchange (Grönroos 2006; Moeller 2008; Vargo and Lusch 2004). ViU extends beyond the co-production, exchange, and possession of a good or service, and it requires customers to learn how to use, repair, and maintain a product or service proposition (Vargo and Lusch 2004). ViU is derived from the user's use context and processes including time, location, or uncertain conditions (Gummerus and Pihlström 2011; Vargo and Lusch 2004), unique experience, stories, perception, and symbols (Cova et al. 2011; Fisher and Smith 2011), and relational affect (Arnould and Price 1993; Grove and Fisk 1997; Jones and Millar 2010; Lusch et al. 2007). Value is co-created in use because customers assess and determine the value of a proposition on the basis of the specificity of their usage (Edvardsson et al. 2011; Vargo and Lusch 2004, 2008). ViU manifests in ways of mutual application of skills in the form of operand and operant resources of actors (Ballantyne and Varey 2006), which result in integrated stages of transformation (e.g., spa treatment that transcends from service to sense of relaxation through the use process; Moeller 2008).

ViU is the customer's experiential evaluation of the product or service proposition beyond its functional attributes and in accordance with his/her individual motivation, specialized competences, actions, processes, and performances (Edvardsson et al. 2005; Edvardsson et al. 2010). The dyadic and networked actions of consumers reinforce their own beliefs and identity and result in associations and relationships with the proposition (Heinonen and Strandvik 2009) that enrich customers' lives (Merz et al. 2009). The opportunity to apply and legitimize their own "meaning" or subjective assessment generates usage value (Ballantyne and Varey 2006; Snepenger et al. 2007). Additionally, in ViU, participants' mental models attach value to the usage processes (Macdonald et al. 2011). These mental models have a specificity and uniqueness that offer personalization—a unique consumption value through the enjoyment of doing, or an idiosyncratic use process (Lemke et al. 2011; Sandström et al. 2008). Thus, our review of the literature identifies three elements that comprise ViU—experience, relationship, and personalization (see also Table 3).

Experience Experience is an empathetic, emotional, and memorable interaction that has intrinsic value (Ballantyne and Varey 2008; Lusch and Vargo 2006). Experience is an artifact of products and services provided by the firm (Bolton et al. 2004) and is also derived from consumers' linking of these artifacts across their physical, cognitive, and affective dimensions, resulting in use value (Edvardsson et al. 2005). Thus, the customer co-creates value through experience in use and even in situations of product or service trial (Edvardsson et al. 2010; O'Neill and Palmer 2003). Experience manifests in the form of intricate customer cognitive and affective processes arising from extensive participation and behavioral actions, hedonism (Lemke et al. 2011), spontaneity, and integrated roles (Archpru Akaka and Chandler 2011; Heinonen et al. 2010; Merz et al. 2009). Experience generates use value because it offers a sense of self-transformation; for example, a utopian marketplace is a source of sensing displace, creating playspace, and performing artscape (Maclaran and Brown 2005). Similarly, the mindscape-related themes that combine entertainment, therapeutics, and spiritual growth generate value through mythological appeals (Kozinets et al. 2002).

Personalization Personalization refers to the uniqueness of the actual or perceived use process, the value being contingent

on individual characteristics (Etgar 2008; Karpen et al. 2012; Lemke et al. 2011). Personalization results in possibilities of cultural reshaping and reinforcement through the uniqueness of the process (DeBerry-Spence 2008; Kates 2004) because the personalized proposition extends the boundaries of realized consumer value and enables fundamental reconfiguration of future production of use and exchange value even beyond the purview of firm and consumers (Cova et al. 2011). Personalized experience manifests in the form of customer immersion (Haahti 2003), application of specialized competences (Edvardsson et al. 2005), extraordinary experience (Sandström et al. 2008), and a supportive environment for the customer's own unique usage processes (Macdonald et al. 2011).

Relationship Joint, reciprocal, and iterative processes are the basis of the relationship between the customer and the object in an environment of active communication and/or engagement. Relationship and collaboration result in customer empowerment to develop solutions (Bonsu and Darmody 2008) and thereby create value. Madhavaram and Hunt (2008) argue that customer relational capabilities create value because they increase the possibilities to sense-and-respond and self-reinforce value cycles of dynamic exchange instead of linear chain of interaction. The interdependence of needs during usage builds cooperative relations between parties, resulting in connected sets of practices that are a source of value in themselves (Archpru Akaka and Chandler 2011; Williams and Aitken 2011; Wong et al. 2010;). Relationship manifests in the form of collaboration (Sawhney et al. 2005), outside–in perspective (Mohr and Sarin 2009), engagement and use of mutual resources (Ng et al. 2009), and reciprocity (Chandler and Vargo 2011).

Evaluation of VCC literature

Validation of conceptual completeness

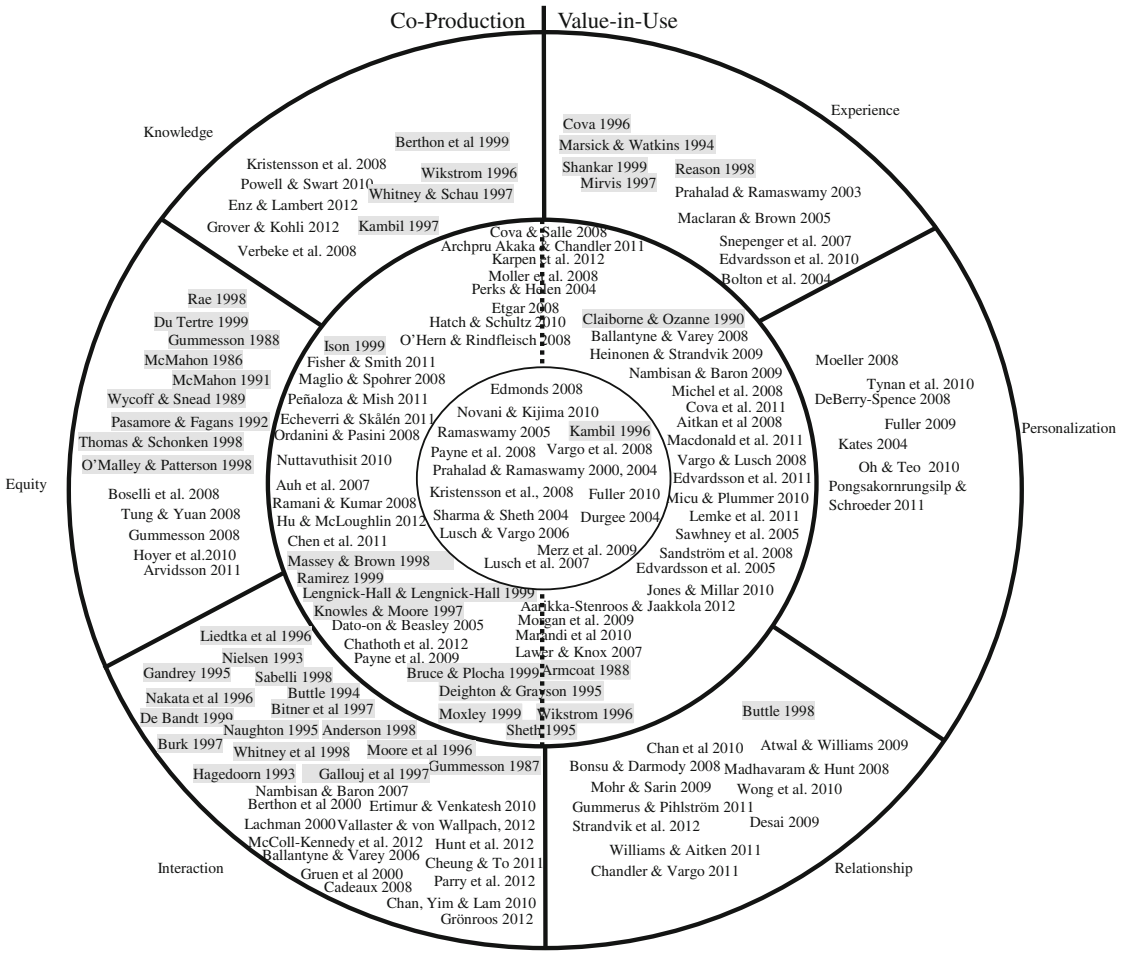
The diversity of theoretical elements in the concept of VCC indicates that a measurement process "must go hand-in-hand with strong conceptual development" (Brakus et al. 2009, p. 52). To examine the conceptual completeness of our synthesis of prior work, we projected the results of our review against a retest sample of the literature.

To ensure we captured the concepts critical to the operationalization of co-production, ViU, and VCC in general, we conducted a validation test. Since the literature suggests a significant increase in activity around VCC after the year 2000, we applied our conceptualization to literature we had not previously considered, work prior to the year 2000. This validation enables us to expose any elements possibly missing in our conceptualization and assess whether the formulation of VCC might be skewed by recent activity in the field. We used the same procedure from our initial review to identify and treat research papers, including work from disciplines outside marketing. A total of 48 papers were analyzed. Only two studies did not directly match our classification—"consumers are a resource in firm processes, fulfilling co-production responsibilities" (Bettencourt 1997, p. 385–6) and "customers … serving as key suppliers of design information and inputs … co-production roles emerged in services and to limited extent in manufacturing" (Lengnick-Hall 1996, p. 795–6). These did not reveal additional dimensions or sub-dimensions of VCC but rather support a general observation of skew in earlier studies toward co-production (McColl-Kennedy et al. 2012). The reliability of the coding of the content from each study to a specific sub-dimension was assessed using Cohen's Kappa (κ) and a $\kappa=0.76$, indicated substantial inter-rater reliability (Landis and Koch 1977). Disagreements were resolved to arrive at the final categorization of the content. Bringing together the dimensions of VCC (co-production and ViU), with the three elements of each, we combine our literature review and conceptual model of VCC in Fig. 1.

VCC conceptualizations in the literature

Several studies in our dataset include elements of both co-production and ViU in their formulation of VCC (examples include Chunyan et al. 2008 and Payne et al. 2008, indicated along the dotted line and in the center of Fig. 1). However, a majority of studies (79%) adopt only one or the other (for example, co-production focus: Mallapragada et al. 2012; ViU focus: Ostrom et al. 2010). Most studies define the concept of VCC as a function of the research question at hand. For example, definitions by Sarker et al. (2012) and DeBerry-Spence (2008) are personalization-centric; Auh et al. (2007), Kohler et al. (2011), and McColl-Kennedy et al. (2012) focus on participation and interaction of consumers in firms' processes; Edvardsson et al. (2005) consider experience as a source of value co-created; Grover and Kohli (2012) and Gummesson (2008) emphasize equity; whereas Sorescu et al. (2011) emphasize relational bonding. Thus, our complete conceptualization gels with available definitions as it integrates these various perspectives on VCC.

Organizing the literature according to theoretical base reveals that VCC is a third-order construct, with two dimensions each having three underlying elements. Earlier literature is skewed toward the concept of co-production. Of the 149 studies in our sample, 71 studies (48%) involve only co-production, 46 studies (31%) involve only ViU, while 32 studies (21%) consider both the dimensions of VCC. Only 2.7% of studies in our sample examine all the sub-dimensions that conceptually



Shadings indicate pre-2000 research

Count of Studies by Cell (Total = 149)

Knowledge: 9	Equity: 14	Interaction: 29
Experience: 10	Personalization: 7	Relationship: 12
2 sub-dimensions: 35	3 sub-dimensions: 17	4 sub-dimensions: 8
5 sub-dimensions: 3	6 sub-dimensions: 4	
More than one element of co-production: 18		More than one element of ViU: 16

Both dimensions and at least four elements (inner-most circle): 15

Fig. 1 Graphical VCC literature review

complete VCC. Interaction is the most prevalent element of VCC (mentioned in 44% of studies in our sample), while sharing of knowledge between firm and consumer are least addressed (19% of studies in our sample). Depicted graphically in Fig. 1 and quantitatively elaborated in Table 1, studies in our dataset only considered, on average, 3.4 of the 6 sub-dimensions necessary to conceptually complete VCC.

Conflicts in existing literature

Exploring whether some controversial results generated by prior literature are an artefact of incomplete conceptualization of VCC, we discuss two dilemmas exposed in our review. The first dilemma relates to ambiguity around costs and benefits to different stakeholders involved in the co-creation process. Here, we observe that conflicting findings related to customer

Table 1 Sub-dimension wise representation in prior literature

	Sub-dimensions					
Aspect	K	E	I	X	P	R
Entire dataset						
Representation count (number of studies where this sub-dimension is considered)	28	53	66	49	30	48
Representation percentage (%)	19	36	44	33	20	32
Subset of dataset that considers at least one sub-dimension of co-production and at least one sub-dimension of ViU (those studies in the "core" of Fig. 1)						
Representation count (number of studies where this sub-dimension is considered)	7	24	20	22	12	23
Representation percentage (%)	23	77	65	71	39	74

K=Knowledge sharing, E=equity, I=Interaction, X=Experience, P=Personalization, R=Relationship

satisfaction and employee satisfaction could be attributable to alternative theoretical foundations of VCC. In studying employee satisfaction, Cova and Salle (2008) view VCC through a ViU lens and find co-creation associated with a positive environment characterized by the empowerment of employees, while Chan et al. (2010), adopting a co-production focus, connect employee job stress with VCC. Investigating customers, Zwick et al. (2008) associate the co-production dimension of VCC with the exploitation of consumers, while Karpen et al. (2012) and Heidenreich et al. (2014), in situations of service recovery, find that VCC, considered through a ViU lens, enhances the customer value network.

Differences in outcome of VCC form the basis of a second dilemma. From a co-production perspective, Buchanan Oliver and Seo (2012) and Echeverri and Skålén (2011) identify both value creating and value destroying outcomes associated with VCC, while related work assuming the ViU perspective characterizes outcomes as specifically positive and related to trust, learning (Lambert and Enz 2012), and authenticity and sustainability (Aitken and Campelo 2011). These differences may be a function of an efficiency outcome focus in studies based on co-production (Enz and Lambert 2012; McColl-Kennedy et al. 2012), versus an effectiveness outcome focus in studies based on ViU (Chang and Gotcher 2010; Tynan et al. 2010), and highlight the uncertainty of whether earlier findings describe empirical dilemmas in VCC or theoretical differences in the formulation of VCC. These findings motivate the next steps of our study (see Table 2), the creation and test of a conceptually complete measurement index that considers both theoretical dimension of VCC and the three underlying elements of each.

VCC measurement index creation

In addition to establishing a theoretical base, our review of prior research provides a rich source of measurement indicators. Our first step in this process of creating a measurement index consists of extracting and coding measures from extant studies according to the model we articulate in Fig. 1. Two coders otherwise unrelated to the project classified existing measures according to the six identified elements, with the freedom to code a given measure to more than one of the six elements, or into a not-applicable category that would be reassessed if additional elements emerged. Simple agreement across coders was 0.73, and the more conservative Cohen's Kappa was $\kappa=0.69$, indicating substantial IRR (Landis and Koch 1977). One element was marked not-applicable. Disagreements were resolved mutually and allocations are shown in Table 3.

Construct measurement is an important and contentious issue in marketing, and one question that frequently arises is whether a construct should be formative or reflective. Jarvis et al. (2003) report that 29% of studies published across four leading journals in marketing during a 24-year period improperly specified formative and reflective constructs. Such misspecifications result in conceptual incompleteness and a biased structural model (MacKenzie et al. 2005; Petter et al. 2007). While prior research has attempted to measure VCC as a reflective construct (Ng et al. 2010), we argue that the unidimensionality across such measures is mismatched with the theoretical foundations of VCC we establish in our review of the literature. Our expectations are supported by the four criteria established by Jarvis et al. (2003) in determining whether to use a reflective or a formative measure. These authors recommend assessing whether the measures can be described as being: (1) the cause and not a manifestation of the construct, (2) non-interchangeable, (3) are elements each capturing a unique aspect of the construct, and (4) not necessarily co-varying with the construct. As elements of VCC satisfy each of these criteria, we identify VCC as formative (Jarvis et al. 2003). From a modeling perspective, we describe the formative construction of VCC using the following equation:

$$\eta_q = \sum_{p=1}^{Pq} \gamma_{pq} x_{pq} + \delta_q,$$

where γ_{pq} is the coefficient linking each manifest variable x_p (MV) to the corresponding latent variable η_q (LV) and δ_q is the error term that accounts for the portion of the LV not accounted for by the respective block of MVs.[1]

For index construction of VCC, we follow the process of specifying content, specifying indicators, assessing indicator collinearity, and assessing external validity as suggested by

[1] To identify the model, we used reflective measures that captured a specific aspect of the latent construct. Such an approach is suggested only to identify formative models, which are underidentified, and need to be either placed in a bigger overall model, or be related with at least two reflective measures (e.g., Bollen 1989; Diamantopoulos and Winklhofer 2001; Jarvis et al. 2003; Reinartz et al. 2004).

Table 2 Study process and distinct steps

Objective	Process	Outcome
1. VCC literature review		
Step 1: Establish theoretical core of VCC	Literature review: co-creation; ViU; co-production; service-dominant logic	Two primary theoretical dimensions of VCC
Step 2: Detail elements	Classify unique elements underlying the two main dimensions of VCC	Each VCC dimension composed of three elements
Step 3: Validate conceptual completeness	Review of research pre-2000	No additional concepts emerged
2. Generate measures for VCC construct		
Step 4: Sort studies for unique measurement of concepts	Classify measurements according to concepts (summary grouped and coded in Table 3)	Establish specific and unique elements
Step 5: Specify indicators from established scales	Extract standard scales relating to indicator variables identified in literature review	120 measures from literature plus 162 measures from existing scales
Step 6: Specify indicators: pool, de-duplicate and validate qualitatively	Pool scales, remove duplicates and present remaining set to a panel for identifying distinct and face-valid measures	Pool reduced to 175 measures, of which 37 considered distinct
3. Assess indicator collinearity		
Step 7: Assess indicator collinearity	37 measures used in a survey of 52 "expert-managers". Multicollinearity assessed by regressing each measure with the remaining. VIF≥5 was used as rejection criteria.	27 measures with VIF < 5 used for data collection and subsequent analysis
4. Construct and test index		
Step 8: PLS analysis (sample 1)	First large sample measurement survey (n=228) and analysis using SmartPLS	Final index for the 3rd order co-creation construct
Step 9: PLS analysis (external validity, sample 2)	Second large sample validation survey (n=230) and analysis using SmartPLS	Externally validated index for the 3rd order co-creation construct

* Based on four steps of index construction suggested by Diamantopoulos and Winklhofer (2001)

Diamantopoulos and Winklhofer (2001). Content specification is a critical step for precision in the composition and meaning of a latent construct and arriving at a census of measures (Bollen and Lennox 1991; Diamantopoulos and Winklhofer 2001).

Sourcing measures

We specify indicators and assess indicator collinearity, seeking to cover the scope of the VCC construct without issues of multicollinearity or loss of parsimony (Bollen and Lennox 1991; Diamantopoulos and Winklhofer 2001; Edwards and Bagozzi 2000). Research on scale or index construction benefits by employing dimensions for which scales have already been developed and the anchor dimensions are distinctly identifiable from research in basic disciplines such as psychology (e.g., brand personality scale (Aaker 1997) or brand attachment (Thomson et al. 2005)). These earlier studies act as a reliable source of measures for the respective constructs. We found neither a previously published measurement for VCC nor any complete study of the measurement of co-production, ViU, or related constructs, though we observed recent efforts in this direction in a doctoral thesis (Devasirvatham 2012) and a working paper (Ng et al. 2010). Hence, we aggregated measures from two sources: (1) our review of the extant literature on VCC and (2) earlier scales that tap into some subset of the six elements of VCC. From our review of the literature, we generated an initial pool of 120 individual measures that were assigned to one of the six elements underlying co-production or ViU. We then sourced additional measures from established scales in the two volumes of Handbook of Marketing Scales, yielding 162 additional measures.

Purifying measures

After removing clear duplicates, our two sources yielded 175 measures. We then checked for redundancy across these 175 measures and purified for face validity. In contrast to unidimensional reflective measures, dropping measures from a formative construct might adversely affect content validity (MacKenzie et al. 2005). At the same time, as formative measures are based on multiple regression analysis, high multicollinearity between the measures affect coefficients' stability, resulting in indicator validity bias and estimation difficulties (Bollen and Lennox 1991). We tested for measure redundancy to select measures (Rossiter 2002) for the six elements of VCC, using a qualitative and a quantitative assessment.

Table 3 Content-database of VCC Studies

Study	Concept	Code*
Co-Production		
(Dato-on and Beasley 2005)	Consumer participation and mutual dependence on firm in the process of production, self-service, joint production	I E
(Auh et al. 2007)	Customer participation in the service creation and delivery in a cooperative manner	I
	Prior preparation, sufficient inputs, timely response to service provider	E
	Facilitate service provider (make their job easier)	K
(Ordanini and Pasini 2008)	Consumer's active role in production	I
	Consumer's openness for releasing its existing knowledge and expertise, with the service provider	E/K
(Tung and Yuan 2008)	Mutualism	E
(Cadeaux 2008)	Participation	I
(Etgar 2008)	In the production process – consumers participation in one or more of the activities of network chain of the firm (design, production, delivery, executing use)	I
	Encompasses all cooperation formats between consumers and production partners (the firm or other users and agencies)	E
	Information provision	I
(Boselli et al. 2008)	Customer contact, participation, involvement	I
	Mutual exchange	E
	Access to mutual expertise and exchange	I
(Ertimur and Venkatesh 2010)	Consumers' both mental and physical participation in the production and the delivery process	I
(Arvidsson 2011)	(perceived) consumer exploitation as they participate	E
	Non-command or non-wage type of relationship, resources are more like "commons"	E
(Chen et al. 2011)	Constructive participation in the service process	I
	Combining and exchanging resources with a collaborator	K
	Open response to requests, prior preparation for meetings	E
	Consumers provide suggestions, and communicate proactively to service providers. Are primary source of creative ideas.	K
	Co-operative contributions to the service process	E
(Cheung and To 2011)	Engaging customers as active participants in the organization's work	I
	Willing to put in a great deal of effort in successful service delivery (such as fill-in a bank-in form or complete other required forms to accelerate their process; co-operate with new employee; willing to assist new customer, say by helping about where to queue)	
(Hunt et al. 2012)	Outcomes are jointly produced	I
(Parry et al. 2012)	The customer plays an active role in developing the service offering	I
	Multiple parties resources are integrated to create a value proposition	
(Chathoth et al. 2012)	The interactive nature of services	I
	Customer participates in creating the core offering itself through shared inventiveness and co-design	E
	Customer's role is relatively passive, and the process is firm-centric and less transparent	E
Value in Use		
(Edvardsson et al. 2005)	It is value creation through service - customer perspective and interaction that results in experience and perceptual value	X
	Application of specialized competences through deeds, processes, and performances (in use)	P
(Ballantyne and Varey 2006)	It is generated at time of use, through experience (interaction with (and not, to) the customers) – relational, communicative, and knowledge interactions	X
	VIU is trust and dialog, which generate value in new ways through use experience	X
(Snepenger et al. 2007)	It is the associated "meaning" or the subjective assessment that frames the experiences of a proposition	X
(Ballantyne and Varey 2008)	It is the value beyond exchange value, through use, and experience	X
	Firms find multiple ways of interacting with stakeholder groups – beyond the usual market-based roles	R
(Michel et al. 2008)	Firms apply skills in their offerings, on which consumers apply their skills – (this affects their experience) and thus value is co-created	X/R
	The firm's offering acts as an integrator between the firm and self-sufficient consumer groups (IKEA)	R
(Moeller 2008)	VIU can be through consumer's integration into the transformation stage (e.g., spa treatment), or can be beyond the actual usage (e.g., recreation beyond health benefits of the spa)	P

Table 3 (continued)

Study	Concept	Code*
(Sandström et al. 2008)	Cognitive evaluation of the service experience, beyond the acquisition and benefits of core offering	X
	"extraordinary" experience – can be unique for every customer and occasion of consumption	P/X
	Uniquely determined by consumers through consumption – unique act and the enjoyment of doing	P
(Heinonen and Strandvik 2009)	It is the experienced value of the consumer – through extensive participation and behavioral actions	X
	Value for customers is created throughout the relationship with and the service provider's support of customers' value creation	R
(Merz et al. 2009)	It is consumer perception of value from the usage	X
	Dyadic relations that enrich consumer's lives	R
(Edvardsson et al. 2010)	It is the customer experience in the consumption process, the experience is inextricably linked with the VIU (e.g., test drive)	X
(Gummerus and Pihlström 2011)	VIU is based on interaction between a user and an object in the use context (time, location, lack of alternatives, uncertain conditions, and conditional values)	R
(Macdonald et al. 2011)	It is the customer's usage process	X
	The role of the supplier–customer relationship – supplier's contribution to the process, and support for the customer's own usage processes	R/P
	Customer co-creates value through interaction with the provider and other customers, it implies that the customer's mental model includes these usage processes	R
(Lemke et al. 2011)	Experience quality and the value perception (of quality) – functional and/or hedonic outcome that is directly served through product/service usage	X
	A degree of personalization, that co-creates idiosyncratic VIU	P
	Resource integration with those of the supplier	R
(Strandvik et al. 2012)	A needing instead of an offering is at the centre; instead of customer involvement and participation, it is the seller adjustment, involvement, and participation – instead of consumer's need assessment, it's about firm trying to fit into the value creation of the consumer and facilitate the process	R
(Aarikka-Stenroos and Jaakkola 2012)	Engage in active dialog and interaction with the customer regarding how to use the offering – suppliers apply their specialized professional skills, methods and judgment, while customers contribute resources in order to create optimal VIU	R

* Concepts grouped with Co-production are coded as (K) nowledge, (E) quity and (I) nteraction) and with Value-in-use as e (X) perience, (P) ersonalization, (R) elationship

The pooled measures from different sources were checked for redundancy by an independent panel of investigators. The panel comprised three senior doctoral candidates in a leading PhD program in management (fourth year and beyond). The investigators had prior exposure to scale development procedures through their own research or coursework but were unaware of the focal study. The panel checked each measure for face-validity and indicated suggestions for improving the measures. Investigators then clustered measures, retaining the most suited and unique set of measures for a particular cluster. Within clusters, the panel sorted to identify the most precise and distinct measures, testing for agreement of at least two of the three investigators (IRR≥0.67) over the expressed uniqueness of a measure in a cluster. Finally, 37 measures were retained. Thereafter, in the second round, and to ensure proper aggregation, the 37 measures were evaluated using the Q-sort technique (Strauss and Corbin 2007). Each panel member performed the task independently and then brainstormed to iteratively resolve all major disagreements in order to classify the 37 measures across the six elements, further validating the original sorting.

Indicator collinearity

In our next step, we surveyed 52 senior managers not otherwise involved in this project using a paper–pencil questionnaire that presented brand management scenarios, with the two central actors in VCC being the company "owning" the brand and its consumers (or clients). The average experience of the executives was 18.9 years, and 20 industry groups were represented in the sample. The survey was implemented as part of a marketing session, where managers participated voluntarily. Respondents chose one brand. Then, we presented each of the 37 VCC measures on a five-point Likert scale,

asking respondents to determine the level to which they agree or disagree, with two additional points on our Likert scale of "not clear" and "not applicable," in order to re-evaluate measures for possible ambiguity or poor generalizability.

We used these data to identify the relevance of each of the measures across diverse businesses and improve all measures marked "not clear" in more than five cases. There was no consistent issue of non-applicability across the 37 measures. To rule out multicollinearity as an explanation for the inflated coefficient, the variance inflation factor (VIF) was inspected. We regressed each of the measures as independent variable against all others as predictors, and tabulated the R^2 for each such regression. Subsequently, we calculated the VIF for each of the measures using the R^2 value of the respective model (see Table 4, which offers an initial as well as improved VIF of measures). Studies in extant research on index development have used a criterion of VIF ranging from less than 10 (Bruhn et al. 2008) to less than 3 (Arnet et al. 2003; Diamantopoulos and Siguaw 2006). We followed a cut-off of VIF greater than or equal to 5 (Dagger et al. 2007; Hair et al. 2012) to indicate multicollinearity and eliminated 10 measures.

Measurement index testing

First empirical study: index test

We externally validated our measurement index and associated relationships using a sample of students in no other way related to the project. We used the context of a diverse set of co-created brands, identified in published cases and articles on the co-created service system. In each instance, the user is actively involved in the value creation process. The use of brand names provides an anchor to develop the scenarios (there is no centrality of "branding" per se in a scenario, but we start with brand as we seek to capture aspects of co-creation in a specific situation as realistically and accessibly as possible). For improved generalizability, and as a good practice (see Brakus et al. 2009), we chose seven brands that simultaneously offer diversity (across products and services) and richness (i.e., degree of details available) around co-creation. These seven brands were Subway (co-production of a food offering), threadless.com (design, purchase and usage of garments), Wikipedia (consumer as content producer and user), Tide detergent (P & G Connect + Develop™ initiative), Nike, Audi (replaced by local car name Maruti, design of accessory), and Axe deodorant (product development story of Axe deodorant). The seven national and multinational brands offer diverse brand-equity profiles, represent utilitarian as well as hedonic consumption situations, and represent products as well as services. Most are gender-neutral brands and well-known to a student population, which formed the sample for this study. Additionally, our selection of brands includes a brand as a service system that was predominantly co-created by default (threadless.com), as well as firm-driven co-creation initiatives (e.g., the P&G Connect + Develop™ initiative).

In addition to the seven pictorial and text-based vignettes, we also offered an eighth one as a text-based, context-free description of a general co-created situation.[2] All vignettes were framed with a description of co-creation and used published case studies and secondary resources from websites of respective companies (e.g., threadless.com; refer to Appendix for a sample). This diverse set of vignettes, underpinned by the common phenomenon of VCC, helps ensure that findings are context-free and generalizable. In the vignettes, the interaction processes between brands and consumers was described for one or more of the stages of design, sales, purchase, consumption, and post-consumption activities. We do not claim that all stages were present in all cases. That was neither possible nor required, because irrespective of the stage, the vignette was based on the same underlying description of VCC. Our objective was to use the scenario as a strong stimulus to bring respondents as close as possible to the actual co-creation state; in most cases, it was a context which the respondent had recently experienced and gave respondents additional information regarding one or more of the co-creation stages. Respondents self-allocated to one brand, based on their perceived level of awareness. A randomly selected group of respondents was allocated to the general situation (the eighth vignette) by the researchers. An initial study-brief encouraged respondents to imagine the actual experience and interaction, and think broadly about the context beyond the description contained in the vignettes. Our method is in line with earlier studies on scale development, e.g., Brakus et al. (2009), who use instructions for respondents to vividly imagine an experiential brand and respond to the questionnaire.

[2] A general description of VCC was finalized through an iterative process from evidence gathered for VCC from extant research. The information collated under each dimension was reviewed iteratively to create a coherent definition. In the second stage, these descriptions were brought together to form a coherent description of VCC. The task was performed by each author independently and then together to arrive at a final description. The authors can provide these vignettes upon request.

Table 4 Individual item sources, measures, and analyses

Sub-Dimension	Name	Item measures	Manager's data		Validation data (Sample 2)	
			R^2	VIF	R^2	VIF
Co-Production						
Knowledge (Idea; Creativity)	K1	The party was open to my ideas and suggestions about its existing products or towards developing a new product	0.75	4.01	0.09	1.11
	K2	The party provided sufficient illustrations and information to me	0.72	3.59	0.47	1.88
	K3	I would willingly spare time and effort to share my ideas and suggestions with the party in order to help it improve its products and processes further	0.72	3.61	0.27	1.37
	K4	The party provided suitable environment and opportunity to me to offer suggestions and ideas	0.72	3.58	0.49	1.97
Equity (Access; Transpar-ency; Alignment; Power Sharing)	E1	The party had an easy access to information about my preferences	0.79	4.82	0.33	1.50
	E2	The processes at this party are aligned with my requirements (i.e. the way I wish them to be)	0.77	4.42	0.34	1.52
	E3	The party considered my role to be as important as its own in the process	0.75	3.96	0.48	1.93
	E4	We shared an equal role in determining the final outcome of the process	0.79	4.88	0.42	1.72
Interaction (Interaction; Dialog)	I1	During the process I could conveniently express my specific requirements	0.69	3.25	0.45	1.82
	I2	The party conveyed to its consumers the relevant information related to the process	0.79	4.80	0.52	2.09
	I3	The party allowed sufficient consumer interaction in its business processes (product development, marketing, assisting other customers, etc.)	0.77	4.40	0.46	1.86
	I4	In order to get maximum benefit from the process (or, product), I had to play a proactive role during my interaction (i.e., I have to apply my skill, knowledge, time, etc.)	0.75	4.06	0.38	1.61
Value-in-Use						
Experience (Value experience; co-experience; use value; Empathy; Benefits)	X1	It was a memorable experience for me (i.e., the memory of the process lasted for quite a while)	0.71	3.47	0.34	1.52
	X2	Depending upon the nature of my own participation, my experiences in the process might be different from other consumers	0.79	4.88	0.28	1.39
	X3	It was possible for a consumer to improve the process by experimenting and trying new things	0.64	2.75	0.32	1.47
Personalization (Unique; Consumer orientation)	P1	The benefit, value, or fun from the process (or, the product) depended on the user and the usage condition	0.78	4.60	0.39	1.65
	P2	The party tried to serve the individual needs of each of its consumer	0.74	3.77	0.52	2.10
	P3	Different consumers, depending on their taste, choice, or knowledge, involve themselves differently in the process (or, with the product)	0.78	4.51	0.33	1.50
	P4	The party provided an overall good experience, beyond the "functional" benefit	0.67	3.07	0.59	2.45
Relationship (Involvement; Network; Enduring exchange; Engagement; Interdependence; Collaboration)	R1	The party's extended facilitation is necessary for consumers to fully enjoy the process (or, the product)	0.77	4.31	0.39	1.64
	R2	I felt an attachment or relationship with the party	0.70	3.36	0.48	1.92
	R3	There was usually a group, a community, or a network of consumers who are a fan of the party	0.79	4.66	0.34	1.52
	R4	The party was renowned because its consumers usually spread positive word about it in their social networks	0.56	2.29	0.45	1.83

1. Measures in co-production are coded as (K) knowledge, (E) quity and (I) nteraction) and with Value-in-use as e (X) perience, (P) ersonalization, (R) elationship

2. VIF = 1/ (1-R^2) The other actor in value co-creation is referred to as "the party" and the activity in general as "the process"

Table 5 Demographic details of samples 1 and 2

Sample 1	*N*	Mean age (year)	Gender: F:M	Respondents per vignette gen:A:F:M:S:Th:Ti:W	Education	Annual income ($)
India	228	23.0	31% :69%	55,17,10,25,32,23,32,34	degree	10,000
Sample 2	*n*	Mean age (year)	Gender: F:M	Vignette: D:P:H:S:F	Education % HS:SC:G:PG	Income
USA	116	32.6	55% :45%	18,8,8,45,37	12:29:40:20	47,000
India	114	32.8	34% :66%	19,25,13,17,40	0:0:45:55	27,500
Total	230	32.7	44% :56%	37,33,21,62,77	5:13:43:39	33,000

N: Sample size

Gender: F: Female, M: Male

Vignette: gen: general description of co-creation, F: Facebook, A: Axe, M: Maruti, S: SUBWAY, Th: Threadless.com, Ti: Tide, W: Wikipedia

D: Doctor, P: Professor, H: Hospital

Education: HS: High school, SC: Some college but no degree, G: Graduate, PG; Post-graduate

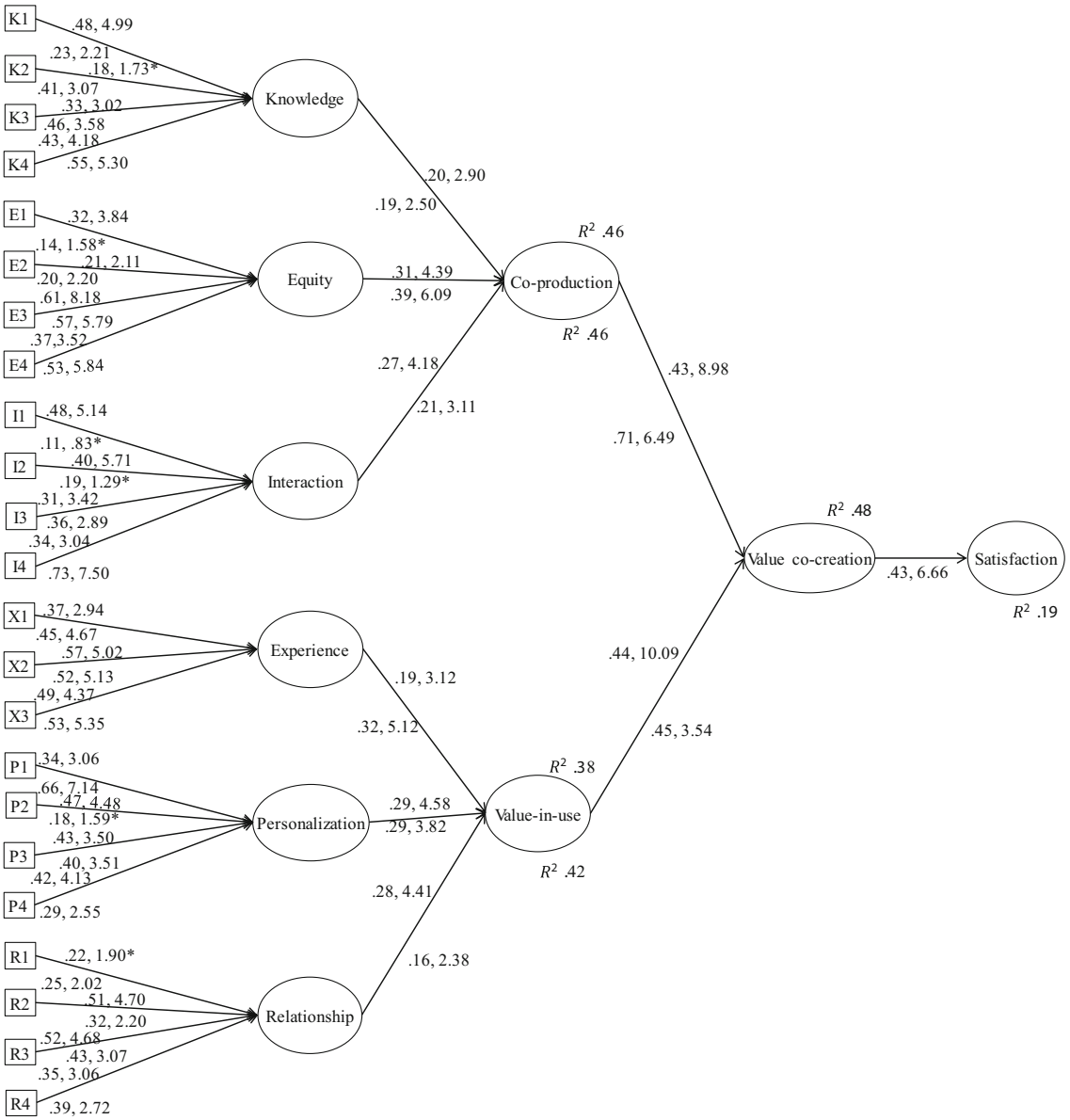
Data Data were collected through an in-class paper–pencil study. Post-graduate students of an institute offering a one-year full-time course in banking were invited to participate in a 30-min vignette-based study. The first page of the vignette collected participants' demographic details. Participants were briefed that the study was related to their general perception of the brand in the context of the vignette they were about to read. Once respondents worked through the vignettes, they were presented with a survey. A total of 228 valid and complete responses were received; 69% of respondents were male and 31% female, the average age was 23 years, and everyone in the group held at least one university degree. Demographic data is provided in Table 5. Most respondents associated well with their selected vignette (mean score of 1.3 on a 3-point scale, where 1 indicates maximum association and 3 the minimum). Similarly, respondents acknowledged high understanding of and comfort in answering the questionnaire (score of 1.4, where 1 implied a high and 3 a low level of understanding and comfort). As a robustness check, we also measured the perceived level of overall co-production, ViU, and co-creation using a single measure for each, asking respondents to express their degree of agreement with the adherence of the vignettes to a broad description of these constructs.

Analysis According to Chin's (1998) recommendation, a bootstrapping procedure using 1,000 sub-samples was performed to evaluate the statistical significance of each path coefficient. All the measures retained in the final model except two (K2 and R1, as shown in Fig. 2) returned a significant coefficient ($t_{(228)} \geq 2.11$, $p<0.05$). At this stage of index construction, all indicators were retained due to their perceived importance to the conceptual domain of the construct.

As there is no overall fit index in PLS path modeling, we triangulated the "goodness" of the model by examining explained variance (Arnett et al. 2003; Jarvis et al. 2003; Petter et al. 2007). PLS provides R^2 for the endogenous variables in the model to indicate how well the model fits the hypothesized relationship. The R^2 indicates a construct's percent variation explained by the model (Wixom and Watson 2001). The three elements of co-production and ViU predict 46% and 38% of variance, respectively, and the two dimensions (co-production and ViU) explain 48% of the variance in the VCC construct, indicating acceptable explanatory power for all endogenous predicted variables (Arnett et al. 2003; Jarvis et al. 2003; Petter et al. 2007).

The conventional expectations of high inter-item loading (e.g., Cronbach's alpha) as an assessment of item reliabilities do not hold for formative indicators, as they can be independent or weakly correlated with one another. Therefore, Chin (1998) suggests that the magnitude of the weights of each indicator (same as the beta coefficients in a regression model) is suggestive of how much the indicator contributes to the latent construct, and can be interpreted as reliability of the indicators. The "reliability" of the indicators and predictiveness of the model is strong, as all except two of the standardized paths in the outer model and one path in the inner model were equal to or above the suggested value of 0.2 (Chin 1998).

Due to error at the level of the latent construct, formative constructs are invariably under-identified. For identifying the disturbance term (ζ) at the construct level, the formative latent variable needs to emit at least two paths to other (reflective) constructs. Literature discusses three approaches for achieving this: (1) adding two reflective indicators to the formatively-measured construct, (2) adding two reflectively-measured constructs as outcome variables, and (3) performing a mixture of these two approaches, that is, adding a single reflective indicator and a reflectively measured construct as an outcome variable indicators (Becker et al. 2012; Diamantopoulos et al. 2008; MacCallum and Browne 1993). For model identification, we generated reflective measures for co-production, ViU,



Figures indicate (path coefficient, t-value)
Sample 1(top figures): all paths, except K2* and R1* were significant at a $p<0.001$
Sample 2 (bottom figures): all paths, except E1*, I1*, I2*, P2* were significant at a $p<0.05$
VCC→Satisfaction relationship was tested only with Sample 2

Fig. 2 Value co-creation measurement index

and the VCC construct. We diagnosed the reflective models for reliability and validity. Such a conceptualization captures a specific aspect and should not be construed as modeling the entire conceptual domain of the construct.

Table 6 shows the significant path strengths of the structural or inner model along with the bootstrapped *t*-values. The relationship of VCC with co-production and ViU was positive and significant ($t_{(228)}$=8.98; 10.09, respectively, $p<0.001$).

We evaluated the quality of the path model further through a cross-validation test of external validity (Cudeck and Browne 1983), and we examined our measurement model using fresh data.

Second empirical study: index validation against customer satisfaction

We examined the validity of the measurement index by analyzing a dependent variable theoretically suggested in prior literature (Diamantopoulos and Winklhofer 2001), but not subjected to empirical test. Consumer satisfaction is theoretically expected

Table 6 Path coefficients

Sample1 – Index construction				Sample2 – Index validation			
	Original sample	Sample mean	*t*-value	Co-production	Original sample	Sample mean	*t*-value
Co-production → Co-creation	0.43	0.43	8.98	Equity → Co-production	0.39	0.40	6.09
Equity → Co-production	0.31	0.31	4.39	Knowledge → Co-production	0.19	0.21	2.50
Experience → ViU	0.19	0.20	3.12	Interaction → Co-production	0.21	0.22	3.11
Knowledge → Co-production	0.20	0.21	2.90	Value in use			
Interaction → Co-production	0.27	0.28	4.18	experience → ViU	0.32	0.32	5.12
Personalized → ViU	0.29	0.30	4.58	personalization → ViU	0.29	0.29	3.82
Relationship → ViU	0.28	0.28	4.41	relationship → ViU	0.16	0.17	2.38
ViU → Co-creation	0.44	0.44	10.09	Value co-creation			
				Co-creation → satisfaction	0.43	0.44	6.77

Original sample implies the original data; sample mean implies the 1,000 bootstrapped samples

to be positively related to VCC (Dong et al. 2008; Grönroos and Ravald 2011; Heinonen et al. 2010; Nambisan and Baron 2007; Payne et al. 2009; Zhang and Chen 2008) and was measured using an existing scale (Brady et al. 2005; Cronin et al. 2000).

Instrument and sample We collected data from a new sample of respondents, using general service contexts such as those of a medical doctor, a hotel, education services of a professor, and two co-created brands, namely Subway and Facebook. Conceptually, the co-creation of products or services is the same (Vargo and Lusch 2004, 2008). Thus, different vignettes should not impact our measurement instrument. Participants self-selected into one of the contexts and were asked to broadly recall recent interaction with the service providers or brands. Thus, the recent/natural experience provided the co-creation stimulus. In addition to changing stimulus for this study, we also included a mixed population of new respondents from two distinct cultures—the individualistic culture of the USA and the collectivist culture of India (Hofstede 1983).

A total of 230 usable questionnaires resulted from an online survey from 403 individuals who connected to the survey; 173 respondents either did not start the survey, did not complete it, or their data were discarded due to low variance across responses. The net response rate was 57%. Demographic details are provided in Table 5, under the Sample 2 subhead.

Analysis The variance inflation factor and tolerance values show improved results over the previous values, indicating acceptable levels of multicollinearity. The reflective latent constructs were evaluated by applying the suggestion of Fornell and Larcker (1981). The average variance extracted (AVE) is within an acceptable range between 0.61 and 0.75, the composite construct reliability (CR) is between 0.86 and 0.93. Construct reliability as measured by Cronbach's alpha is also within acceptable ranges: Satisfaction 0.890 (4 items), ViU 0.788 (4 items), and Co-production 0.790 (3 items). AVE and the CR both exceed minimum suggested thresholds of 0.5 (AVE) and 0.7 (CR).

We treated co-production and ViU as second-order formative constructs and estimated the model using reflective measures on the other side. Second, we used the latent variable scores of co-production and ViU from these two models as a formative indicator of co-creation on one side and consumer satisfaction as its consequence on the other to estimate this model. This is a well-established approach to estimate models of formative constructs (Arnett et al. 2003; Bruhn et al. 2008; Diamantopoulos et al. 2008; Reinartz et al. 2004). Thereafter, we assessed the index by examining the individual outer-model path coefficients, i.e., γ-parameters (Diamantopoulos and Winklhofer 2001) as performed during index construction with Sample 1. All except four paths were significant at p-value<0.05. The effects in the inner model were all significant, (β ranging [0.16, 0.39]). Compared to the first model, two of the path coefficients, idea→co-production and relationship→ViU, returned lower than the desired criteria of $\beta \geq 0.2$. These may be attributed to the heterogeneous sample or differences across vignettes. As our intent to use diverse contexts and different samples was only to validate the model, we offer the examination of these sorts of moderating factors for future investigation, focusing here on main effect. Coefficients of the structural path of the inner model are shown in Fig. 2.

Coefficients of the outer paths ($\gamma=0.71$; $t_{(230)}=6.49$, $p<0.001$) for co-production compared to ($\gamma=0.45$; $t_{(230)}=3.54$, $p<0.001$) for ViU showed a significant shift in the relative importance of the two dimensions as compared to what was observed during index construction with the first sample. We also observed a strong and significant positive

effect of VCC on satisfaction (β=0.43; $t_{(230)}$=6.77, p<0.001). The R^2 of 0.19 indicates that VCC explained reasonable variance in satisfaction in our setting. For further examination of the robustness of the formative conceptualization and measurement, we conducted a series of post-hoc tests.

Post-hoc validation tests

Inter-item correlation "High inter-correlations between formative indicators can make it difficult to separate the distinct impact of the individual indicators on the construct" (MacKenzie et al. 2005, p. 712). While a reflective-indicator measurement model necessarily predicts high inter-item correlation, a formative-indicator measurement model might have high, low, or somewhere in between (MacKenzie et al. 2005, p. 713). Correlation above 0.4 is classified as moderate and above 0.7 is considered high (MacKenzie et al. 2005; Petter et al. 2007). Of the 351 inter-item correlations possible between all the 27 measures, mean correlation was 0.12. Only one correlation in Sample 1 and three correlations in Sample 2 were above 0.5. This finding suggests acceptable inter-item correlation and offers further support to our conceptualization.

Vanishing tetrad analysis The model with all indicators as causal (formative) implied no vanishing tetrad for K, E, P, and R elements, whereas all tetrads in the one-factor model (reflective model) vanish (Bollen and Ting 2000, p. 13), further supporting a formative conceptualization. In case of element I, $p \leq 0.059$ lends substantial support to the causal specification (Bollen and Ting 2000, p. 14). Although we do not observe such support for the element X, the model was tested for four measures (a prerequisite of the tetrad method), whereas our final instrument has only three measures for which we illustrate suitability of formative conceptualization. Given the earlier tests, alternative diagnosis, and tetrad test for all the other five elements, we have strong evidence for the formative conceptualization.

Discussion and conclusion

This study is the first scholarly effort in the direction of illustrating the complete multidimensional theoretical nature of VCC and developing a measurement instrument aligned with theory. Here, we add color to three aspects of our contribution, specifically connections back to the SDL literature, application to existing dilemmas in the VCC literature, and opportunities and insights for future research.

Connections back to the SDL literature

SDL has done much to advance broader thinking around VCC. At the same time, Achrol and Kotler (2012) lament that currently only some aspects of SDL can be realized. They look forward to theory and methodologies that aid better understanding of the relational and network aspects of SDL. We address this call and strengthen the claim of the service logic by offering precise evidence that co-creation of value is inherent in joint production as well as the context specificity of "use." Such insights into these mechanisms of VCC offer several conceptual advancements. For instance, despite the prominence of co-production in extant research, the effect sizes in both the test and the re-retest studies highlight the parallel importance of consumer usage processes as a source of value. This observation provides a strong basis for understanding value and its genesis (Aarikka-Stenroos and Jaakkola 2012; Ballantyne and Varey 2006; Lemke et al. 2011; Sandström et al. 2008), particularly in the context of SDL. Further, VCC is a theoretical representation of an extended exchange process of joint production and consumption of value. Therefore it is actor agnostic and would be equally applicable to a situation of "exchange," such as that between firm and supplier. This understudied relationship is theorized by SDL, and its investigation is supported through the results of our study.

Application to existing dilemmas in the literature

While every fledgling domain of research grapples with its own set of debates and doubts, we worry whether some existing dilemmas in VCC might be merely an artefact of the researcher's (constrained) perspective, perhaps stemming from a "partial" or unidimensional conceptualization of VCC. We reanalyzed both datasets from our measurement development process to gain insight into this important issue, employing the following steps.

First, we calculated effect sizes taking sub-dimensions one at a time and subsequently two at a time. These results invariably returned inflated path coefficients as compared to the full model. Comparing the differences, the inflation percentages were significantly higher in situation for co-production than for ViU (p<0.05). This offers a prima facie evidence that depending on the researcher's assumed perspective about VCC, resulting effect sizes vary.[3]

Second, we calculated path coefficients taking sub-dimensions one at a time and subsequently two at a time against the dependent variable of consumer satisfaction. The

[3] The authors can provide the details of the analysis to the readers of JAMS upon request.

Table 7 Contribution of scale development to the respective research stream

	Year of publication of instrument	Number of research papers (N) that mentioned the respective construct anywhere "in-text"		
Scale	Base t	$\sum_{t-5}^{t-1} N$	$\sum_{t+1}^{t+5} N$	% change
Service quality	1988	1,550	5,380	247
Brand personality	1997	85	543	539
Brand attachment	2005	59	315	434
Brand experience*	2009	1,010	1,890	87
Brand love	2006	15	265	1,667
Market orientation	1993	1,690	3,950	134

Accessed from Google scholar in Feb 2013; * $t\pm3$ years only

findings indicated deviations contingent on the conceptualization of VCC. For instance, comparing path coefficients of the complete construct versus taking one dimension at a time, coefficients differ significantly when only co-production → satisfaction or ViU → satisfaction is considered ($p<0.05$). This indicates a divergence in the effects of the second order dimensions on satisfaction, and hence differences observed by researchers between theory and reality might not be a dilemma of sorts, instead, an artefact of selected research focus.

More generally, our study indicates the role and nature of endogeneity inherent to VCC. By offering theoretical identification and empirical constructs for the two higher order dimension of co-production and ViU as well as the underlying elements of knowledge, equity, and interaction, and experience, relationship, and personalization, we provide fellow researchers a foundation to develop nuanced theory and co-create a better understanding of mechanisms underlying VCC.

Insights for future research

In several domains of marketing, including services (SEVQUAL scale; Parasuraman et al. 1988), branding (brand personality; Aaker 1997), brand attachment (Thomson et al. 2005), brand love (Carroll and Ahuvia 2006), brand experience (Brakus et al. 2009), and market orientation (Kohli et al. 1993), empirical and theoretical research activity has risen in the wake of the theoretical cohesion that accompanies the availability of a viable measurement instrument (see Table 7).

This increased activity has taken the form of developing and testing theoretical antecedents and consequences of the focal concept, building theory around moderators and mediators, and exploring dilemmas that could not be resolved previously. Specifically, our study opens up three fresh avenues of theoretical and empirical research around VCC. First, as the measurement instrument is developed for a consumer–firm dyad, the application to a system level set of measures, would further buttress the claims and relevance of the SD-logic (Vargo and Lusch 2004). Second, our comprehensive conceptualization and measurement of VCC offers a key to investigation into the antecedents and consequences of VCC. And third, we offer a basis to examine the variance within the concept of VCC-specific inquiry into VCC processes and the tradeoff between its finer constituents. For example, how will equity with one stakeholder in the firm's system vary when the firm tries to focus on personalization and interaction with other stakeholders? Theoretical work has begun to expose these possibilities (Ertimur and Venkatesh 2010; Etgar 2008) and, enabled by this study, examination of these issues could also include possible mechanisms of mediation and moderation of such relationships.

Conclusion

We conclude on a note of curiosity. Surprised by the findings from our VCC literature review, we wonder to what extent other broad concepts within the current literature have achieved theoretical cohesion. Only four of the 149 studies in our sample of the VCC literature considered all three of the elements of co-production and all three of the elements of ViU. Though our core effort is specific to VCC, we suggest one additional possible contribution: a process or perhaps a tool that researchers in other fields might utilize to assess or inventory the elements within a broad theoretical concept and achieve theoretical cohesion in their own domain.

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Appendix

Sample Vignette – threadless.com

Page 1 Study brief and demographic information

Page 2

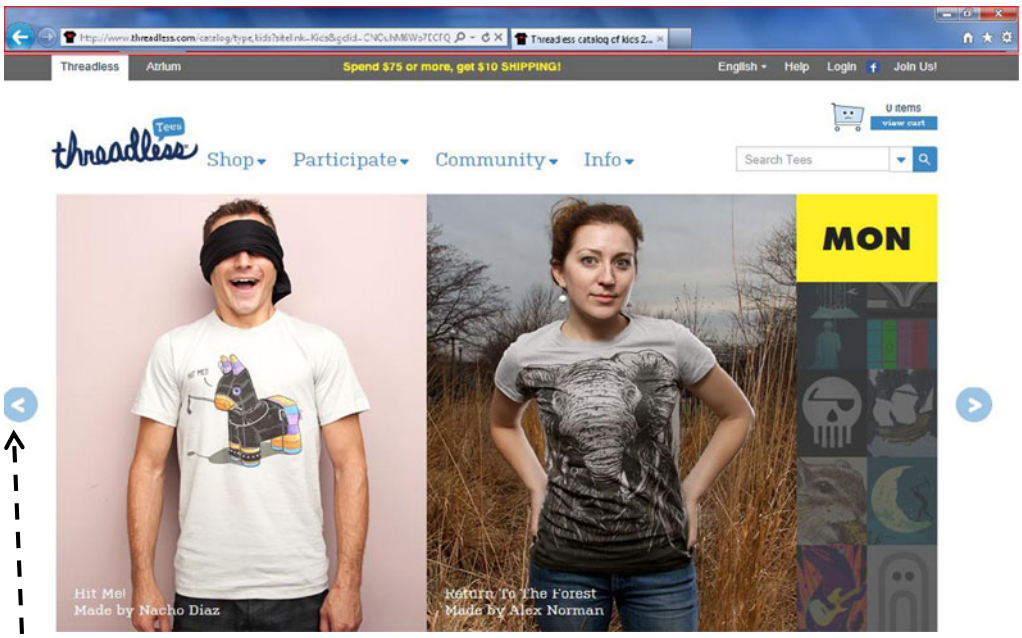
You have been looking for a T-shirt to be bought for a college get-together, happening early next month. You came to know from a friend about threadless.com.

threadless.com is a T-shirt manufacturer. It invites graphic designs for its T-shirts from customers as well as expert designers, to be submitted online. Members and visitors of the website threadless.com vote on the submitted designs. The most popular designs are sent into production and sale. Designers, whose designs are finally chosen, receive a monetary reward and get to keep the rights to their designs. The company also involves its customers to commercialize and popularize the brand. The company does not advertise, instead it encourages its customers and design-contributors to spread positive words about it by providing e-banners and mass mailing lists. This helps the company website become popular and the brand known. This is so because, in order to vote, people need to register and get a username. The greater the number of people who register, the more widely the brand is known and talked about.

Page 3

With this information about threadless, you decided to check their website and look for a good T-shirt for yourself.

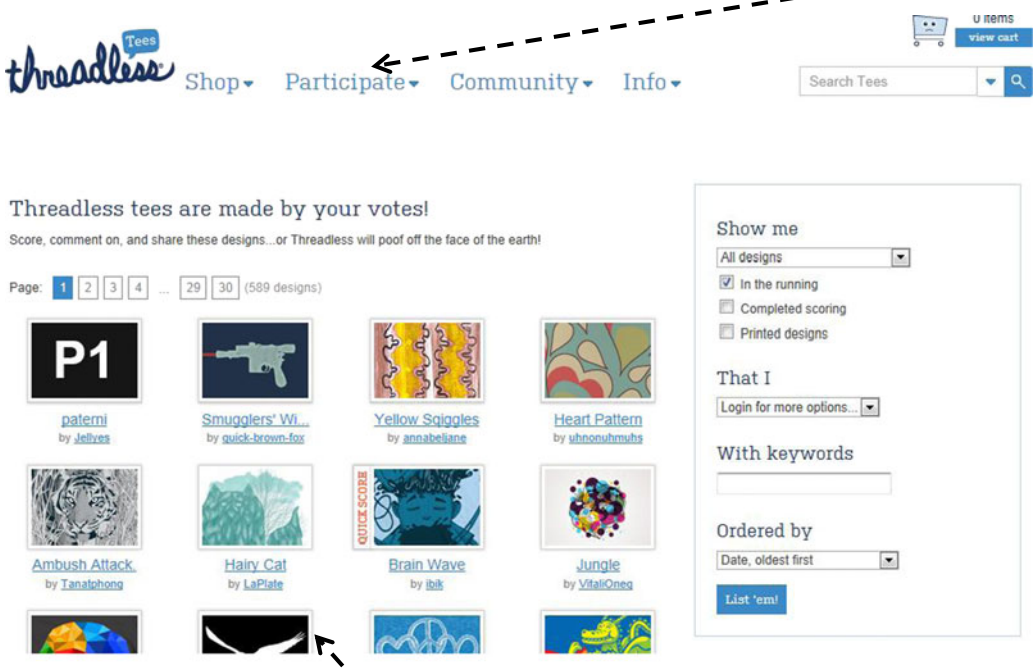
So, Welcome to the home page of threadless.com



You can press the arrow to see more winner designs of the week…..

Page 4

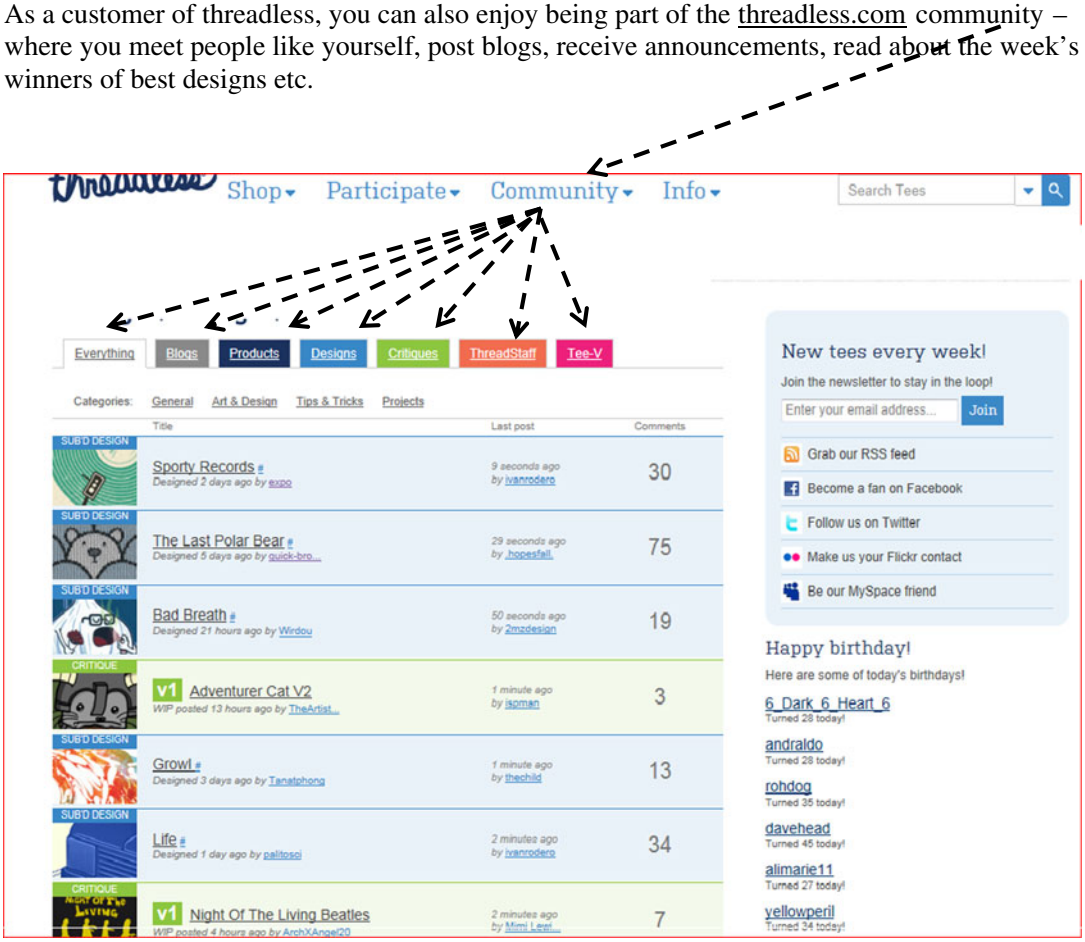
On the website you can participate actively in several activities related to threadless. Specifically, you can rate submitted designs, submit your own design, take design challenges, submit interesting photos of self or others wearing T-shirts, and take part in a contest for the best T-design and photo award. For doing any of these you just have to click on the participate tab.



Suppose, you liked the design “circle of birds”, you can click on it to have a closer look. You can then score this design from 0 to 5. All of the scores will be added up and used to decide which designs are good.

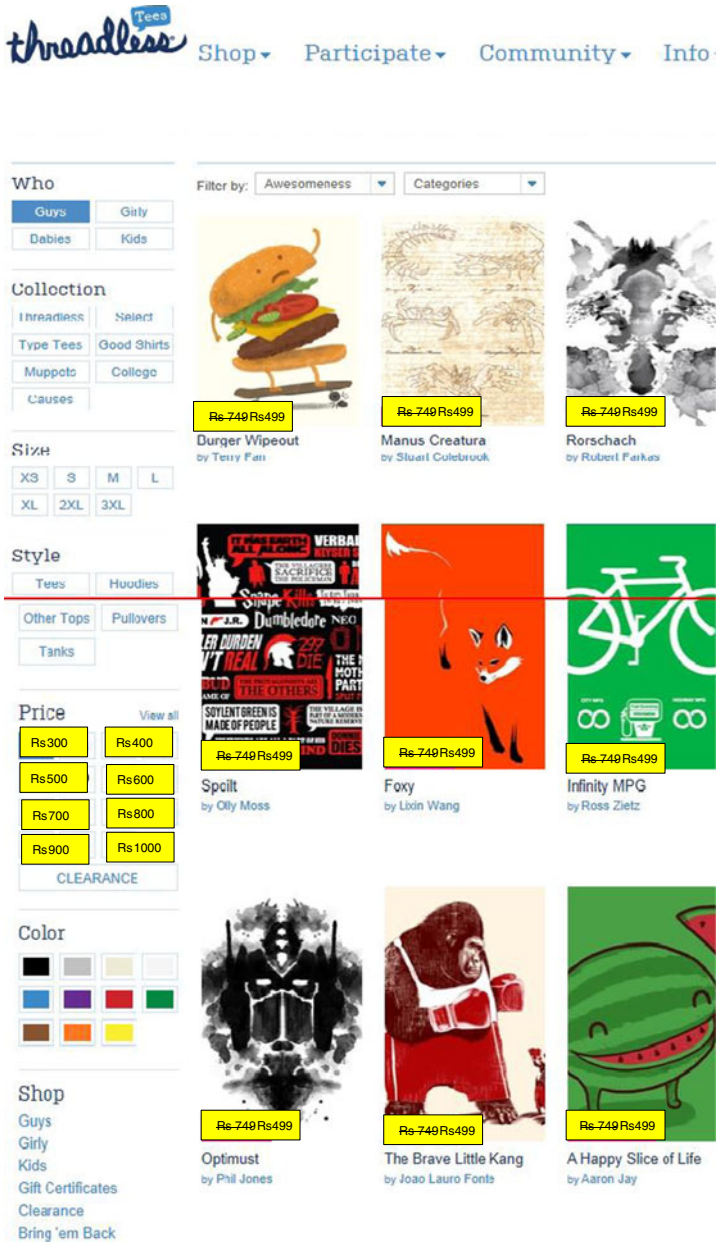
Page 5

As a customer of threadless, you can also enjoy being part of the threadless.com community – where you meet people like yourself, post blogs, receive announcements, read about the week's winners of best designs etc.



You can shop, too – sort your designs according to gender, size, style, price, color and your general liking. Based on your choices, a T-shirt will be made for you, ready for you to wear.

Page 6



When you start using your chosen T -shirt, you can come back and share your experiences with threadless.com. If you lik e it …spread the word around; if you don't, you can let them know what went wrong.

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