

# Co-Creation: Toward a Taxonomy and an Integrated Research Perspective

Vladimir Zwass

**ABSTRACT:** Enabled by the Internet-Web compound, co-creation of value by consumers has emerged as a major force in the marketplace. In sponsored co-creation, which takes place at the behest of producers, the activities of consumers drive or support the producers' business models. Autonomous co-creation is a wide range of consumer activities that amount to consumer-side production of value. Thus, individuals and communities have become a significant, and growing, productive force in e-commerce. To recognize co-creation, so broadly understood, as a fundamental area of e-commerce research, it is necessary to attain an integrated research perspective on this greatly varied, yet cohering, domain. The enabling information technology needs to be developed to suit the context. Toward these ends, the paper analyzes the intellectual space underlying co-creation research and proposes an inclusive taxonomy of Web-based co-creation, informed both by the extant multidisciplinary research and by results obtained in the natural laboratory of the Web. The essential directions of co-creation research are outlined, and some promising avenues of future work discussed. The taxonomic framework and the research perspective lay a foundation for the future development of co-creation theory and practice. The certainty of turbulent developments in e-commerce means that the taxonomic framework will require ongoing revision and expansion, as will any future framework.

**KEY WORDS AND PHRASES:** Active consumption, co-creation, consumer roles, e-commerce research, taxonomic frameworks.

The clear separation between the production and consumption domains is a matter of the last three centuries.<sup>1</sup> During the last two decades, there has appeared, and is gathering strength, a phenomenon that points in the opposite direction. Empowered by the Internet-Web compound (hereinafter the Web) and the associated information technologies (IT), consumers have been producing marketable value. This is changing the role of consumers in the marketplace and, more broadly, the role of individuals versus organizations. This also challenges our understanding of work—and of the rewards it brings. The discussion that follows frames an integrated perspective on this phenomenon.

*Co-creation* is here defined broadly as the creation of value by consumers. *Sponsored co-creation* comprises co-creation activities conducted by consumer communities or by individuals at the behest of an organization (termed the producer). In *autonomous co-creation*, individuals or consumer communities produce marketable value in voluntary activities conducted independently of any established organization, although they may be using platforms provided by such organizations, which benefit economically. Marketable value is not necessarily consigned to the market—it may be placed in the commons, as is the case with Wikipedia. Sponsored co-creation is exemplified by Procter & Gamble and IBM, which seek product ideas from unaffiliated individuals in well-organized contests and jams. Combining autonomous and sponsored

co-creation, and on a different scale, the Polyvore e-commerce site enables consumer visitors to assemble on-screen images of garments and shoes from various e-stores into the consumers' style statements; it also runs idea contests. IT enables both endeavors: Some IBM jams are run on the Second Life platform, while others use interlinked bulletin board and Web pages. Polyvore uses an innovative technology for aggregating images from the Web. It benefits from co-creation in several ways: Consumers' preferences are ranked and analyzed, yielding vital real-time information; consumers' creative ideas can be marketed to producers; producer contests are run to test new ideas (and, with interest amplified by these opportunities, the site receives sellers' commissions and consumers are exposed to ads). Such iconic products of autonomous co-creation as open source software (OSS) and Wikipedia have changed the competitive landscape of the software and knowledge industries—and continue to do so. Consumer reviews provided by individuals form a large part of the value of many Web sites—and are furnished in autonomous co-creation. Thus, consumers are no longer just passive value takers, but have emerged as value makers in both individual and collective actions.

Co-creation is here treated broadly as the activities of individuals/consumers/users in the production domain, generated independently or at the behest of producer organizations. As will be argued, such a broad research program enables the development of theories and analytical approaches that cut through divisions that are rapidly becoming artificial. Indeed, the methods of process governance in the domain, and so too the motivating factors, have much in common whether one analyzes sponsored or autonomous co-creation. The integrated approach will serve well as business methods evolved in co-creation are adapted and adopted for intra-organizational use.

A major objective of this paper is to stimulate research on this broad subject within the transdisciplinary field of e-commerce, which is uniquely suited to this purpose. Seeing the phenomenon whole will further enable seeking competitive advantage in the marketplace with the contributions of co-creating consumers, developing Web-based technology to enable co-creation, enacting the motivators by communities and firms, and thus empowering individuals to lead a fuller life. The need for close study can be clearly seen from the dominant tropes. When one speaks in a context-free manner about "crowd-sourcing" or the "wisdom of crowds," one glosses over a number of issues, such as how to select contributors from the crowd, how to organize the sourcing to make sure of a satisfactory outcome, what incentives to provide to that part of the "crowd" that can truly contribute, how to assess the process and the product, and indeed, whether the "crowd" is smart enough for what we are trying to do.

An ultimately comprehensive taxonomic framework is needed that would contextualize research efforts in the area of co-creation. By developing models in specific contexts and studying the impacts of specific factors on the outcomes, using the theories and instrumentalities of various disciplines, a cumulative body of knowledge will be created in the field. A broad perspective for such a framework is needed for knowledge cumulation.

In the present discussion, the top-ranked journals in the relevant disciplines of information systems, marketing, electronic commerce, computer science,

economics, and related fields have been consulted. Other works are cited as appropriate, with only the references essential to the argument stated, in the interest of relative concision and readability. Illustrations have been drawn from e-commerce practice, a laboratory in turbulent action. The presentation is aimed at diverse audiences. This is a vast terrain, and capturing its scope is bound to come at the expense of detail, if the treatment is to be bounded by the customary length of the genre.

After this introduction, the paper is structured as follows. The nature of co-creation and the reason it has emerged as a significant force in the 1990s is discussed next. The intellectual space forming around the nodal aspects of the phenomenon is explored next. This space includes the study of: virtual communities, where much of the value contribution occurs; the commons, where such co-created artifacts as OSS are freely revealed for open access; collective intelligence, the emergence of intelligent behavior to surpass the intelligence of the individual members of certain collectives; and open innovation, the producer firms opening themselves to co-creation in new product development. The two following sections classify the two essential supra-components of the taxonomic framework proposed here. The first of these sections describes the typology of value co-created autonomously and in symbiosis with producer organizations. The second one classifies the salient aspects of co-creation into a taxonomic framework. The most prominent research directions are discussed next, offering a perspective on this research domain. The conclusions follow.

## **What Is Co-Creation? Reasons for Its Emergence**

Co-creation is the participation of consumers along with producers in the creation of value in the marketplace. Activities of this kind go well beyond the notion of co-creation as conceived in services that are, to an extent, jointly actualized by their suppliers and the receiving customers. They also go beyond mass customization, as it aims to satisfy cost-effectively the needs and wants of a specific individual. Co-creation may be initiated by producer firms or by consumers themselves. Indeed, in this definition, participants in many co-creation activities are considered consumers only in contrast to producers.<sup>2</sup>

Co-creation was originally defined in the late 1990s by Kambil and his co-authors as co-creation of value by a firm's customers [54, 55].<sup>3</sup> This meaning has been gradually extended toward autonomous individual initiatives [24]. With the technologically enabled broad movement of individuals into productive activities, it is worthwhile to study the strategies, methods, and technologies of co-creation in an integrated manner.<sup>4</sup> Thus, OSS development methods, elaborated by communities of volunteer developers, are being ported into organizations, along with the products of these communities.<sup>5</sup> Ludic, or play, communities, provided only with a platform, develop a virtual life that builds monetary value for the platform-maintaining firms. Blog aggregators evolve new forms of on-line newspapers. Communities of practice evolve and freely reveal substantive knowledge stocks, untethered to specific producers. New forms of production are thus emerging and evolving in the voluntary sphere

that are increasingly permeating the productive sphere, knowledge creation, capital formation, and the very fabric of work. Wikipedia and SourceForge-centered OSS projects are laboratories of evolving organizational approaches to channeling the knowledge and efforts of individuals into products. Integrated study of the domain will further our understanding of this evolution enabled by IT and will underwrite the seamless use of best approaches across the B2C and C2C sectors.

The nature of the goods that dominate co-creation is of the essence. These goods are digital and nonrival (not consumed in use and thus available to all who have access); they are also not easily excludable, as some are intentionally available to all having access even without a reciprocal contribution, while others generally can be “liberated” (pirated) through a contravention of security measures, and against legal and ethical constraints. Network effects present in the case of some of these goods make them more valuable to each user as the number of users increases—the more contributors there are on a review site, the more visitors and the likelier future contributions. Two-sided network effects are also present in some cases—the more individuals use an OSS product, the more valuable is the experience its creators garner, and the more likely is the product to be well maintained for future use by motivated developers. Beyond this, the collective processes of sharing data, information, and knowledge in the digital domain by individuals vastly contribute to the growth of co-creation activities.

Many of the underlying motives that drive individuals to co-creation, such as volunteering and other types of social action on the one hand, and repurposing of products for one’s own use on the other, are not the epiphenomena of the Web. Yet, co-creation has emerged owing to the ubiquity and accessibility of the Web in its multiple aspects. The qualitatively different scale of the phenomenon derives from the fact that the Web presents, simultaneously and synergistically, several major aspects bearing the relevant opportunities: marketplace, universal supply-chain linkage, network of relationships, collaborative, forum, interactive medium, and distribution channel [117]. In the specific relation to co-creation, we now have the following enablers and drivers:

1. Broadly accessible *means of production* are available, that in many ways are indistinguishable from the means of consumption.

The Web-Internet stack and the means of access are ubiquitous in the developed and in much of the developing world, and both general and computer literacy is spreading as well, including at this time more than a billion people. Moving toward universality, IT artifacts and the infrastructure on which they are deployed become even more accessible with the smartphone as the evolving primary access device. Producing opinions, encyclopedia articles, or software faces only the barriers of knowledge. Roles are becoming fluid as well. Zazzle offers on demand a multitude of customized retail products, but the point is that a Zazzle consumer can very easily become a producer and marketer of the good he or she has just co-created. A reader of a Wikipedia article can almost instantaneously become the co-author (or even the new author) of the article, if not necessarily with a salubrious outcome. The users

of an OSS product can become co-creators with its developers [62]. This is “the wiki way”—consumption and production can be intertwined. Recursively, OSS products are freely available to users who know how to use them and who can co-create new OSS using them.

2. The Web provides the *means of coordination* of effort.

The Web’s ubiquity and the IT tools available for access serve to harmonize the efforts of individuals in a common action, the very definition of coordination. For example, the tools for organizing OSS projects are available on SourceForge. Wikipedia has accreted a powerful set of means of organizing the widely distributed production of articles. Idea contests or information markets provide a different form of coordination of contributors. As we move broadly to m-commerce, this is even more so.

3. The Web furnishes a broadly dispersed *means of aggregation* of digital products.

Version-control systems for OSS enable tight control of the builds on a daily basis. The existing Wikipedia structure provides an evolving means of organizing the contributions and their history, in multiple languages, and embedded in many cultures. Hyperlinking to create new content and blog aggregation are other cases in point. Real-time search of Twitter feeds is a newer, and powerful, method of gauging sentiment by aggregation.

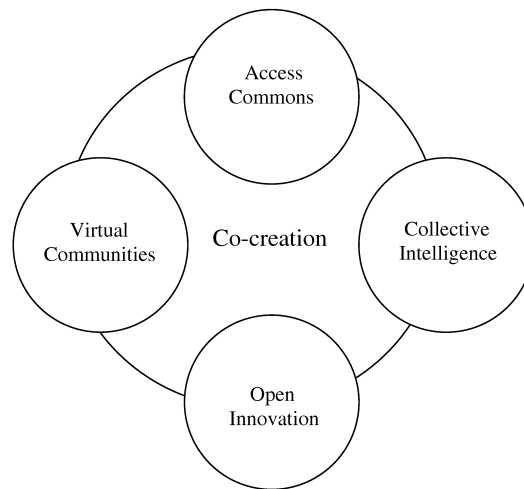
4. With the widely spread and economically accessible Internet and Web IT, there is now a global digital *means of distribution* for digital products, encompassing sourcing and mass access.

As the use of the platform stack spreads ever more widely, in particular into the mobile domain, and as new firms providing innovative business platforms based on it emerge, and the competition among established and emerging firms intensifies, one may expect tempestuous developments in the distribution of the products of co-creation. As an important example, Benkler characterizes “computation and storage” as “lumpy” goods, available only in discontinuous amounts of functionality and capacity [11, p. 113]. With the rapid advance of cloud computing, the discontinuities disappear, and access to hardware and software resources, and thus to ever more sophisticated means of production and distribution, is further facilitated.

The broad availability of the means of production, effort coordination, product aggregation, and distribution acting synergistically has a powerful effect on the continuing development of co-creation.

## Intellectual Space of Co-Creation Research

Co-creation is underwritten by several developments that have accreted research literatures and traditions. The prominent contributing streams of



**Figure 1. Intellectual Space of Co-Creation Research**

practice and research involve virtual communities, the collectives of co-creating individuals; the commons, where much—but by far, not all—of the product is placed for open access; collective intelligence, the emergent superior judgment of some collectives in certain tasks; and open innovation, through which organizations involve their customers and, in general, unaffiliated individuals in sponsored co-creation of innovations.

The intellectual space of co-creation research is represented in Figure 1.

### ***Virtual Communities and Social Capital***

Virtual communities (VC) are the primary locus of collective contribution to co-creation. Definitions of VC differ in terms of the intensity of commitment required by the human collective that is regarded as a community. Rheingold, who introduced the concept, defined VC as “social aggregations that emerge from the Net when enough people carry on . . . public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace” [90, p. 5]. The salient characteristics of the VC are, according to Lee, Vogel, and Limayem, member interactions on-line, production of content by members, and building of relationships among members [64]. Blanchard and Markus go further, expecting feelings of belonging and mutual attachment from community members [13]. Turkle also sees VCs as providers of identity to their members [104]. Indeed, the originator of sociological thinking about communities, Tönnies, who described community (*Gemeinschaft*) as a counterpoint to society that serves as an association created to further individual self-interest (*Gesellschaft*), considered a common identity and a degree of surrender to the common good to be the defining characteristics of a community [102].

There are many types of VC, depending on the categorizations. They range from strongly bound communities of affliction to loosely affiliated transac-



tion communities based on acquisitions; it needs to be noted that the looser types do not go far beyond the characteristics identified by Lee et al., as stated above [64]. Notable are the communities active on social network platforms, which serve as community enablers. Important in the present context are knowledge communities, sharing and elaborating knowledge within a domain. These collaboration communities expressly target the development of a collective product, such as Wikipedia or an OSS. Ludic communities emerge around virtual worlds, where the players' avatars interact and virtual objects can be created, with economic consequences [83]. Two fundamental genres of the virtual world, in turn, are metaverses or fictional worlds, epitomized by Second Life, and game-oriented, massively multiplayer on-line games (MMOG) like the World of Warcraft. The first type of virtual world affords a much greater opportunity for co-creation, since the players actually create the world, although many MMOGs afford players an opportunity for game modification. Iriberry and Leroy analyze various VC types and their lifecycles from the perspective of ensuring their success [51].

E-commerce is directly supported by brand communities: on-line communities based on social relationships among brand adherents [76]. These are important in co-creation in many ways: by the elaboration of user knowledge about the brand's products, by surfacing lead users, and by creating a commitment to the brand that can lead to an intent to contribute to the development of its products. Brand communities may be hosted by the brand or by consumers, with notable differences leading to diversity, freedom of expression, and stronger bonds and member motivations in the latter [30].

Virtual communities can be highly productive generators of social capital. Social capital has been defined as "resources embedded in a social structure that are accessed and/or mobilized in purposive action" [69, p. 29]. Social capital, according to Putnam, "refers to connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them" [87, p. 19]. This relatively recently recognized form of capital has been conceptualized to have both a private dimension, with the benefits that accrue to individuals engaging in social relations, and a public dimension, with the benefits accruing to the community within which the ties are enhanced. The society at large benefits from the enhanced levels of trust and cooperation among individuals beyond their own kin [39, 88]. With the emergence of the Web, and the variety of individual relationships whose traces can be digitally captured, analyzed, and aggregated, into this dichotomy between the private and the public steps the third agency—the producer/aggregator able to appropriate some of this capital. Notable in the above quotation from Putnam is that the reference to social networks of the pre-Web type is apt as a reference to social networks on the Web and the capital they give rise to. The structural and relational dimensions of social capital are the most prominent of the three aspects identified by Nahapiet and Ghoshal, while the cognitive dimension is clearly in the background [77]. The outcomes range from the free revelation of knowledge in communities of practice to the less laborious, less obvious, more ubiquitous, and more alienable forms of capital formation, such as forming links and articulating communications between individuals [111]. The notion of social capital extended the economic analysis of capital in the

direction of sociological analysis [85]. The economic consequences of social capital formation and use on the Web still await ground-breaking reciprocal research with economics tools.

### **Commons, Open Access, Open Source**

The commons are universally shared resources, owned in common, as it were.<sup>6</sup> Wikipedia is an example of a co-produced resource placed for open access in the commons; Creative Commons contains a variety of works contributed by their authors. Open access is a broad movement and worldview, as well as a set of practices. As a nonrival good, digital content can be consumed by anyone without impairing the ability of others to consume it. Property rights, such as intellectual property protections, provide enclosures from the commons. Benkler considers social production with a commons-based open access to be a new production mode that complements and rivals the market and the hierarchy of organizations [11]. However, the economic aspects of the arrangements are likely to assert themselves before co-creation can truly rival the two established production regimes: Co-creators do not conduct their lives in the commons, which places a limit on the extent of co-creation as the need for economic incentives becomes imperative. This having been said, the growth and diversity of this production mode are apparent.

Technologically enabled open access to digital content has been most strongly expressed by OSS, which has freely available source code, produced in the most general form by a distributed (globally, with round-the clock advantages) development community. Highly parallel development processes rely on prompt and frequent peer review, and frequent and methodical new releases. Well-understood requirements favor horizontal projects, as opposed to business-oriented systems that would call for extensive systems analysis [34]. Some of the iconic products are Linux, Mozilla, Apache, OpenOffice, and MySQL. As infrastructural systems, many of these further the development of the software industry as a whole [100]. The rights of the commons are asserted for OSS through a variety of more or less restrictive licenses aiming to assure perpetuity in the commons for the original software and its derivatives. Interpreted as an innovation, OSS production can be studied as unremunerated work toward the production of a public good [109]. The practices realign power and market relationships around digital content in the domains of knowledge, information, entertainment, and software products [57]. Research shows that free revealing offers significant private benefits to the co-creator, which are discussed below as motivators of co-creation. Another category of OSS co-creators consists of the users, who are strongly involved in the process, and sometimes carry out most of the system testing and initiate new features [34]. Thus, OSS can be appropriated by users in an active mode, with major benefits to their learning [62].

Recursively, OSS products leverage further OSS projects: Configuration management for OSS projects is performed with a version-control system, such as Concurrent Versioning System (CVS), an OSS itself, or with a newer, distributed, system, such as Bazaar or Git. The nodal role in the OSS movement is played by the SourceForge source-code repository, the Web site supporting



OSS developers with coordination and communitarian tools. As of the February 2009 update, the SourceForge repository hosted more than 230,000 projects and more than 2 million registered users. However, as pointed out by Fitzgerald, only a small percentage of the projects listed are stable and mature [35]. Cultural norms regulate the development projects: for example, forking (splitting into rival development projects) is not tolerated, and credit is conscientiously assigned, thereby acting as a motivator.

The culture of the commons and, in particular, the culture of open access to and co-creation of derivative cultural works in the digital domain, of remix and mashup, has vocal academic advocates, such as Lessig [67, 68]. It also has respected opponents, such as Lanier, who asserts the primacy of the auteur, and argues that a “hive” cannot create transcendent artifacts or art [63]. Issues pertaining to the definition and protection of intellectual property, and the generation and distribution of revenue emerge from the positions advocated in this realm.

### **Collective Intelligence**

Much of co-creation relies on the contributions of collectives, such as VCs, or on asynchronous contributions by individuals, aggregated by one of the methods discussed below. The hypothesized superiority of collective intelligence in various cognitive tasks is therefore a subject of active research interest. The emergence of intelligent behavior in a collective has been described by Surowiecki [99] as the “wisdom of crowds,” generating the concept of crowd-sourcing [50]. Intellectual predecessors come from various disciplines. Thus, Hayek showed how price serves as an aggregator of the knowledge of many distributed individuals, allowing them to act in a self-organizing system of voluntary cooperation (far more effectively than a central-planning mechanism ever could) [45]. Holland has defined the fundamentals of the complex adaptive systems in which independent agents compete and cooperate, with complex collective behavior emerging in the process [49]. The work continues in several disciplines, creating the science of complexity.

Pertinent to co-creation is the emergent coordination of voluntary endeavors without a direct managerial structure or role assignment. One example is the “follow the taillight” project coordination in OSS projects, where the focus on a shared target, such as besting an existing software product, frequently with an emotional engagement, aligns the efforts of a group [12]. The cooperation of group members in working toward their common goal emerges as a behavior learned after repeated, ultimately successful, interactions. This is sometimes characterized as swarming behavior, with analogies to the animal behavioral patterns studied by ethologists. Gloor analyzed a type of VC that he calls a collaborative innovation network, using insights gleaned from this approach [42].

In the co-creation research domain, collective intelligence is studied intensively with respect to information markets (or virtual stock markets) in the applications to forecasting, decision making, and idea generation. Participants in such markets trade contracts whose payoff may depend on a future event.

These markets are considered efficient economically, and often also in the sense of speed, in aggregating the dispersed information and knowledge of diverse individuals. Based on research results that can be traced to the theory of complex adaptive systems, the necessary characteristics of information markets have been determined [49]. These are: the presence of motivators necessary to elicit participation and knowledge revelation; participants with relevant knowledge; diversity of the participants in aspects relevant to the decision; independent decision-making by participants (thus avoiding mutual influence and groupthink); and the presence of an aggregating mechanism (generally the market price, but other possibilities exist, such as popularity points).

Information markets are used as prediction, preference, or idea-generation markets. Prediction markets serve to aggregate opinions about the likelihood of future events. This may involve a choice between several discrete alternatives or an estimate of a value (such as sales volume). Preference markets identify the participants' preferences—for a product, for example. Idea-generation markets are deployed to generate new ideas, possibly also identifying the way the future outcome can be estimated and thus a payoff determined. While prediction markets pay off on the underlying event and can use the outcome as the criterion of goodness, the others cannot rely on a *fait accompli*, as the outcome becomes known only in the longer term. Information markets have been studied in a variety of disciplines, notably and obviously in economics (e.g., [114]), and have extensive analytical literature. Geng, Stinchcombe, and Whinston presented and formally analyzed a framework for a two-stage Vickrey (sealed-bid-second-price) auction for the introduction of radically new products [41]. The co-creating participants used on-line simulators to exercise the prototypes. Spann and Skiera presented alternative designs of prediction markets and analyzed their forecast accuracy [95]. Effectiveness of a market for idea generation was investigated in an experiment by LaComb, Barnett, and Pan [61]. Ideas were "securitized" and traded on the market, with the idea adjudged the best surfacing as the highest-priced security. The market was found to result in more ideas and attract more participants than more traditional idea-generation techniques, but was no more effective in ranking ideas than others.

The nature of the needed reward in information markets has been researched. Real-vs.-play money as payoff was the subject of research by Servan-Schreiber et al. [93]. Play money has been found effective indeed. Chen et al. used play money to investigate voluntary employee participation in an internal preference market and found it effective [18]. Dell and Starbucks experimented with such markets involving customer communities. Jones, Collins, and Berndt present a comprehensive set of research propositions in the information-market landscape [53].

### **Open Innovation**

In sponsored co-creation, organizations open themselves to the co-creation efforts of external individuals, including present or potential consumers.

From the point of view of the producer organization, the closed model of innovation, relying principally on internal knowledge stocks and flows to create novel products and processes, is being augmented and modified in this model, known as open innovation, which also includes cooperation with other producers. The general premise is that there are far more potential value creators outside the company than within its walls (or on its internal networks). "Open [i]nnovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" [19, p. 1]. In relation to consumers, open innovation aims to attain a rich understanding of their objectives and the way they use the firm's products, and to garner the creative ideas they have about their needs (rather than only with regard to currently used products). Binding consumers to the brand is a clear objective as well.

In opening themselves to consumer co-creators, firms are democratizing innovation, in the words of von Hippel [106]. The division of labor between producers and consumers is being redefined. Consumers, as the users of products, know different things than the producers. Consumers can contribute in a variety of roles; some of these are parsed by Nambisan and Nambisan [78]. Their possible contributions are discussed further below. In supporting consumers' co-creation activities, producers can provide toolkits over the Web, assisting consumers/users in designing, prototyping, and testing the products [106]. While some of this activity falls under the rubric of customization for the use of a given individual, certain producers incorporate the ideas and designs proposed by consumers into corporate open innovation processes or expressly support co-creation activities with extensive corporate programs. Innovation intermediaries, such as InnoCentive, have emerged to assist companies in opening their innovation processes to the "world," literally and figuratively. The Web site of InnoCentive seeks solutions proffered by individuals (and firms) globally to well-defined problems of its corporate clients and offers professional services in the processes of vetting and assisting contributors. The open platform code of sites such as Facebook or the support for iPhone apps brings into the compass of the owner firms creative talents and fresh ideas of a highly diverse population of developers, many of them co-creating consumers. The ability to engage customers in the exploration and exploitation of innovation opportunities is seen as a factor of corporate agility in the marketplace [92].

## Typology of Co-Created Value

As defined above, co-creation includes autonomous activities by individuals and communities, that is, by consumers as opposed to market-oriented producers, as well as sponsored co-creation in conjunction with a producer. Here we shall consider both. It should be noted that various autonomously co-created products are deployed by organizations characterized as producers, including platform providers (e.g., Amazon, Facebook, TripAdvisor), often acting as information aggregators.

### **Autonomous Co-Creation: Consumer-Side Production**

The following components of autonomous co-creation can be recognized.

#### *Production of Procedural Content: Software Production*

The successful autonomous production of OSS has surfaced the ideology, production systems, tools support, wealth of motivations, and means of legally protecting commons property that have become a defining syndrome of co-creation.

While the foundations of OSS production have been established, the meta-system that would incorporate this mode of production into the overall IT environment keeps evolving, with major corporations using OSS platforms, reusing OSS code in their own, wrapping OSS products in their for-profit services and support as complementary products, and attempting to deploy the development methods discovered by OSS communities in the corporate development milieu.

#### *Production of Declarative Content*

The great variety of user-created digital content includes the following:

- *Knowledge compendia.* The icon is the Wikipedia model of the continuing accretion and refinement of knowledge content by globally distributed individuals. The spectacular success of the model of open contribution to a commons product can be contrasted with the spectacular failure of the original attempt to offer the Wikipedia based on the traditional model of the accreditation of contributors and editorial supervision.
- *Consumer reviews.* A different model of information aggregation is that of the successful Zagat guides and derivatives, which use material within a limited domain supplied by qualified consumers and aggregate the information by systematization, indexing, summarization, and statistical means.<sup>7</sup> Angie's List, Yelp, and similar sites use variants of this model. Consumer reviews of many kinds are available on technology, travel, cultural products, and so forth, with the best-known aggregates having acquired strong market power.
- *Multimedia content.* YouTube is a starring example of the value created by "the world" of contributors.
- *Blogs.* Sometimes highly personal, very timely, and informed by deep knowledge and analysis, on-line journals volunteer coverage of many domains, from the highly specialized to the truly global. Of course, most blogs are of strictly private interest. Blog aggregators like the Huffington Post have created novel news and opinion formats rivaling traditional newspapers. The facilities provided by the aggregator of this content include the platform, the means of classification and search, often with a summary aggregation, and—

not least—the means of monetization (e.g., advertising, sponsorship) that assure continuing existence.

- *Mashups*. These sometimes controversial compositions of existing content can be created and modified by ever new contributors. In the commons, the use of Google Maps combined with local or statistical information often results in high-value products.
- *Virtual worlds*. The contents of a metaverse such as Second Life are created by the users, most of them individuals (although organizational use is growing). Business models of this kind exhibit strong network effects—the benefits to existing users grow supralinearly as new users (and their avatars) join the world.

### *Hardware Co-Creation*

With the drastically falling costs of user-side fabs and the availability of toolkits, consumer-side production of hardware artifacts has been on the increase [3]. Digital prototyping tools and inexpensive stereolithographic 3D printers make it possible to reallocate some production tasks, along with customization, to the consumer side. It may be expected that this trend will go beyond production for one's own use and evolve into value co-creation entailing innovation and the production of marketworthy artifacts. Arduino, the open source prototyping platform for electronics design, is a notable example of an enabler. The increasing volume of digitizable content, such as configuration for field-programmable gate arrays (FPGA) for digital design, supports this trend.

### *Development of Social Capital and Appropriable Relationship Value*

The social capital accumulated in Web-based relationships is being used in the creation of value. The relationships among the members of social networks, such as Facebook, the leader, but also MySpace, LinkedIn, Baidu Space, Orkut, QQ Alumni, and others, as expressed by “friending” and other links, and as supplemented by vast disclosures of information, are available for commercial exploitation by the platform owners, subject to legal constraints and ethical norms. Location-based social media in the m-commerce domain, such as Foursquare, enable the accumulation of information on the pattern of the members' movements as customers in the physical world, with the consequent economic leveraging.

### *Trust Creation: Reputation Systems*

Trust deficit constitutes a recognized barrier to e-commerce. Indications of counterparties' trustworthiness, or lack thereof, supplied by consumers to transactional platforms, therefore, represent a significant value. Reputation systems aggregate the data for this type of trust. “Reputation is the opinion of the public toward a person, a group of people, an organization, or a resource”

[48, p. 1:1]. A reputation system “collects, distributes, and aggregates feedback about participants’ past behavior” [89, p. 46]. Thus, buyer and seller feedback on eBay (some of it supplied by generally small enterprises) constitutes a major value component for the site—and a potent barrier to entry for competitors unable to compensate for the absence of comparable longitudinal trust information.

### *Word-of-Mouth Promotion*

Word of mouth is defined as “all informal communications directed at other consumers about ownership, usage, or characteristics of particular good and services and their sellers” [113, p. 261]. Word-of-mouth (WOM) promotion is vastly amplified on the Web by the availability of massively shared transactional platforms like Amazon, social networks, and other social media, such as the microblogging service Twitter. Linking to, blogging, sending tweets, informing “friends” through collective messages, are among the available ways to engage, in effect, in social product promotion (or demotion). Electronic WOM (eWOM) is subject to social amplification [116]. Reputation systems that evaluate participants coexist with word-of-mouth product reputation articulations [26]. Although they may rely on similar mechanisms in certain aspects, the differences are significant; among other factors, time horizons and reliability criteria differ between the two categories. Platforms offer additional means of aggregating WOM by combining it with reputation systems for opinion-makers, such as Slashdot’s karma points.

### *Collective Sense-Making*

Annotation by consumers and the bottom-up taxonomy emerging from the labeling of items, such as photos on Flickr (“folksonomy”), provide an organizing means and equip the search capability for the context, thus enhancing the value of user-generated content.

### *Appropriate Collective Ranking for Importance*

In an economy where attention rather than information is the scarce resource, the means of directing users’ attention to items truly important to them are valuable. This is the foundation of Google’s PageRank algorithm—which is based, in essence, on the number of links pointing to Web pages, with further weights assigned, recursively, in the same fashion to the pointing pages. The implicit collective ranking emerges from the page-creation activity of the multitudes. It may be noted that the value absorbed by the owner of the by-now heavily modified algorithm, whose variant is also used and monetized in AdWords, is the positive externality of the regular activity of Web users. Digg’s advancement of comments to the home page is another example of such ranking.



### *Collective Sentiment Expression*

Social media, the means of interpersonal expression on the Web, include social networks like Facebook, microblogging networks like Twitter, blogs, aggregated, for example, by Blogger and Technorati, as well as a great variety of consumer articulations on transactional platforms that encourage such self-expression as the means of building a relationship with customers. Text and data mining is increasingly deployed to hear *vox populi* and create customer-centered value. With the inexorable effects of Moore's Law, data- and computation-intensive real-time approaches can be used to mine photo, video, and audio information as well. Going further in deploying simple user articulations, Google uses spoken requests to its free directory-assistance service to collect vocal expressions of the multitudes and train its voice-recognition algorithms.

### *Task Redistribution*

The availability of sometimes deep knowledge on certain authoritative Web sites has enabled motivated consumers to share the task of advice or diagnosis with the professionals they retain. This is notable in the "Web-informed patient" syndrome, with patients researching their conditions on WebMD and similar sites, but also using community sites such as PatientsLikeMe that offer deep and hard-earned experiential knowledge. The legal and investment domains, among others, have experienced significant efforts by consumers informing themselves. Professionals in these domains need to equip themselves to be able to take advantage of this co-creation.

### ***Sponsored Co-Creation: Contribution to the Producer/Sponsor Value Chain***

In sponsored co-creation, consumers can contribute to virtually every stage of the value chain of the organizations that involve them in their activities. The following contribution domains can be recognized, starting with upstream value-chain stages.

### *Ideation and Idea Evaluation*

As the users of products in the most diverse circumstances and the collective possessors of diverse stocks of knowledge and experience, consumers as a whole, and consumer communities as collective bodies, can generate new product ideas, elaborate on ideas generated within organizations, and help to assess the viability of proposed new products. Among the notable and well-known examples, Procter & Gamble (P&G) deploys its Connect + Develop Web site to organize interactions with ideating consumers, and 3M has implemented a process of innovation rooted in co-creation. In a recursive process, ideation by

Twitter users leads to a continuing modification of the microblogging service. Idea competitions, ideation jams, and idea-generation markets are used to assess, and often generate, new product and market ideas.

### *Product Co-Design*

LEGO Design, Threadless.com, and Zazzle are exemplars of firms that involve users in product design, supporting them with toolkits available over the Web, and subsequently bringing the products to market. The evolving product offered by metaverses, notably Second Life, is developed largely by the users of the site. Initiatives of many kinds have been employed to draw in co-creating consumers. As one example, the labels contests for Jones Soda produce attractive photo-based designs—and a relationship with consumers.

### *Product Testing*

The beta testing of software by potential users has been joined by the testing of other products, with software prototypes and test kits available over the Web.

### *Contribution of Consumer Resources*

Consumers contribute their computational resources to such grid-computing sites as SETI@Home and Folding@Home. Consumers' computers are used to transmit packets in the peer-to-peer systems of BitTorrent and Skype.

### *Product Promotion*

Many firms have deployed eWOM in co-creation activities. Consumer-side production of ads, such as "flying iPods" and Sony's ad for Current TV, has produced not solely the ad designs, but also the eWOM. eWOM marketing programs have been organized, among other firms, by P&G with its Vocalpoint assembling 600,000 "connectors." P&G and Unilever have created Web sites for some of their personal hygiene products that have engendered communities of consumers who are more comfortable sharing their experiences and concerns with other members than with experts. P&G found these sites many times more effective than television advertising [25].

### *Consumer Self-Revelation*

By uploading self-description, lifestyle documents, and photos to corporate Web sites, consumers offer the firm's marketers, with support from mining software and other software tools, an opportunity to obtain a rich picture of the

firm's customers. Thus, the Web site of Wet Seal, a 500-store clothing retailer, offers an Outfitter feature that allows users to produce virtual outfits on-line, to be shared with others, who comment on them. "We can get a read to where our customer is headed faster than ever before," states the firm's CEO [71].

### *Consumer-Side Customer Service*

Members of user communities are drawn upon by the producer firms to respond to questions and resolve use-oriented issues for other users. Requesting "help from the communities" is a well-known method of dealing with software problems—not infrequently used by employees of the producers as well.

## **Taxonomic Framework of Factors in Co-Creation**

The development of a full-scale taxonomic classification of co-creation is a daunting task, considering the richness of the domain. As one relevant example, the rigorous systematics of organizations initiated by McKelvey has not been completed [74].<sup>8</sup> Yet, the study of a research domain benefits greatly from the establishment of a classification of its entities in the theory-development work preliminary to further theory building [43]. Toward this end, the following taxonomic framework is offered, based on a multi-year study of e-commerce activity and of its analysis in the literature, both scholarly and anecdotal. The classification includes the most salient aspects of co-creation. It will undoubtedly be expanded in the future, both by scholarship and by events. It is hoped that further research in the area will lead to the refinement of this framework, with cluster analysis of its various segments, for example, aiming as it is at a moving target.<sup>9</sup>

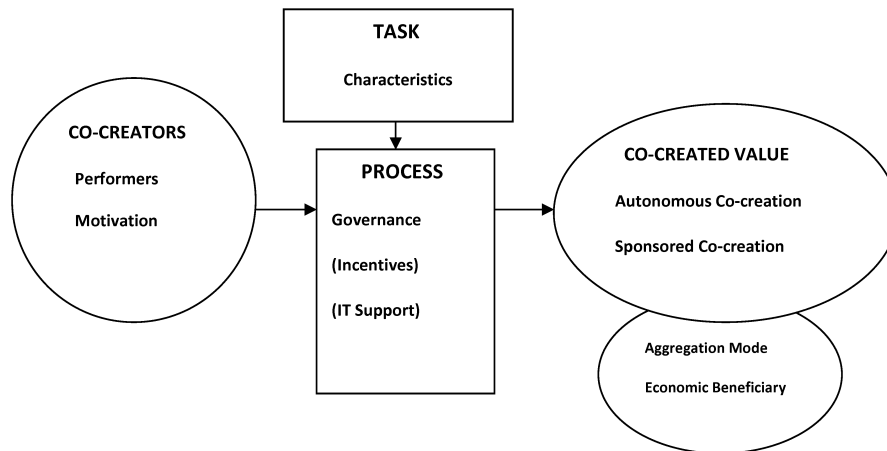
The taxonomic framework is shown in Figure 2. The typology of the co-created value is a part of it. The framework only includes aspects specific to co-creation. The Process characteristics are not taxonomized beyond Governance. The Incentives follow from the Motivation factors, discussed below. The IT support does not necessarily benefit from taxonomization. The specific, and vital, IT support includes, for example, prototyping aids, data- and text-mining systems, version-control systems for OSS, information markets, components for idea competition [65], and myriad other systems.

These are the components of the taxonomic framework.

### **Performers**

A task can be performed by any of the agent collectives listed below.

- *The world.* Any individual can contribute to the best of his or her ability. This is well illustrated by the Wikipedia model, whose genius is its acceptance of the contribution of the provider of the *mot juste* as well as that of a highly credentialed creator of a scientific entry.



**Figure 2. Taxonomic Framework**

- *Prequalified individuals.* An opinion provider may be prequalified by a previous episodic experience (e.g., “Have you stayed at the hotel within the last month?”), a consummated transaction (as on eBay), or, more demandingly, an accumulated experience (as in the Zagat guides). The prequalification, possibly accompanied by the individual’s profile, makes the contribution far more valuable, beyond aiming to validate its authenticity.
- *Community members.* The level of mutual trust attained by the members of the community lends weight to the contributions (some health- or faith-related communities operate on this basis, for example). Further distinctions, such as organic versus sponsored communities or product- versus game-oriented communities, help to contextualize the results of research on this type of co-creation.
- *Skilled contributors.* OSS projects, as a notable example, rapidly winnow out would-be contributors lacking the requisite skills.

## **Motivation**

There is a very rich, and continuously researched, array of motivators leading participants to articulate themselves, freely reveal valuable knowledge, and work “for free” in the co-creation framework. Some psychological theories draw a distinction between extrinsic motivators (i.e., external rewards) and intrinsic factors of the inner motivation of the individual, which generally are found to bind more tightly. When one considers such factors as a desire to learn, which motivates many OSS contributors, it becomes clear that such a dichotomization is not fully satisfactory. Therefore the most frequent motivators will be stated in order from most altruistic to monetary. The motivators are listed in Table 1 in brief statements, combining some that are closely related. The

**Table 1. Potential Motivators in Co-Creation.**

*Altruistic desire to contribute*—based on the expression of personal values, ideological beliefs, or deeply felt needs

*Passion for a task*

*Inner need to reciprocate* in view of the contributions by others

*Enjoyment, state of flow, playfulness*—the essential motivators of participants in virtual worlds

*Self-expression*, speaking the truth as one sees it

*Identity construction*—co-creators can derive their sense of identity from the co-creating communities and projects

*Forming personal relationships*

*Community norms*

*Competitive spirit*—expressed prominently in idea competitions, but also in OSS development and other co-creative pursuits

*Learning through co-creation from and with others*

*Satisfying one's affiliation needs*

*Self-esteem and self-efficacy*

*Thymotic strivings*<sup>1</sup>—desire for social standing, recognition, and renown

*Acquiring social capital and peer recognition*

*Career advancement*—acquiring skills and experience, and becoming known, akin to the outcomes of traditional volunteering

*Own use of the object of co-creation* may be the object. Some OSS developers aim to respond to their own software needs. The co-creators of Delicious organize their own Web bookmarks; the aggregated bookmarks of all users serve the world.

*Nonmonetary rewards*—home-page recognition, high review rankings

*Signaling to potential employers and investors*

*Financial rewards*—indirect and direct monetary payoff from co-creation activity

<sup>1</sup> Fukuyama expands on the concept of *thymos* in Plato's Republic as lying at the origins of the motivation to contribute through work [38].

extant co-creation literature has so far studied only some of these motivators in various combinations, as discussed further in the paper.

## **Governance**

There are a variety of governance regimes, that is, decision-rights allocations and policies, in co-creation activities. Here are the most noteworthy methods of governance:

- *Individual autonomy* is the prevailing mode in uncoordinated co-creation.
- *Collective norms* are a powerful mechanism controlling community-based behavior. Ostrom asserts that norms are more powerful than formal rules as a governance mechanism in collective action [81].

- *Software code* and the rules embedded in it may form an implicit governance regime; they serve to organize the versioning and reuse of OSS, for example.
- *Facilitators* have been found to have a positive influence on the operation of such opinion aggregators as Slashdot.
- *Adhocracy* emerges in Web-based collaboration as a more organized (yes, *ad hoc* is better than none), albeit improvisational, way to distribute decision rights and coordinate work. It is grounded in an organically emerging structure and highly informal relationships. This form of governance has emerged in some successful OSS projects.
- *Bureaucracy* may be established—generally in a longer-term evolution of co-creation efforts—with formal rules and strict distribution of rights and responsibilities. For example, Wikipedia has evolved processes of this kind for certain kinds of articles, in the search for quality and consistency.
- *Market mechanism* is enacted in information markets.
- *Hybrid forms* of governance generally emerge in practice; Wikipedia is a case in point.

### **Task Characteristics**

The task to be accomplished poses requirements on the participants and the process. Among the most important task characteristics are the following:

- *Structural complexity*—high in OSS, low in Wikipedia, and very low in blogging.
- *Intellective demands* for knowledge, skills, experience, creativity, and diversity in collectives.
- *Effort intensity* required by an OSS task is far higher than that of most other co-creation tasks.
- *Time frame* ranges from indefinite in many Wikipedia tasks to very tight in citizen participation efforts in emergency management (e.g., uploading and tagging photos on Flickr [70]).

### **Principal Mode of Product Aggregation**

Multiple methods are used to aggregate the digital product or design over unbounded time or for a specific time interval. Depending on the need, the aggregation may result in a textual or multimedia corpus, in summary results, or in a combination thereof. The digital product may be aggregated as follows:

- *Searchable corpus* is the most frequent form of aggregating digital content; an effective search facility is the means of rendering the corpus an aggregate. As just a single example, this is one way Technorati aggregates blogs.
- *Hyperlinking* is a native Web method that can be used to aggregate and is generally combined with others.



- *Progressive refinement* is used in software code as well as in Wikipedia.
- *Statistical ratings and rankings* are used to summarize.
- *Competitions and voting* are deployed to select. Cambrian House solicited game ideas from a large community whose members then voted on them. The top vote getters were subsequently placed in a tournament; the winning game has attracted investors [73].
- *Information markets* are deployed to select a forecast or an idea.
- *Bottom-up taxonomy (folksonomy)* can be used to classify and provide access (as in Flickr).
- *Moderators, auditors, and facilitators* help in selection in some business models (Slashdot is the case in point).

### **Economic Beneficiary**

Reviewing the motivators of co-creation, economic value is by far not the only type of value created in its activities. Indeed, a claim can be made that in the current distribution of value received, many individuals forgo this type of value, receiving more intrinsic and deeper satisfactions from their co-creation activities. However, the economic value received by co-creating communities and individuals, as compared to what is extracted by the aggregators and producers, needs to be researched. The principal beneficiary, or appropriator, of co-created economic value (expressed as the revenue or value to a benefiting firm) may be:

- *the world*, in the commons model, such as Wikipedia
- *the community*—even in open innovation models where the sponsor benefits as well, the user or brand community itself may have the principal interest in improving the products they are able to acquire
- *the sponsoring firm*—the firm sponsoring the co-creating activities of the consumers
- *the aggregator*—a firm that provides the platform and aggregates the user-provided content; the degree to which consumer communities participate in value extraction differs and depends on enclosures erected by the aggregator (e.g., the membership fee in Angie's List)
- *the contributors*, with the sponsor's/aggregator's participation, in the case of InnoCentive, or, on a far smaller scale of revenue, Amazon's Mechanical Turk.

Much contextualized research is needed to explore how various taxonomic entities interact in autonomous and sponsored co-creation. The discussion in the next section considers the major research avenues discernible at present.

### **Principal Research Directions**

In an attempt to synthesize the major directions of co-creation research, the following narrative favors the presentation of the problematics and results

through representative research, at a certain cost to an impossible project of exhaustive citation. Contributions more pertinent to the study of e-commerce are stressed. The literatures defining the intellectual space of co-creation research and some of the iconic illustrations were invoked above. The intention is to highlight the directions in which research can be fruitfully continued. It is expected that new avenues of research will develop in parallel to the expansion of the present ones.

### ***Motivation to Participate in Co-Creation***

The propensity of individuals to contribute is the bedrock of co-creation. To those blinkered by purely immediate monetary incentives, co-creation is a closed book. The rich array of other potential motivators was discussed above. These solve in large part the free-riding problem that manifests itself in various settings of collective production [9]. So long as a critical mass of contributors is motivated to contribute, free-riders constitute an audience that may be used to support the enterprise through various monetization means. There are several lines of research on the motivations for participating in co-creation in various settings.

The development of OSS has called forth an extensive research literature on the operative motivations. The originating empirical work by Hars and Ou identified a complex set of intrinsic and extrinsic motivations [44]. Several cohorts of contributors were identified in this survey research, some satisfying their inner needs, while for others long-term economic motivations prevailed or a payment was actually received. Lerner and Tirole analyzed the incentives of OSS co-creators in terms of the currently available economic theory [66]. The delayed rewards of career enhancement (future job offers, shares in commercial OSS-support firms, future access to capital markets) were listed as a signaling incentive and an active motivator, with ego gratification also listed as an incentive.

Roberts, Hann, and Slaughter identified a broad set of motivations, dichotomized by them as intrinsic and extrinsic, in a study of a very large OSS project [91]. The *effects* of various motivating factors on task performance, as mediated by goal commitment and effort intensity, have been found to be quite differentiated, with social identification with the OSS project group being the strongest [20]. This finding enlarges the scope of the factors under research beyond the individual ones. Extrinsic motivation, found important in the prior research, has been found to contribute only to goal commitment. Shah found that the motivations of OSS participants evolve over time [94]. Sustained participation in OSS projects has been found to be motivated by other factors than those that led the contributors to join; situated learning (acting knowledgeable and purposefully in the world) and identity construction within the community have been found to be the motivators of continuing participation [33].

The impact of ideology, defined as shared and strongly held beliefs, values, and norms, on OSS development practice was studied in a nuanced fashion by Stewart and Gosain [97]. Based on SourceForge data, they found that adherence to the OSS ideology of collaborative values and a belief in the OSS process

attract people and effort to a project. Notably, commons-related beliefs (in the need for code and information to be freely available) and collaborative values were found to have a negative effect on task completion. This exploratory study needs to be followed up by a closer look at the revealed symptoms.

Studies have been performed to explore the motivators of contributing one's knowledge to a community. In the context of a students' discussion forum, knowledge-contribution behavior was found to be stimulated by both perceived sociability (notably social interactivity) and perceived system usability (ease of use in particular), surfacing again the importance of social factors [84]. The leading factors motivating contributors to Wikipedia were found to be seeking fun, satisfaction of ideological needs and values, and learning [80].

The articulations constituting eWOM have been the subject of intensive research from the point of view of incentives. The motivation to contribute product reviews was derived by Hennig-Thurau et al. from the literature on traditional WOM [47]. Eleven potential motives for engaging in eWOM were postulated, and the most salient ones were identified in survey-based research in the context of an opinion platform, with social benefits heading the set of motivators. Amblee and Bui showed empirically that the high brand reputation of a good, or of a complementary good, increases the likelihood of its being reviewed on-line (the Matthew effect in action) [1]. Interestingly, the propensity to review movies has been found empirically to be U-shaped by Dellarocas, Gao, and Narayan [28]. Thus, both hit and niche movies find relatively large numbers of reviewers (the Matthew effect and the long tail combined).

Social and communitarian factors stand out as vital motivators, along with the personal ones. The crowding-out theory asserts that financial incentives may undermine intrinsic motivators such as social norms; this theory can be tested in the co-creation environment. In general, this research direction requires integrative work that would offer a contingency perspective on why individuals freely contribute their efforts under various conditions, why and how the motivation is sustained or lost, and how the motivators change throughout the longer term. A longitudinal study of the motivations to co-create may reveal changed attitudes with wider acculturation to the phenomenon and recognition of the potential economic benefits.

## Quality of Freely Revealed Content

Free revelation of knowledge, whether embodied in original content or in software, implies surrender of the right to be paid directly for intellectual property. Owing to the anonymity of most of the production, ensuring the quality of the contributed ("freely revealed") knowledge is an issue. How to raise the quality?

More significant Wikipedia articles are now produced by groups of volunteers working on a wiki page. The extensive quality-assurance processes adopted by the Wikipedia community have been analyzed and assessed by Stvilia et al. [98]. In particular, so-called featured articles, nominated by the members of the community, undergo a peer review with respect to multiple quality attributes. Although these attributes are arguable, particularly in

terms of the coherence of the entire Wikipedia, it must be recognized that in several respects any definition of the quality of a body of knowledge would be socially constructed—and Wikipedia continually, and socially, enacts new processes of quality assurance. For example, the German Wikipedia no longer permits modification of a biography of a living person without authorization by a senior community member (with the attendant delays in updates to the site). The quality of collectively produced Wikipedia articles has been found by Arazy et al. to depend on the functional composition of the group producing an article [5]. These researchers identify an intricate relationship between the composition of the group (established, more generalist, registered contributors vs. specialized novice contributors) and the quality of the article it produces. Longitudinal study shows that the growth of Wikipedia is not accompanied by quality deterioration, with stable processes of contribution being operative [96]. The general quality rise of Wikipedia is indeed apparent to any reader.

Using the analytical tools of economics, Chen, Xu, and Whinston offer a mechanism design for a moderation system to be deployed in a forum such as Slashdot that offers technology-related material, including opinions supplied by users posting their comments on a topic [16]. Slashdot uses karma points to quantify the contributor's reputation, based on scores assigned by other users. The value of the scores is attenuated according to the reputation of the scorers. Slashdot also uses moderators who rate contributions and are selected randomly from the eligible users to moderate a limited number of posts. The economic perspective of incentive compatibility is taken and game-theoretic analysis is provided by the researchers. Moderation is found to raise the quality of content and keep out opportunists (promoters); the frequency of moderation is critical to its success.

In the blogosphere, the quality of continuing contribution to a blog is—far from perfectly—reflected by its in-degree as a node in the overall link network: the number of links pointing to it, including permalinks linking it with other blogs. One can argue for the aptness of this proxy, with some success, by citing the popular blogs' ability to attract the scarce resources of the attention economy. The correlation between this expression of attention and the actual quality of the blog requires further study. Most blogging activity is strictly of personal value and requires no assessment in the realm of co-creation [79]. To go further, the blogosphere can be conceptualized as consisting of three layers: the individual bloggers (some highly creative and coalescing into interest groups), blogger pairs, and blog communities [60]. Parts of the first group, and certainly the last one, are of great interest in terms of the co-creation of knowledge and information. To move ahead, it is necessary to explore the quality attributes of articulation where personal opinion is of the essence.

The general conclusions in this research area are that structures, mechanisms, and processes cannot be expected to wholly emerge, but need to be organized, perhaps over time, to make community production result in quality work. The composition of groups working on various projects is germane to quality of the output. Progressive speciation of roles in content- and code-creation communities needs to be analyzed. Much contextualized and nuanced further research is needed to specify the methods of quality assessment and

improvement. The setting of research within a taxonomically well defined environment should assist in the accretion of knowledge.

### ***Role of Communities' Social Capital in the On-Line Marketplace***

Individuals associated in communities continually accumulate capital in on-line relationships. The effect of this on the economic outcomes for producers and aggregators affiliated with these communities is being studied under multiple theoretical commitments.

Exploring the relationship-related aspects of Amazon reviews, Forman, Ghose, and Wiesenfeld found that the revelation of reviewer identity leads to higher sales [36]. Using social identity theory, they found that community norms lead to self-disclosure by individuals seeking relationships within the VC and identification with the community, and that self-revelatory reviews are rated more highly by others and are associated with higher product sales. Mutual trust among members of trading communities, anteceded by informational and emotional interaction, has been found to lead to trust in the platform provider, with the further consequence of loyalty to the provider [17]. The clear implication is that the provider should offer rich means for interaction among community members.

Loyalty to a brand can be an outcome of a committed brand community, as determined empirically by Jang et al. [52]. Community commitment, in turn, has been found by these researchers to be positively affected by information resulting from member interactions, pointing again to the importance of organizing congenial information space for community members. An example of a partial survey-based confirmation of the positive effect of co-creation on loyalty in financial services is found in Auh et al. [7]. Drawing consumers into high-credence services by these means requires further investigation.

Other economic benefits result from the operation of VCs. Subcommunities emerge within larger communities to produce outcomes beneficial to the producers or the content aggregators. Chua et al. analyzed the operation of three crime-prevention communities operating within larger trading communities on the on-line auction sites, well-known targets of fraud [22]. Community-based clan control may (or may not) be in concordance with the formal control of the auction site. Community knowledge, combined with the Internet-Web means, renders its actions effective. On-line games can be designed so that the participants, while playing to socialize and be entertained, perform tasks computers are unable to perform [105]. For example, Peekaboom is a game designed to locate objects within images. Metrics that combine the efficiency of output production are being developed in combination with those evaluating the enjoyability of the game. On the part of the firms, using the wiki way of enabling consumers to co-create some of the corporate Web content has been found, using multiple case studies, to be an effective way to engage customers, notwithstanding the risks of defacement, negativity, and chaos [110].

This research direction will benefit in the future from a more textured understanding of how social capital is defined on-line, how it emerges, and

how it can be lost in the far more dynamic Web environment, as well how it translates into other forms of capital, notably economic ones, for various categories of participants.

### **Organization of the Co-Creation Process**

Coordination, workgroup organization, workflow design, and continuing support or provision of motivators have been the focus of numerous studies of OSS and content-creation communities such as Wikipedia. The differences between OSS projects and the content-creation community projects of Wikipedia have been pointed out by Stvilia et al. [98]. These include the low barriers to participation and the speed of contribution in the case of Wikipedia, as becomes obvious in the wake of a world event.

Closer analysis of the operation of content-producing communities shows continually evolving and intricate processes of organization. Indeed, the wisdom of the crowd, or, at any rate, a quality product, does not spring out like Athena from the head of Zeus. Forte, Larco, and Bruckman, in a qualitative analysis driven by the theory of collective action in self-organizing communities, portray Wikipedia “as an organization with highly refined policies, norms, and a technological architecture that supports organizational ideals of consensus building and discussion” [37, p. 49]. The authors find that growing decentralization of governance processes, necessary with the growth of the community, requires consistent efforts by the community. The role of the community “elders” as the carriers of norms and ideals (and perhaps a measure of charisma), is found vital. “Cathedrals in the bazaar”—rigorous organization of projects producing peer-sourced product, such as OSS—has been noted by Feller and Fitzgerald [34]. The role of lead users in ideation—that is, engaged users at the leading edge of the market who foretell future demand, and at the same time are highly motivated to innovate—has been studied by von Hippel [107].

The technological environment supporting the co-creation process is being investigated. The role of toolkits in co-creation has been studied by von Hippel and Katz [108]. A set of IT components used for motivating ideation has been described by Leimeister et al. [65]. Evaluated in the environment of an idea competition for the open innovation of SAP ERP software, the components aim to activate various aspects of both intrinsic and extrinsic motivation. In the event, users indeed found the incentives effective, as was borne out by the quality and quantity of produced ideas.

In sponsored co-creation, organizations can organize external co-creators in collaborative communities or competitive markets [14]. The choice depends on the nature of the task and of the reward: Tasks that call for knowledge cumulation and lend themselves to reliance on more intrinsic rewards are best performed by communities; markets are effective when broad experimentation is needed and tangible rewards are offered. A framework for systems development using co-creation is offered by Kazman and Chen [56]. They argue that firms engaging in the co-creation of software and large content-based



systems need to move away from lifecycle-oriented development and adopt peer-production tenets and thinking.

Along with contextualized research on effective coordination methods, this research avenue will benefit from a concerted effort, perhaps in conjunction with service science and design science research, to establish the specific methodologies and means of IT support that would best benefit the agents involved in co-creation. At this time, as illustrated above, one can perceive only embryonic work in this direction.

### **Changing Consumer Roles and Self-Perceptions**

Consumption culture (as opposed to the culture of production of early capitalism) emerged in the 1920s, primarily in the United States, as a defining societal cultural strain [31]. In this culture, individuals acting as consumers satisfy and evolve their needs and wants, define their identity, and compete for social status through acquisition of products. Co-creation redefines the notion of the consumer in a much more active and, well, creative vein. In the co-creation environment, consumers naturally play multiple roles and their self-perceptions are changed.

Equipped with the tools for new-product development, individuals, and individuals *qua* consumers, perceive their own empowerment. Empowerment by the Web has been conceptualized as the ability to effectively interact with the world on different levels (thus, personal, dyadic, group, and community, but also an opening of the real self to the world) and to accomplish activities heretofore unachievable, and engage in a search for meaning [2]. A large-scale study of consumers who have participated in new-product development projects using Web-based tools, such as kits and configurators, shows the key role of the actual tool in the presence or absence of the sense of empowerment and enjoyment [40]. Specifically, virtual prototyping tools with immediate feedback, wide solution spaces affording users broad control, and congenial user interfaces that foster realistic understanding of the product under development and creative articulation of the co-creator's ideas lead to a sense of empowerment and, in turn, to the intention to participate in further co-creation projects.

Consumers are enabled to exert influence on organizations. In some cases, customer engagement is fostered by organizations themselves. In their study of the wiki way, Wagner and Majchrzak qualitatively analyzed the operation of such endeavors, notably by Novell Corporation [110]. Novell integrated into its corporate portal a discussion forum and an on-line magazine written by both employees and customers. While the magazine was subject to an editorial process, the forum was open to comments, some not necessarily favorable to the company. Although anecdotal evidence of the use of communitarian technologies in such engagement is plentiful, processes that can lead to mutual benefits from such efforts need further research assessment.

The self-perception of consumers is evolving. A close analysis of the blogging narratives that underlie eWOM shows that their authors engage in four

different communication styles in transmitting their articulations, styles that one may interpret as strategies [59]. As messages become embedded in consumer communities, they are transfigured; this reflects consumers' roles becoming more complex, attendant on the tension between communal and commercial norms.

"Putting consumers to work" in symbiotic co-creation was examined from the power-oriented Foucauldian and surplus-value-oriented Marxist perspectives by Zwick, Bonsu, and Darmody [118]. By "excavating" the "ideological underpinnings" of the phenomenon, they concluded that it represents a new technology of consumer exploitation and control [118, p. 167]. This approach is reductionist. Although it is obvious that partnering organizations do not engage in co-creation as a benevolent project, the phenomenon that accesses a great diversity of intrinsic motivators needs a deeper analysis. Indeed, co-creation aims at "reconfiguring social relations of production" [118, p.184]—and that is a subject worthy of exploration.

Bauman asserts that "contemporary society engages its members primarily as consumers; only secondarily, and in part, does it engage them as producers" [10]. Taking this assertion as a point of departure, the deeper level of individual engagement elicited in co-creation activities is a worthy subject of further interdisciplinary research. The issue of the distribution of the economic value produced by the co-creators is, however, as mentioned above, a weighty one that will require further research and, perhaps, new practices.

## **Economic Effects of Co-Creation**

The economic outcomes of co-creation are significant and keep growing. Virtual worlds, for example, represent productive economic aggregates. Castronova computed that an early, and relatively small, fantasy world produced the per capita equivalent of the (physical) world's 77th richest economy [15].

Contextualized economic studies are being conducted in various industry settings. Arakji and Lang studied the economic effects of producers' partial opening of code to users in the video-game industry [4]. By doing so, the producers partly outsourced product innovation to user/consumer communities in the MMOG sector. The video-game industry is a leader in such co-creation activities, owing to the nature of its product and of the gaming communities. Modified ("modded") games, differing in degree of transmutation, become a part of the product offering. Using formal economic analysis supported by the empirics, the researchers show that the producers benefit economically from such co-creation, provided that the mods are complements and not substitutes for the original games (this also explains why other entertainment producers do not benefit from such co-creation). Archak and Sundararajan used a game-theoretic model to study the optimal prize distribution in a "procurement-by-contest" mechanism that firms can use to attract outside contributors (e.g., the Netflix recommender contest) [6]. Reputation systems, such as those populated by eBay users, reduce transaction risks and have been found to lead to the realization of higher prices by reputable sellers [8]. Dellarocas continued

this line of research by analyzing the influence of feedback-system design on market efficiency [27].

The economic consequences of eWOM have been researched in several settings. Studying the consequences of game reviews, Zhu and Zhang found empirically that consumer reviews are more influential for the sale of less popular games; the findings suggest that marketers of niche products benefit more than others from eWOM, because its salience is high in the absence of alternative information [115]. Cheung et al. found that the credibility of eWOM is predicated on two sets of factors: the strength of the recommendation and its value within the context where it is given (e.g., other recommendations on the item, ratings assigned by others) [20]. In these two-sided quasi-markets, the readers of opinions are motivated by the possibility of saving decision-making time and making better purchase decisions [46]. Further, favorable eWOM has been found to be positively associated with sales. Positive book reviews lead to higher sales of the item and appear to create a better fit between consumer and acquired book, thus increasing consumer surplus [21]. The authors are unable to claim, however, that such reviews lead to a higher top line for the retailer, as they may simply redistribute the given volume of acquisitions. Duan, Gu, and Whinston found, in the context of movie reviews and using econometrics to establish causality, that it is the quantity of reviews that matters, rather than the ratings level [32]. On the other hand, Park, Lee, and Han found that consumer intentions to purchase are positively affected by both the quality and quantity of on-line reviews [82]. On-line product reviews can also be used to refine sales forecasting; adding the metrics reflecting these reviews substantively improves the performance of diffusion models in forecasting revenues [29]. The relationship between on-line product reviews and the success of new-product launches was studied by Clemons, Gao, and Hitt using the theories of hyperdifferentiation and resonance marketing [23]. Based on sales data from the craft-beer industry, the researchers found that the strength of the most positive reviews is highly correlated with new-products sales growth.

The continual emergence of new business models assembling and incorporating various aspects of co-creation points up its economic importance. As one example, real-time search engines that update their results from social media sites (e.g., Delicious, Digg, Twitter) have recently emerged in the marketplace (e.g., OneRiot). Facebook Connect is emerging as a hub in social media and networking. One can envisage some of these becoming a platform for further business models that rely on recent consumer reactions and articulations. As these business models are based on cost structures that differ from the traditional modes of production, they can be a foundation for disruptive innovation. The economics of this disruption requires further study.

OSS has a rich tradition of monetization by the suppliers of complementary products, such as value-adding service (e.g., training) and technical-support firms, and by users who often treat some open-source systems as platform software to leverage the work of OSS communities [35]. The total cost of ownership of OSS requires research, as do the macroeconomic effects of the phenomenon.

Since, arguably, a new mode of production is being considered here, methods have to be developed to assess its productivity at various levels of analysis. In addition, new levels of analysis may need to be developed—for example, methods of assessing community productivity and for comparing the productivity of various types of communities. Pre-Web assessments of co-creation, as in the work of Mills, Chase, and Margulies, need revisiting in the new contexts [75]. This very important research direction should explore the distribution of economic value among the agents in various types of co-creation activities. The issues of distributional justice are likely to arise and require follow-up studies.

## Conclusion

The co-creation phenomenon splinters many simplistic dichotomies and categories. The definition of “consumer” has always been reductionist. An individual plays many market-affecting roles that are different from being a passive consumer or a paid producer. Work and play are not irreconcilable opposites. There is a plethora of motivations beyond the pecuniary ones in the human drive to produce. These perhaps obvious facts have always been known as generalities, and sometimes researched. Mass and multifaceted co-creation, as enabled by the Web, has brought these issues together and made them a subject worthy of investigation in an integrated research program. The typology presented here should serve to further differentiate studies and discriminate among them within a well-defined context, but also to keep integrating the findings in more refined systematic studies.

Co-creation challenges our understanding of the nature of work and of the separation between work and play. Co-creation also changes the nature of the objects of production. To compare the Wikipedia with the *Encyclopaedia Britannica*, note the vernacular subjects, previously considered unworthy of an encyclopedic treatment (democratization of content), the inclusiveness of content owed to the almost-free IT, the immediacy of inclusion, modification, and intended correction of errors. We see the cumulation and evolution of content, moving toward a Borgesian vision of a one-to-one map of existing knowledge. We also see unevenness of treatment and loss of imprimatur that goes with the authority-based *Britannica*. Huffington Post is the emerging new form of newspaper (newsscreen?), with the higher significance accorded to individual opinion and a real-time aggregation of news. The aggregate of video snippets on YouTube, the metaverse types of virtual worlds, are all creations of co-creation. Foursquare creates a new way of being in a city, where you are able to gather in real-time the people in a place “where everybody knows your name” and include those physically absent as well. Acculturation to the environment of co-creation proceeds apace. The product is not necessarily finished: many OSS products undergo continuing and frequent new releases; Wikipedia is *always* a work in progress. Mass appropriation is recognized by some as a form of creation—and spills over into the “physical” world [58]. These phenomena are worthy of further study by researchers in multiple fields.

It is hoped that the taxonomy presented here will be of service in the further development of co-creation theory. As we do so in our field, we are aiming at the moving target of rapidly developing new business models, platforms, and approaches to co-creating value. The world of the Web is a vast laboratory for such experimentation. Continuing development and refinement of the taxonomic framework, therefore, will certainly be necessary.

## NOTES

1. The “consumer” category refers to the set of actions of individuals, rather than to a set of individuals. The eighteenth century saw the emergence of a well-defined consumption sphere and infrastructure, but the notion of a consumer solidified only in the last century [103].

2. The changing relationship of consumers to the marketplace was foretold by the futurist Alvin Toffler, who coined the portmanteau word “prosumer” to denote a producing consumer [101]. However, the role of prosumers was to “produce for their own consumption” [101, p. 273], which is not the principal thrust of co-creation.

3. Kambil et al. defined co-creation as “engaging customers directly in the production or distribution of value” [54, p. 40]. The theme was further developed by Prahalad and Ramaswamy in the sense of firms creating value with customers to produce a unique customer experience [86].

4. “Co-creation” can thus be also read to stand for “consumer creation” or “collective creation.”

5. It should thus be noted that the communitarian mode of OSS production is only one of several possible ones [112].

6. More restricted forms of commons are also possible and considered by Benkler [11].

7. Nina and Tim Zagat can claim to have been the originators of qualified crowdsourcing for their restaurant guides in 1979.

8. Following some biological scholarship, McKelvey considers taxonomy, evolution, and classification to be three aspects of systematics [74]. Following the common usage, we consider taxonomy to be synonymous with classification (as does Gregor [43]).

9. Partial classifications of some of the factors included in co-creation are available as Web-accessible documents [24, 72].

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VLADIMIR ZWASS (zwass@fdu.edu) is Gregory Olsen Endowed Chair and University Distinguished Professor of Computer Science and Management Information Systems at Fairleigh Dickinson University. He holds a Ph.D. in Computer Science from Columbia University. Professor Zwass is the founding editor-in-chief of the *Journal of Management Information Systems* and of the *International Journal of Electronic Commerce*. He is also the founding editor-in-chief of the monograph series *Advances in Management Information Systems*, the objective of which is to codify the field’s knowledge and research methods. He is the author of six books and several book chapters, including entries in the *Encyclopaedia Britannica*, as well as of a number of papers in journals and conference proceedings. Dr. Zwass has received several grants, consulted for a number of major corporations, and is a frequent speaker to national and international audiences. He is a former member of the professional staff of the International Atomic Energy Agency in Vienna, Austria.