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COLLABORATIVE INNOVATION: CURRENT FINDINGS, CONCEPTUALIZATION AND FUTURE DIRECTIONS

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Introduction

In more recent years, there were an increasing number of studies rooted in the managerial and product development tradition, highlighting the relevance of external actors for the innovative activity of a firm. This concept has been variously explored, with attention to the interaction with customers (von Hippel, 1988; Sawhney et al., 2003) and to companies' capability to absorb their knowledge all along the product development process, through virtual environments. The topic of collaborative innovation is relatively new, and it could be premature to define too carefully its research boundaries. Therefore, in order to provide a deep understanding of the topic, this work opens with a detailed review on the topic and closes with an extension of the research issues.

The purpose of this work is threefold: after having demarcated the domain of collaborative innovation, a framework for examining the state of the art of collaborative innovation has been created, and an in-depth agenda for future directions of research is proposed.

This study provides important contributions to both the theoretical and managerial perspective. On one side, from the theoretical perspective, the work examines the vast literature on innovation, enabling cross-fertilization with technology, marketing and organization researches and develops an analytical framework for understanding the

evolution of firms' innovation approaches and tools. On the other side, from the managerial perspective, the work provides the state-of-the-art of the diffusion of collaborative innovation tools and proposes guidelines for the identification of industry and firm's typologies according to the presence of a collaborative approach. From both perspectives, the work suggests priority for future research, addressing a fallow field for interested parties.

As for the structure, this work is composed of three main parts. The first part (Chapter 1) reviews the literature on user innovation, customer knowledge management and technology marketing. Thereafter (Chapter 2) the work illustrates the results of an empirical study which aims to map the Web-based mechanisms currently supporting collaborative innovation in five industries, namely the automobile, motorcycle, consumer electronics, food and toiletries industries. The third part (Chapter 3) shows some implications deriving from a case study analysis; building on previous analyses hints and limitations, the concluding part (Chapter 4) points out future directions for research, suggesting methodological approaches and expected implications for management.

To accomplish these goals, the research has been handled in three different ways, according to the different research issues. A broad and in-depth literature review (Borg and Gall, 1989) has been integrated with an exploratory analysis through both a multivariate statistical analysis and a qualitative case study research (Eisenhardt, 1989); finally, quite a few research questions and related methodological approaches are proposed, following the research design approach (Creswell, 2003).

1   Chapter 1 - User Innovation Underpinnings

The purpose of this section is to explore the topic of user innovation. The aim is to define the concept of user innovation, outlining how the advent of the Information Communication Technologies (ICTs) in consumer markets has determined new competitive dynamics, influencing firms' action perspective and their relationship with the market. To accomplish these goals, the study roots in different streams of research drawing from works found in marketing, innovation and organization literature.

1.1   The Growing Importance Of Product Innovation

During last years the emergence of new technologies – which have basically altered the economies of manufacturing and removed the factory as a barrier to product variety and flexibility (Jelinek and Goldhar, 1983; Meredith, 1987) -, the increased pace of technological change and the concomitant shortening of product life cycles - that have led to an increased proliferation of product varieties (Sanchez, 1995; Stalk and Hout, 1990; Wheelwright and Clark, 1992) - and the shifting nature of customer demand for increased product variety and higher quality in products and services (Kotler, 1989; Pine 1993) has

been progressively transforming the fundamental nature of competition in many industries.

This continuous rise of technological opportunities, new competitors and new requests by customers has consequently demanded for proactive strategies aimed at constantly renewing the sources of competitive advantage (Collis and Montgomery, 1995).

In such increasingly dynamic and competitive environment, the dialogue on strategy has shifted from sustainability of competitive advantage to the ability to manage innovation and change (Tushman and O'Really, 1997; Christensen, 1998; Hamel, 2001); firms have gradually transformed their priorities and now focus more on acquiring the necessary competence to manage processes and changes rather than maintaining a competitive edge. In response to the quickening pace of change, firms (in several industries) are feeling the need to engage in *continuous innovation* – i.e., managing innovation on an ongoing basis (Brown and Eisenhardt, 1997).

Firms competing in industries undergoing such transformation have found that they are no longer able to compete on the basis of standardized products and services alone; they have to enhance their "capability to switch gears relatively quickly and with minimum resources" (Hayes and Pisano, 1994: 78). In changing environments, in fact, a firm's ability to develop and maintain sustainable competitive advantage lies in its capability to create organizational knowledge, along with strategic flexibility (Garud and Kumaraswamy, 1995; Hayes, Wheelwright and Clark, 1988); firms recognize the necessity

of building flexible intellectual assets, like capabilities and knowledge, that can be leveraged in a variety of ways as market conditions change.

This perspective is narrowly related to the notion of dynamic capabilities as stated by Teece, Pisano and Shuen (1997: 516) that is, the "firm's ability to identify, integrate, build, and reconfigure internal and external competences to address changing environments". A central factor in the dynamic capabilities view of firm strategy is the acquisition of new capabilities through organizational learning (Mowery, Oxley and Silverman, 1996), defined as a process of experiencing and analysing, or the process to communicate the knowledge previously generated by others (Spender, 1996).

To put it more formally, the dynamic capability perspective suggests that long-term competitive advantage rests on firms' ability to create different types of specialized knowledge, as a product of individual and collective learning (Kogut and Zander, 1992; Henderson and Cockburn, 1994); to integrate this specialized knowledge into strategic initiatives or product development projects (Henderson and Clark, 1990; Kogut and Zander, 1992; Henderson and Cockburn, 1994; Grant, 1996; Conner and Prahalad, 1996); and to a periodic reconfiguration of the patterns of combined knowledge that form the essence of products and strategies (Teece, Pisano and Shuen, 1997; Galunic and Rodan, 1998; Eisenhardt and Martin, 2000).

Innovation is therefore performed through the development, combination and reconfiguration of valuable knowledge-based resources in a new rent-generating way (Verona and Ravasi, 2003).

1.2 'Outside Originated' Knowledge Management

The emergent importance of innovation management has been supported by a growing understanding that in-company efforts are not enough for successfully competing in such dynamic environment. Even if knowledge *per se* is seen as one of the most valuable resources for sustainable competitive advantage (Grant, 1996), firms recognize that interaction has become a key element for the access, acquisition and development of new knowledge (Kogut, 1988; Kogut and Zander, 1992; Mowey, Oxley, and Silverman, 1996; Inkpen, 1998).

According to the theory of strategic network (e.g. Jarillo, 1988; Gulati, 1998; 1999; Gulati and Martin, 1999), firms have understood the relevance of relations as the basis of collective inter-organizational learning and innovation in complex environments.

As a consequence, innovation has been progressively seen as an inter-organizational process where firms produce new knowledge but also absorbs it from outside their boundaries; in particular, increasing attention has been paid to create and manage a suitable outside network of knowledge sources[1] and, through interface roles, to combine this knowledge synergistically with in-company knowledge sources (Castaldo and Verona, 1998).

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[1] Value Constellation proposed by Norman and Ramirez (1993), Value Co-production suggested by Ramirez (1999), the Third Generation (half) of Knowledge Management proposed by Lee, Jen-Fang (1999, 2001), Co-creation of Prahalad and Ramaswamy, (2002); Kambil, et al., (1999); Friesen, (2001); and Sawhney and Prandelli, (2000), Customer as Innovator proposed by Thomke and von Hippel (2002), and the Customer Capital Theory proposed by Stewart (1997), are only some examples of outside network.

Firms' ability to address this mechanism resides both in what Cohen and Levinthal (1990:128) have defined as absorptive capacity - "the ability of a firm to recognize the value of new information, assimilate it and apply it to commercial ends" - and in the way firms interact with their environment, that is their ability to create linkages with other entities, establish channels of knowledge flows between them and within the organization itself (Caloghirou, Kastelli and Tsakanikas, 2004).

Firm's ability to absorb external knowledge can be influenced by different variables, such as the firms' past experience - so that they tend to learn only in areas related to their previous relevant knowledge (Christensen, 1998; Ford, 1996; Schilling, 1998; Nelson and Winter, 1982); the reduced variety of knowledge deriving from the contacts that firms can directly enact within their information network (Van Wijk, Van den Bosch and Volberda, 2001); and the commitment and speed: even when the individual firm's commitment is high, there are time-constraints in compressing the process of knowledge absorption.

Therefore, exposure to knowledge *per se* does not guarantee that a firm will have higher levels of absorptive capacity (Kim, 1997; Matusik, 2000); what influences the acquisition of capabilities is the diversity of exposure and the degree of overlap between the knowledge bases of the external source and the firm (Kim, 1998).

The characteristics of the product innovation process render it as a favourite setting where to study the processes of knowledge creation and integration (e.g., Teece, Pisano, Shuen, 1997; Vicari and Troilo, 2000; Vicari and Verona, 2001; Daneels, 2002).

While many knowledge areas influence the process of product development (Verona, 1999), studies have shown firms narrowing their focus to market knowledge (Kohli and Javorsky, 1990). Of the various actors outside the companies, particular attention has progressively been focused on customers[2] (Norman and Ramirez, 1993; Ramirez, 1999; Prahalad and Ramaswamy, 2000, 2002; Lee, 1999, 2001; Kambil et al., 1999; Friesen, 2000; Sawhney and Prandelli, 2000). Such an interest is due to the evidence that not only customer knowledge is critical for improving the firm's innovation process, but also it is difficult to grasp.

1.3   Customer Knowledge Value

As far as product innovation is concerned, several contributions in the literature stressed the strategic relevance of grasping market knowledge, of "listening to customers' voice" (Day and Wensley, 1988; Kohli and Jaworski, 1990). Companies equipped with customer information and knowledge have greater potential to make correct decisions, produce desirable products or services, and deliver true value for them (Winnie and Kanji, 2001).

The adoption of a Web-based mechanism for absorbing customer's knowledge allows overcoming the problem of limited customers' ability to effectively explicit their

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[2] In this work the terms Customer, Consumer, User are used interchangeably.

needs. Previous researches have acknowledged that when asking customers what they desire is that they only refer to those which come to mind. They simply cannot imagine what they have not experienced and what they do not know about, for example new technologies, materials, etc. (Christensen, 1997; Ulwick, 2002). According to Lojacono and Zaccai (2004), customers' input may be useful for incremental improvements and product differentiation; in radical innovations or innovations where customers extract high value from the emotional meaning of the product, their input is of limited value as they are unable to express their needs and state a clear preference. Too closely listening to customers may result in incremental improvements only (Christensen, 1997).

Only, if customers can experience a new product and its features, they are able to realistically assess whether or not they like it and whether it fulfils a latent hitherto unidentified need virtual product experiences enable customers to transfer not only their known but also their unknown needs. As a consequence, methods have been identified that allow active engagement of customers in new product development (Lilien et al., 2002). Through virtual prototypes (Srinivasan et al, 1997) it is possible to integrate customers into new product development via the Internet. Thereby, customers get their hands on innovations long before the design has been finalised, when changes according to their needs and wants can be done quickly and at little cost. Customers' experiencing innovative products via the Internet, long before they really exist, allow them to build sound judgments, and come up with new ideas through trial and error learning. Empirical investigation, via survey, confirm these expectations: customers taking part to a virtual

product experience have been able to articulate their own individual wants and needs, feeling as they have actively contributed to new product development.

Thanks ICTs, companies have new opportunities to improve their innovation processes by applying the knowledge and competence of their own customers rather than just accumulating knowledge about them through traditional marketing research. Companies can thus create value by working *with* their own customers rather than just working *for* them. This mutual collaboration allows the company to improve its external fit by reinforcing its competitive edge, since it can better anticipate market changes and satisfy not only their customers' desires but also their potential needs (Leonard and Rayport, 1997). Exerting leverage on customer knowledge not only promotes the innovation process but makes it possible to better satisfy market needs. The fit with market needs, wants, and preferences, is indeed the starting point of a successful product innovation (Urban and Hauser, 1993).

1.4   The Customer Role Evolution

Collaboration with customers to co-create value through new product development has recently become a major issue in management literature (e.g., Griffin and Hauser, 1993; Leonard, 1995; von Hippel, 2001b; Thomke and von Hippel, 2002; Prahalad and Ramaswamy, 2004).

Even if firms have always sought to build deeper customer connections to make their innovation process more effective, it is possible to identify several different stages in the evolution of the relationship between a firm and its customers to support customer knowledge absorption and collaboration. The direction of interaction has evolved from one-way knowledge import to an interactive dialogue – direct and mediated. A graphical representation is reported in Figure 1.

The traditional perspective on customer engagement implicitly views value creation and innovation as a 'firm-centric' activity, with most information flowing in a one-way direction (Prahalad and Ramaswamy, 2004).

At the simplest level of the firm-customer interaction firms learn *about* customers. While firms have always endeavoured to hear the "voice of the customer", customers have traditionally tended to play a passive role as the receptors of the firm's innovation activities. At this level, firms seek to improve fit between their offerings and customer needs simply by surveying customers and importing their understanding into the firm (von Hippel, 1988). The ingredients of innovation success include the firm's market sensing ability (Day, 1994), effective R&D and manufacturing routines (Hayes, Wheelwright, and Clark, 1988) and the right balance of organizational competences (Verona, 1999).

The strategic role progressively played by market knowledge in supporting firms' competitive advantage in the long term (Day and Wensley, 1988) has drawn firms to create

deeper connections with their customers (Wailand and Cole, 1997), by developing two-way learning relationships *with* them, at both the individual and the community level.

To support this two-way process, the firms' research toolkit has expanded, including newer techniques aimed at discovering unarticulated needs through direct customer observation and active interaction with selected customers. Firms can progressively develop techniques more oriented to collaboration conducting not only market experiments by using a 'probe and learn' process (Hamel and Prahalad, 1994; Lynn, Morone, and Paulson, 1996), but also dialoguing and working closely with individual lead users (von Hippel, 1986) and communities of developers (von Hippel, 2001). Furthermore, firms can engage in dialogues mediated by third parties that are able to reach non-customers or prospective customers who may not have any relationship with the firm, or may see the firm as promoting a biased point of view or having a vested interest in the interaction.

Pushing such approaches a step further, in fact, firms can involve customers deeply in their innovation process, asking them to directly contribute to their value proposition definition and enhancement. Customers are gradually stepping out of their traditional role and turning simultaneously into both creators of values and consumers, and becoming competitors of manufacturers in creating values. Customers may assume the role of the upper stream as an input party - customer as resource, and customer as co-creator/co-producer - or of the lower stream as an output party - customer as buyer, customer as user, and customer as product (Finch, 1999; Gersuny and Rosengren, 1973; Kaulio, 1998;

Lengmich-Hall, 1996). Nambisan (2000, 2002) deemed that the above classification structure might be used to examine customers' participation in new product development, especially in the three customers' roles of resource, co-producer, and user. At this point it is even possible to discriminate between the contribution made by advanced users and ordinary users compared to professional developers (Kristensson, Gustafsson and Archer, 2004).

Figure 1. A Taxonomy of Customer Involvement
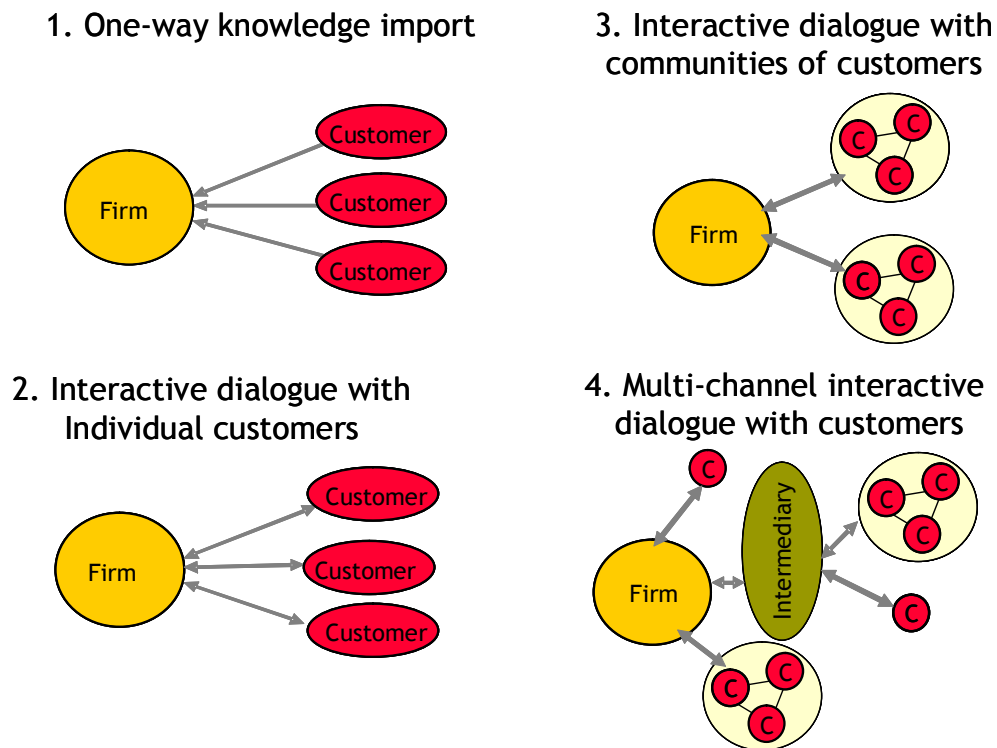
Source Our Elaboration

Hence, instead of rigidly defining the product from the early stages of the development process - where the consumer is, at best, involved in the collection of market inputs and in the final tests before the product launch (Cooper, 1993) - a new approach is being adopted which focuses on the systematic, direct interaction with the customer. In this way, new product development comes to resemble new service development, considering that most of the usefulness of a service is based on customer experience and interaction with the company when the service is provided (Balasubramanian, Krishnan and Sawhney, 2001).

More specifically, in the last years, several studies have shown the impressive role that Internet has in supporting this dialogue to absorb knowledge, which is relevant for innovation. Scholars have written about the process of using the Internet for adaptive co-development of new products, where customers become co-developers, and firms continually solicit customer feedback in new product development (e.g., von Hippel, 1986; Eisenhardt and Tabrizi, 1995; Iansiti and MacCormack, 1997; Tyre and von Hippel, 1997; Bhattacharya, Krishnan, Mahajan, 1998), however all these studies have assumed that customers possess specific characteristics and capabilities that really allow them to proactively participate in new product definition and specification.

Since consumers in a market do adopt innovations in a time sequence rather than at the same time, researchers have tried to develop adopter categories on the basis of when consumers first buy a new product (Rogers, 1995). In addition, an extensive research

literature has accumulated about personality traits that might be useful to characterize the

consumers of different categories (e.g. Midgley and Dowling, 1978; Hirschman, 1980;

Goldsmith and Hofacker, 1991). These attempts primarily aimed to develop a sound

understanding about the personality of the earliest adopters who initiate diffusion and

who play a critical role as communicators to later adopters ('market initiators' according to

Foxall, 1995). The most critical categories are briefly reported:

- Early adopters (Gatignon, Eliashberg and Robertson, 1989; Mahajan, Muller and Bass, 1990, Rogers, 1995; 2003): Adopters who are (a) respected by peers; (b) a more integrated part of the social system; (c) opinion leaders; (d) role models for other members of the social system; (e) less price sensitive than the rest of the market

- Lead Users (von Hippel, 1986; 2005; Herstatt and von Hippel, 1992; Morrison, Roberts and Midgley, 2004; Franke, von Hippel and Schreier, 2006), members of a user population who (a) have high expected benefits; (b) are ahead on an important marketplace trend

- Trendsetters (Leonard and Rayport, 1997; Leonard and Swap, 1999) defined as opinion leader customers with (a) central position in their social network; (b) superior ability to influence other customers' choices

- Niche customers (Govindarajan and Kopalle, 2006), customers who initially find a disruptive innovation attractive. They differ from the early adopters because (a) they not necessarily influence the mainstream market; (b) are more price sensitive than the rest of the market.

Although adoption behavior is not exactly the variable that has to be considered in the present work, the existing research on adoption appears to be at least partly relevant for explaining innovating behaviour – that takes place prior to market introduction and is centered on the development of new products. First, innovating users and the market initiators might be the same people. After all, innovating users are presumably also the first to "Buy" the commercialized products that are developed on the basis of their requests and ideas. Second, the phenomenon of 'use initiation' shows similarities to innovating activities that are in the focus in this work. It encompasses consumer initiatives to discover novel functions and new ways of product use for established products (Price and Ridgeway, 1983). Both, use initiation as well as the development of genuine new products involve creative tasks and require that the user conceives solutions that are in conflict with the familiar.

Even if similarities between adoption behavior and innovating behavior can be derived, it is important to be aware that the motivation and qualification for innovation in a product field can only be understood in their context. A user who might initiate the development of new products in one market is not necessarily innovating in other product fields. The decision to innovate is not assumed to depend on stable traits but on variables that for a given user vary across different products and markets.

1.5   Internet As Enabler

The advent of ICTs seems to have partly changed the opportunities around customer integration; the Internet has specifically opened to firms a huge amount of new knowledge that can be produced and absorbed through virtual customer environments (VCEs) – Web-based environments to facilitate customer co-innovation (Nambisan, 2002). It enhances in a remarkable way the company's capacity to conveniently absorb market knowledge by itself and regularly interact with a category of consumers that is broader than the regular customer base (Sawhney, Prandelli, Verona, 2003).

The Web has improved the ability of firms to engage with their customers in collaborative innovation in several ways. As just stated (§ 1.4), it allows firms to transform episodic and one-way customer interactions into a persistent dialogue with customers. It permits companies to go beyond individual customer knowledge to tap into the social dimension of customer knowledge shared by groups of customers in virtual communities (Kozinets, 1999). And it extends the reach of the firm and scope of the firm's customer interactions by using third parties to reach non-customers – competitors' customers or potential customers who have yet to enter the market.

The Internet breaks the age-old trade-off between richness and reach because it is interactive in nature[3] (Evans and Wurster, 1999); it also greatly increases the speed and the

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[3] In the physical world, communicating (and absorbing) rich information requires physical proximity or personal interactions with customers, while interaction with a large audience entails compromises in the

persistence of customer engagement[4] and allows customers to develop a joint experience of co-creation, making their contribution both richer and less expensive than in the physical world.

Finally, the Internet increases the flexibility of customer interactions: customers can vary their level of involvement over time and across sessions (Hoffman and Novak, 1996; Hagel and Singer, 1999).

1.5.1 Web-based Tools for Enhancing Customer Contribution

Customers' contribution can even be supported through the usage of specific Web-based tools.

As clearly shown in the review of the literature by Urban and Hauser (2004), specific instruments have been developed to solicit companies to listen to the "voice of the customer" during the concept generation stage (Griffin and Hauser, 1993), to identify the desired product features through conjoint analysis (Green and Srinivasan, 1990), to strategically position new products (Hauser and Koppelman, 1979; Shocker and

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quality of the dialogue. However, Internet-based virtual environments make it possible to interact with a large number of customers without compromising on the richness of the interactions.

[4] Due to cost and effort limitations, traditional market research techniques like focus groups and surveys tend to be limited in terms of the frequency with which customers can be engaged with, and the time taken to solicit customer input. In virtual environments, customer interactions can happen in real-time, and with a much higher frequency. The physical and cognitive effort needed for the firm as well as customers is far lower in virtual environments, permitting a more persistent and frequent interaction. The only limitations are customer willingness to participate in the interaction and privacy considerations.

Srinivasan, 1979), to develop product and market tests before the product launch (Narasimhan and Sen, 1983) and to carry out ad hoc surveys to guarantee a successful product launch (Urban and Hauser, 1993; Wind, 1982). Table 1 illustrated and summed up the main theoretical contributions.

It is possible to assert that digital environments are extraordinarily powerful in supporting direct involvement of consumers throughout the entire innovation process because a segmented public can be efficiently and rapidly reached. Hence, an approach based on the systematic, direct interaction with the customer is becoming increasingly relevant in new product development. The cost of developing and testing virtual prototypes is much lower than physical prototypes and virtual reality can significantly enhance the quality of the interaction with the consumers and the process of distributed learning (Dahan and Srinivasan, 2000).

To this extent researchers have investigated the efficiency and effectiveness of specific tools - such as open source mechanisms (von Hippel and von Krogh, 2003; Hertel et al., 2003) design tools and configurators (Liechty, Ramaswamy and Cohen, 2001; Dahan and Srinivasan, 2000; Randall, Terwiesch, and Ulrich, 2004) – that are not only able to design a customized product from a functional point of view but also have mechanisms to explore a customer's demand set.

Table 1. Web-Based Tools for Innovation: A Review of Literature

INNOVATION PROCESS STAGE	LITERATURE REVIEW
Idea generation	Burke, Rangaswamy, Gupta (2001) Thurow (1997) Urban, Hauser (2002) Hagel, Armstrong (1997) Kozinets (1999) Sawhney, Prandelli (2000b)
Idea selection	Srinivasan, Lovejoy, Beach (1997) Montoya-Weiss, Massey, Weissman (1998) Dahan, Hauser (2002a)
Product design	Liechty, Ramaswamy ,Cohen (2001) Dahan , Hauser (2002) Park, Jun, MacInnis (2000) von Hippel (2001b). von Hippel, Kats (2002). MacCormack, Verganti, Iansiti (2001) Lakhani, Von Hippel (2000) Lee, Cole (2000) von Hippel (2001a)
Product test	Thomke (1998); Thomke, Von Hippel, Franke (1998). Dahan, Srinivasan (2000) Urban, Weinberg, Hauser (1996)
Market launch	Armstrong, Hagel (1996) Hagel, Rayport (1997) Jurvetson (2000) Kenny, Marshall (2000) Peppers, Rogers (1997) Reichheld, Schefter (2000)

Source Our Elaboration

Internet-based collaboration mechanisms can be mapped to the new product development process based on two important dimensions – the *nature of customer*

involvement that is needed, and the *stage of the new product development process* at which the customer involvement is desired.

Leaving the description of the most significant Web-based applications to engage customers at each stage of the innovation process to the next Chapter, this introductive part needs to be integrated with the depiction of the different nature of knowledge contributions customers can provide to support and enhance the front-end as well as the back-end of the product innovation process.

Customers not always can explicitly codify their knowledge. As human beings, they can be not completely aware of their needs and consumption habits or simply unable to verbalize them (Badaracco, 1991; Nonaka, 1991). To catalyze and improve new product development activities, firms need to gather the knowledge that is embedded in customers' experience and rooted in their context of consumption. While traditional market has been mainly focused on explicit customer knowledge (Leonard and Rayport, 1997), Web-based tools have expanded to include newer techniques aimed at discovering unarticulated needs through direct customer observation (Leonard and Rayport, 1997) and interaction (von Hippel, 1986; Tabrizi and Walleight, 1997; von Hippel, Thomke, Sonnack, 1999; Hamel and Prahalad, 1994)[5].

Even if all these techniques strongly help firms in grasping tacit knowledge from individual customers, but do not allow them to overcome other two relevant market knowledge gaps related to the collective and to the 'restricted' nature of knowledge.

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[5] As already pointed out in § 1.4.

Customer knowledge has not only individual nature, but also collective origins. Relevant inputs for the firm's innovation process come from the social dimension of customer knowledge; customers deeply influence each other in their choices of new products (Quelch and Ash, 1981; Schlissel, 1985) and contribute to the development of collective meanings enriching the functional value of many goods (Gainer and Fisher, 1994). To map and absorb this knowledge, firms can employ virtual customer communities based on the collection and analysis of knowledge that develops through spontaneous conversations among customers (Kozinets, 1999). It makes it possible for groups of customers to communicate directly and iteratively with one another and, together, produce a set of needs that might not have been identified in any other way (Urban and Hauser, 2002). Customers self-select themselves on the basis of the focused interests promoted by specific communities, demonstrating their high level of involvement and motivation in sharing knowledge with other customers and community managers.

A complementary approach for mapping Internet-based collaboration mechanisms sees the identification of two other dimensions - the *continuity* and the *activity level customers are integrated* into new product development (Fuller and Matzler, 2007). The continuity dimension deals with the frequency customers are virtually involved in the innovation process. It may range from one time interaction, for a specific task only, to continuous interaction during an entire development project or ongoing for several projects. The level of integration describes how actively customers engage in new product development, ranging from rather passive to highly active. Depending on those two

dimensions, examples of basic forms of virtual customer integration are reported in the following figure (Figure 2).

Figure 2. Forms of Virtual Customer Integration

Continuity

Punctual/one time ⟵ ⟶ Countinously

	Punctual/one time	Countinously
Active	Single Virtual Customer Interaction	Ongoing Customer Dialogue – Innovation Community
Passive	One time Information Retrieval – Pure Observation	Ongoing Online Community Monitoring

Level of Integration
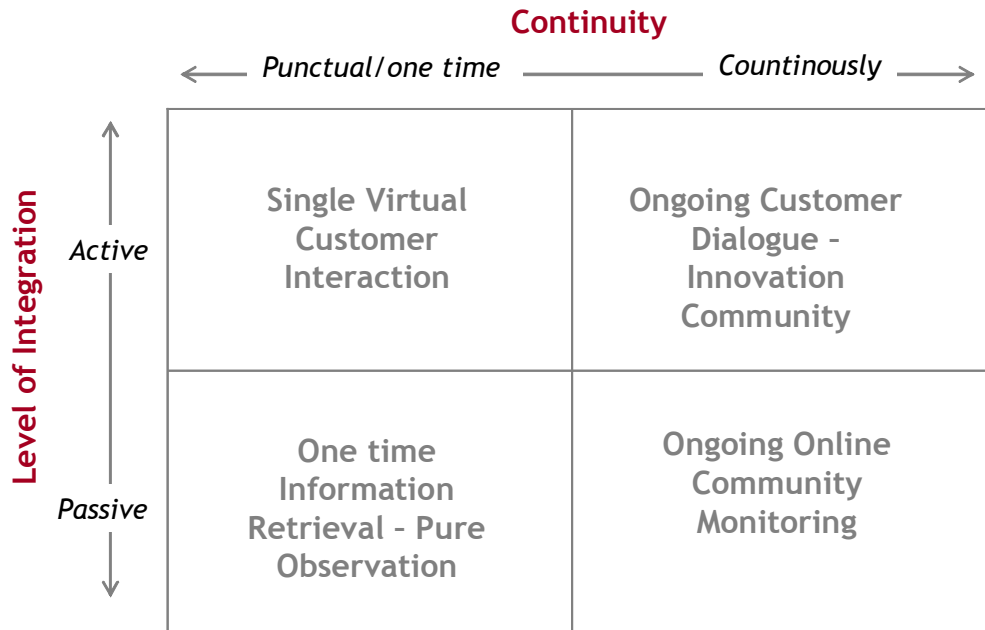
Source Fuller and Matzler, 2007

Furthermore, interactions with current clients can be biased by their past experiences with its products and the expectations they have consequently matured. The knowledge of current customers is rarely relevant in period of innovation; collaboration with customers in new product development can even compromise the competitiveness of the firm on its market (Christensen and Bower, 1996). New products suggested by specific customers can be slightly relevant for the whole market (Bennett and Cooper, 1979) and not innovative enough for generating competitive advantages that can be sustained on the

long run (Hayes and Abernathy, 1980). Hence, in order to push forward the new product development process and get potential inputs for really breakthrough innovations, firms could need to recur to mediated process, where third-party actors - by virtue of the centrality of their positions within a specific network, and their ability to dialogue with a wide variety of different actors (Cillo, 2001; Castaldo and Verona, 2001) - facilitate otherwise difficult or unlikely knowledge exchanges (Burt, 2000).

In summary, virtual environments expand customer collaboration by helping firms to engage customers in conversations rather than knowledge import, to gather individual as well as social knowledge, and to involve customers directly as well as through third-party mediators (Sawhney, Verona and Prandelli, 2003).

1.5.2 Beyond Web-based Tools: Innomediation

The computer-mediated interactions through the Internet provide a basis for the division of innovative labour among firms with specific regard to the absorption of customer knowledge. While the direct creation of virtual customer environments is an effective approach to improve a firm's innovation activities (Nambisan, 2002), several studies conclude that it is not sufficient.

Whenever firms face constraints in external knowledge absorption or when they need new customer unbiased knowledge – namely, when they need to go beyond the breadth and depth of their current customer scope - and when speed is a relevant issue in

order to innovate, it may be reasonable to look for additional customer knowledge useful for innovation that other actors produced in the market.

These mediated innovation through virtual customer environments - called *innomediation* ("innovation" + "mediation") - allow firms to produce complementary customer knowledge; the intermediaries that focus on harnessing knowledge to enhance the innovation process for firms; that collect dispersed knowledge and distribute this knowledge to firms, after organizing and elaborating it to support innovation, are labelled as *innomediaries* (Sawhney, Verona and Prandelli, 2002).

According to this definition, it is possible to affirm that innomediation is particularly relevant in situations where markets are fragmented on the demand and supply side; where tacit knowledge possessed by customers is important; where customer preferences and needs are poorly understood and rapidly evolving; and where social aspect of knowledge creation is important. In such contexts, traditional market research is less effective due to problems of data collection and data interpretation (Leonard and Swap, 1998). Further, firms in these contexts have a poor understanding of customer preferences and buying behavior because of the cognitive and physical distance between customers and firms. Finally, the wide assortment of brands and manufacturers fragments customer attention, and makes the company-customer connection less efficient. In these conditions, mediated innovation offers significant benefits to customers as well as firms. Innomediaries can also overcome the problems of interpretation by providing a deeper understanding of the customer context.

Furthermore, according to the kind of customer knowledge the firms need to absorb and the step of the new product development process they are in, the innovating firm should leverage different kind of innomediaries – customer-based innomediaries - when they want to "find out what customers 'know they know' and what they actually purchase"; community-based innomediaries - to "find out something customers 'don't know they know'"; or marketplace innomediaries – when firms' goal is to "find out solutions or technologies customers 'don't know exist'"(Prandelli and Verona, 2006). A detailed classification of these innomediators is reported in the following figure (Figure 3)

Figure 3. Virtual Knowledge Brokers: A Classification
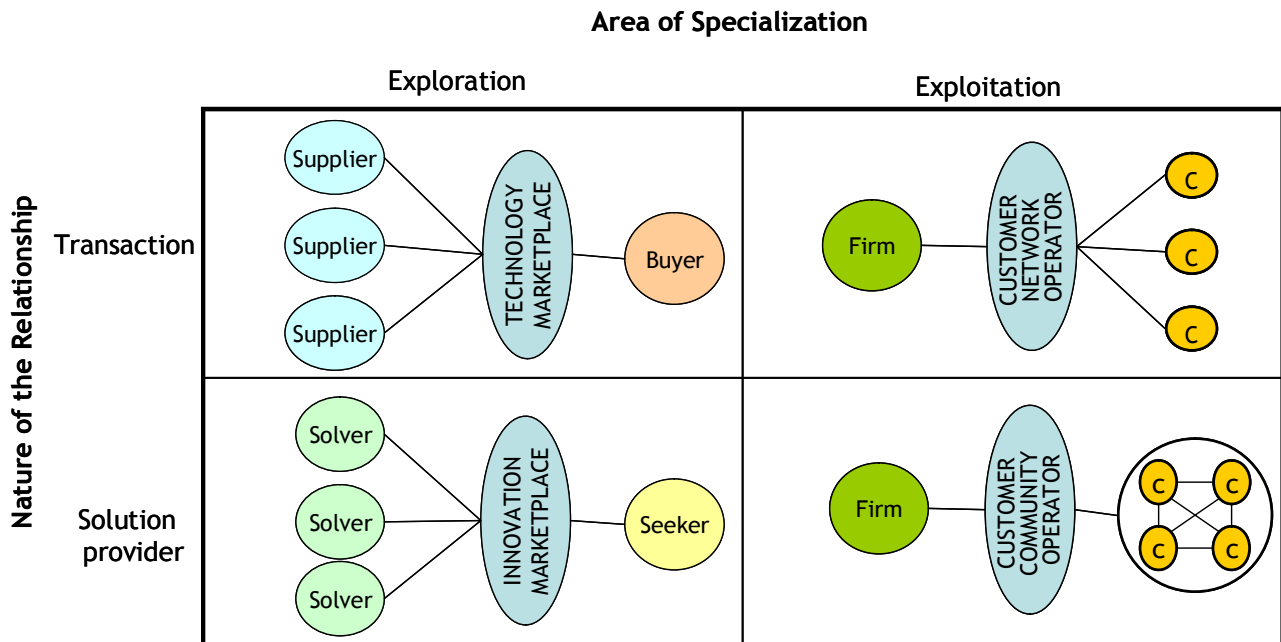
1.6   Collaborative Innovation: Drawing A Conclusion

The literature amply demonstrates that innovation is a key factor in company operations and has made companies, operating in different industries, continually change their innovation strategies. Innovation can include different aspects of company management such as the organizational structures, the market approach and competitive positioning, information technology and the technological and industrial characteristics of the company, namely, their products and related production processes.

Innovation, after all, is synonymous with value creation (Hamel, 2001), value disruption (Christensen, 1997) and creative destruction (Schumpeter, 1917). And while customer interaction has always been important for product innovation (von Hippel, 1988), the widespread deployment of the Internet has greatly enhanced the ability of firms to directly engage with customers in the product innovation process (Dahan and Hauser, 2002). Virtual environments allow firms to absorb (tacit and explicit) customers' knowledge along the innovation process through direct (i.e. Website tools) and mediated (i.e. innomediaries) dialogue and individual (i.e. survey) and collective (i.e. community) interactions.

According to the emergent literature review, the tenet of collaborative innovation resides in firm's ability to implement virtual customer environments[6] - that is, firm's ability

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[6] Implementation, design, creation, adoption etc. are all terms here used for explaining the organization' s activation of virtual customer environments for innovating purposes. For this reason, in order to understand

to acquire customers' knowledge through Web-based mechanisms, integrate it within the organization and actually use it for supporting each phase of the innovation process.

While in the last years several contributions have highlighted the efficacy related to different Internet mechanisms to absorb customer knowledge for product innovation (e.g., Dahan and Hauser, 2002a; Urban and Hauser, 2004), there still is a lack of empirical evidence about their actual diffusion.

Starting from theoretical conclusions – i.e. efficacy related to different Internet mechanisms to absorb customer knowledge for product innovation – an unanswered question remains: "how much do firms leverage the Internet to absorb and share customers' knowledge in order to sustain their innovation process?"

In particular, it could be interesting to understand:

- what are the tools more intensively adopted by firms to that purpose?
- what kind of firm uses the Web to involve customers in the innovation process?

The research[7] presented in the following part of this work (Chapter 2) has been developed with this idea in mind; moving from the theoretical assumption that new information and communication technologies enable firms to create virtual customer environments which greatly enhance the connectivity between customers and producers to

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collaborative innovation, in this work we are going to alternatively use concepts such as: VCEs implementation; collaborative mechanisms or Web-based tools adoption, etc.

[7] Article published on California Management Review (co-authored E. Prandelli and G. Verona): "Diffusion Of Web-Based Product Innovation"

support new models of new product development that involve customers as partners of innovation, the following study aims to understand "to what extent companies are integrating these tools into their Websites to support cooperation with consumers at each innovation stage".

2   Chapter 2 – Diffusion of Web-Based Product Innovation

Article published on California Management Review, August 2006

In a wide array of industries, customer integration leads to improved performance of product development, in terms of both better fit with market needs and faster time to market (Iansiti and Clark, 1994; Brown and Eisenhardt, 1995). The ability to involve customers in the creation of new products is highly recommended in both theory and practice (Griffin and Hauser, 1993; Ulrich and Ellison, 1999; Prahalad and Ramaswamy, 2004). However, the absorption of customer knowledge is not an easy task. As with any other business process that involves importing knowledge from outside the firm's boundaries, it is organizationally complex and expensive. Customer knowledge is also characterized by idiosyncratic and sticky know-how, which makes it difficult to be learned and transferred (Cohen and Levinthal, 1990; von Hippel, 1994). Lastly, knowledge transfer requires direct interaction between firms and customers, which entails considerable physical limitations. While some firms have opted to create internal market research departments, the great majority have usually relied on dedicated third parties—namely, market research operators—in order to absorb market knowledge for innovation purposes.

The advent of information and communication technologies (and the Internet, in particular) has created new opportunities for customer integration. Web-based tools can simplify customer integration and knowledge absorption by facilitating systematic

interactions with selected groups of customers at a low cost (Dahan and Hauser, 2002a; Nambisan, 2002; Sawhney, Prandelli, and Verona, 2003). The Internet greatly enhances a company's capacity to obtain market knowledge without a third party and to regularly interact with a broader category of consumers than just its regular customer base. This would be impossible offline and it represents the revolutionary potential of the web to support the development of product innovation by individual companies. Specifically, various Web-based tools have been developed over time to support collaboration with customers at each stage of the innovation process (Dahan and Hauser, 2002b). The question is: To what extent are companies integrating these tools into their web sites to support cooperation with consumers at each innovation stage?

This article reports on an empirical study that maps the Web-based mechanisms currently supporting collaborative innovation in five different sectors— the automobile, motorcycle, consumer electronics, food and beverages (hereafter, "food"), and toiletries industries[8].

2.1   The Role Of The Web At Each Stage Of The Product Development Process

A company's capacity to absorb customer knowledge is vital across the entire product development process. Great emphasis has been placed on the potential of the web

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[8] We build on the contribution by Dahan and Hauser (2002a), op. cit.

as a tool of adaptive co-development of new products, allowing companies to systematically solicit consumers feedback (Eisenhardt and Tabrizi, 1995; Iansiti and MacCormack, 1997). Web sites can also contribute to increasing consumer trust and, consequently, the consumer's willingness to share information (Urban, 2005). Of course, not all customers feel the same way about online participation and the representativeness of Web-based tools is still being tested. However, it has been proven that customers interacting with the company through the web are the most involved and innovative, showing the highest interest towards experimentation and trend setting (Solomon, 1996; Randall, Terwiesch, and Ulrich, 2005).

2.1.1   Idea Generation

The first stage of new product development benefits considerably from the web's potential to enhance consumer input. The simplest application consists of online questionnaires. When searching for successful new product ideas, one should aim to reduce uncertainty by identifying customer preferences and interacting directly with them to absorb new knowledge. The questionnaire usually aims to improve selected aspects of the site, product, or service. To enhance customer involvement in the idea generation stage, companies can even use online suggestion boxes where users express their own innovative ideas. A good example is provided by the Ben & Jerry site, where users can contribute new ideas for both products (pre-packaged ice cream) and services (especially packaging and

distribution). Advanced applications of such dialogue windows can also be found in the Procter & Gamble web site. (In all these cases, it is essential to establish clear regulations regarding intellectual property rights so that the company can use the innovative ideas suggested by consumers.)

Product or financial incentives have proven to improve idea generation remarkably (Toubia, 2005). Even reward mechanisms can be introduced to encourage the most competent users to compete with each other in finding new ways to solve in some cases, can even exceed one hundred thousand dollars (as in the Innocentive.com site created by Eli Lilly). It is also easier to handle complaints online, both for the company and for users. Accurate analysis of the complaints serves to strengthen existing products and can even lead to radical changes. Particularly useful is the technique of "listening in," namely, recording and analyzing the information exchanged between individual users and the experts who provide virtual advice to help identify the product that best satisfies the customers' needs (Urban and Hauser, 2004). New product generation can also benefit from online virtual communities of customers, which bring together users sharing the same interests and willing to exchange opinions and experiences. By encouraging iterative communication, these groups generate knowledge regarding consumption shared at a social level that is difficult to obtain using other research tools. Intangible incentives, such as those associated with opinion leadership, usually represent a good way to stimulate participation in communities emerging in consumer markets, while economic incentives are more common in business communities (Hagel III and Armstrong, 1997; Kozinets,

1999; Sawhney and Prandelli, 2000). In both cases, members who join on their own accord tend to be particularly involved and often have specific technical competences—as in the case of the communities of videogame (e.g., Idsoftware.com), motorcycle (e.g., Ducati.com), and software (e.g., Sunmicrosystems.com) enthusiasts. Because of their competence, the contributions of such groups are particularly valuable.

2.1.2 Idea Selection

Idea selection represents a critical stage in new product development, one that helps prevent wasteful investments. The most important Web-based tools to assist such selection are virtual concept testing and online focus groups. In concept testing, virtual reality allows companies to develop product concepts in detail so that consumers can compare product features and select the most convincing concept. For instance, Volvo has created an ad hoc site Conceptlabvolvo.com—where users choose the new automobile concepts they like best.

Users can also view the evaluations expressed by other consumers in real-time.

However, since different customers might have different degrees of knowledge about a specific product, virtual interfaces have to be flexible enough so that the customer does not become frustrated[9]. The Internet enables companies to take the traditional

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[9] For Volvo and other examples, please see Emanuela Prandelli, Gianmario Verona, and Deborah Raccagni, "Il ruolo del Web ai fini del coinvolgimento del cliente nei processi di innovazione: teoria e prassi a

research technique of the focus group and make it more efficient and accessible to a geographically diverse customer base. Online focus groups use videoconference technology and chat rooms (Montoya-Weiss, Massey, and Clapper, 1998).

Consumers are identified according to their characteristics and asked to form virtual teams to discuss different product concepts. An important aspect of the online focus group is the anonymity the Internet provides. Although the participants are less emotionally involved, they are less inhibited and are less likely to be affected by group-thinking, where the individual contributions merely reflect the views of the dominant group members (Nunamaker, Briggs, Mittleman, Vogél, and Balthazard, 1997). The so called "Information Pump" is based on virtual focus groups where companies identify the best new product concepts by asking participants their opinions on a range of concept ideas (Prelec, 2000).

The aim is to obtain an objective evaluation of the quality and reliability of the participants' opinions, which are then evaluated by an impartial expert and by the other participants. To ensure that this method works efficiently, the information must be updated in real-time and an appropriate system of incentives developed for the participants.

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confronto," *Micro & Macro Marketing,* 3 (2003): 321-359. For theoretical considerations about virtual interfaces, see Randall, Terwiesch, and Ulrich, op. cit.

2.1.3   Product Design

By allowing consumers to participate in a wide range of activities, from making minor changes in existing products to suggesting more radical ones, digital environments allow consumers to design and develop new products (Thomke and von Hippel, 2002). Consumer priorities can be transformed into engineering priorities by letting customers specify product features to incorporate in the final product. Such a codefinition of product features can range from simply applying mass-customization tools to combining aesthetic and functional features conceived in modular form, to developing cross-functional design teams involving customers, to allowing the customer to design the product entirely by himself. Consumers can be asked to select different product attributes by applying Web-based tools of conjoint analysis. Virtual interfaces are relatively easy for the company to implement and enjoyable for the respondents to navigate. Of course, there are some limitations, including the small screen of most computer monitors that reduces the number of profiles that can be viewed; the limited time and concentration that most respondents give to the task; and the fact that instructions and tasks must be understood without the researcher present[10]. Nevertheless, companies can identify as much information as traditional conjoint analysis—the key features users prefer, the attributes that interact, and the ideal combination of these attributes. This method has been successfully applied in developing a wide range of products, from cameras to toys and detergents. The most

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[10] For a complete review of the advantages and limitations related to the use of virtual interfaces in order to enable conjoint analysis, see Dahan, and Hauser (2002b), op. cit.

advanced applications of Web-based conjoint analysis have led to the mass customization of products designed and sold online. One example is the Nike site that allows consumers to customize sneakers. In general, respondents are asked to either add attributes to a basic model or eliminate undesirable ones from the complete configuration (Park, Jun and MacInnis, 2000).

In order to speed up new product development and make it less costly, toolkits for user innovation can be assembled to exploit new technologies such as computer simulation (von Hippel, 2001a). These toolkits are coordinated sets of user-friendly tools that allow users to develop their own innovations and also eliminate the problems of sharing customer knowledge, often considered sticky due to its context-specific nature. These tools usually support specific projects, requiring ad hoc competences in a product category. Within this area, the user is free to innovate, develop customized products by trial and error, and even propose new patents (von Hippel and Katz, 2002). Prototyping and rapid experimentation are also crucial in supporting this stage (Kalyanaram and Krishnan, 1997). Indeed the cost of developing and testing virtual prototypes is much lower than physical prototypes and virtual reality can enhance the quality of the interaction and the process of distributed learning. A great variety of industries have begun to introduce these applications. For example, in the software industry, users can download beta versions in order to identify possible bugs. Web-based toolkits have also been successfully developed

in the industries of computer circuits, plastics, and consumer goods [11]. User design

mechanisms can be applied by ad hoc virtual cross-functional teams created by companies

or organically by the larger virtual communities of product users. In the first case,

consumers are regarded as partners in the innovation process and are encouraged to

participate in specific projects. After undergoing a rigorous selection process and offering

appropriate incentives, consumers participate in distance work teams and collaborate with

members chosen from the Marketing, R&D, and Production divisions. Networking systems

and groupware technologies make it possible for the organization to share consumer

knowledge. In the second case, customer-input in the innovation processes is mainly based

on open-source mechanisms Von Krogh and von Hippel, 2003). These mechanisms support

communities run completely by and for the users and allow them to share opinions on

specific products that, initially, are mainly technical but can lead to direct collaboration in

creating a broad range of new products and services.

Many studies show that these mechanisms are particularly useful in developing

innovations where systematic new product development is essential[12] . The sense of

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11 Regarding the software industry, see, for instance, Alan MacCormack, Roberto Verganti, and Marco
Iansiti, "Developing Products on 'Internet Time': The Anatomy of a Flexible Development Process,"
Management Science, 47/1 (January 2001): 133-150. Regarding the applications to other sectors, see Thomke and
von Hippel, op. cit.

[12] Systematic new product development is common in the software industry and Internet start-ups, as shown
by Iansiti and MacCormack, op. cit.; Lakhani and von Hippel, 2000. In fact Web-based mechanisms have also
been adopted by many different industries (for instance, sportswear) that deeply rely on continuous
innovation, as described by von Hippel (2001b)

responsibility towards the group and the awareness of the significant impact on the community are often key motivating factors for qualified participants (Kollock, 1999).

2.1.4   Product Testing

Digital environments can make the new product testing stage more efficient, leveraging technologies such as simulation and combinatorial methods (Thomke, 1998). If the cost of transforming the product concept into a prototype is low, it makes sense to move the selection stage as far up as possible in the innovation process. This allows for increased response flexibility, thereby reducing product development time, promoting the process of trial and error, and preventing the information collected at the beginning of the cycle from becoming outdated (Srinivasan, Lovejoy and Beach, 1997; Iansiti, 1995; Eisenhardt and Tabrizi, 2000). Web-based tools enhance this approach by exploiting the potential of virtual reality and animation in order to give rise to low-cost virtual prototypes. Indeed, it is virtuality that provides the needed realism that allows customers to understand and evaluate the complexity of the product from different angles. This can be done by applying the Virtual Reality Markup Language (Dahan and Srinivasan, 2000). This tool is a three-dimensional virtual representation of the product that, when combined with streaming video and interactive sensory peripherals, allows visual, auditory, and tactile information to be effectively distributed to end users. Consumers can view detailed descriptions of each prototype combined with virtual tours around and inside the product.

The virtual representation of the product can also be enhanced by reproducing other marketing mix attributes in order to create a total virtual shopping experience. This additional method, aimed at supporting the market forecast for new products, is also defined as Information Acceleration. Like the evaluation of an electric vehicle prototype proposed by Urban and colleagues, each user can not only virtually "enter" the car, but can also interact with other users and the car dealer, as well as view advertising material (Urban, Weinberg and Hauser, 1996). The amount of information required to reproduce a simulation of the purchasing experience tends to be much greater compared to simple virtual product testing, and the number of tested prototypes also tends to decrease. Finally, it is worth noting that in both cases, conjoint analysis makes it possible to make reliable estimates of the future market share of each prototype.

2.1.5   Product Launch

The role of Web-based customer tools in the innovation process does not end with the product development stage. Online activities such as viral marketing or web-enabled word-of-mouth become strategic tools that can effectively promote the final product launch stage (Jurvetson, 2000). Companies can initiate viral marketing with techniques such as sending a specific web page "to a friend." Due to the reliability of the information source, these "electronic postcards" can enhance product exposure at a low cost and increase product trust (Kenny and Marshall, 2000). In order to support this "word-of-

mouse" activity, the company can offer ad hoc incentives—such as discount coupons—to both the sender and the recipient of viral messages[13]. This phenomenon may also be enhanced by virtual communities. The members' reciprocal trust catalyzes the exchange of experiences and, vice versa, the exchange of information enhances member relationships (Sproull and Kiesler, 1991). Since users come together spontaneously, these communities create an interesting target for companies because they are the result of a process of self-segmentation that ensures considerable involvement. Therefore, promoting company-run communication through forums or chat rooms based on shared values can profoundly influence purchasing expectations. In fact, users may even turn into veritable proselytes of the company's products. In order to support the launch of new products to targeted groups, these communities are sometimes hosted by independent minisites, which differ from corporate sites in that they are short term and designed to promote individual product launches. Alternatively, sites dedicated to new products can be set up within the main site, often with links via the home page. Customer involvement in the product launch stage may also occur by means of personalized communication, especially customized newsletters sent to customers according to permission-based criteria [14]. Providing personalized customer assistance can also enhance customer relationship management. Even organizing events by bringing together offline and online users contributes to

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[13] In fact on the Internet customers are just "one click away" from each other. Word-of-mouth, hence, turns into what some authors call *word-of-mouse (*Reichheld and Schefter, 2000).

[14] Customized newsletters are dedicated newsletters with information of interest for the individual customer. They are customized because they are sent to profiled customers and sometimes also have content that is customer-specific. Regarding permission-based criteria (Godin, 1999).

strengthening interaction and making the users feel part of a select group. In fact, the activities related to customer relationship management take on crucial importance throughout the entire new product life cycle. These activities allow the company to systematically interact with its customers and obtain regular feedback, crucial to subsequent product upgrading. Web-based tools therefore foster new product development by making it an ongoing process that continuously benefits from customer input. The recent emergence of 3G mobile networks will substantially increase the opportunity to communicate and provide customer relationship management (CRM) solutions to the end market [15]. In fact, mobile communication enhances the possibility of pursuing contextual marketing strategies, because it allows companies to identify the customer's location and to send appropriate messages when the customer is willing to pay more attention to them. For instance, Unilever tried out such an application by offering Northern-European shoppers recipes and suggestions directly in the supermarket via their mobile (Kenny and Marshall, 2000).

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[15] We acknowledge one of the reviewers for letting us note this relevant trend (O'Driscoll, Reibstein, and Shankar, 2003).

2.2   Research Method

We carried out a quantitative analysis of the public web sites of firms in industries exposed to both online technology and the dynamics of innovation and change. The industries we selected are the automobile, motorcycle, electronics, toiletries, and food industries.

We identified 28 variables that represent the Web-based tools that companies can adopt to interact with customers to support the different stages of their innovation process. Table 2, in the first two columns, summarizes our classification (for detailed information on the research method adopted, see Appendix I).

The following three areas of results emerged from our study:

- the specific Web-based tools that are diffused at each stage of the process;
- the variation in Web-based tool presence across companies in different industries; and
- the core features shared by the companies most involved in Web-based customer innovation.

TABLE 2. Selected Web-Based Tools Used at the Different Stages of
the Product Innovation Process

Innovation Process Stage	Selected Variables	References From Literature
Idea generation	"Contact the firm" option Feedback session/survey Suggestion box Complaint area Virtual community Formalized mechanisms of competition on new ideas Agreement area to manage intellectual property rights Customer advisor programs	Burke, Rangaswamy & Gupta (2001) Hagel & Armstrong (1997) Kozinets (1999) Sawhney & Prandelli (2000b) Thurow (1997) Urban & Hauser (2002)
Idea selection	Analysis of customer opinions Virtual concept test Focus group on line	Dahan & Hauser (2002a) Montoya-Weiss, Massey & Srinivasan, Lovejoy & Beach (1997) Weissman (1998)
Product design	Mass customization of aesthetic attributes Mass customization of functional attributes User patents for new products Open source mechanisms Design toolkits Virtual teams	Dahan & Hauser (2002) Lakhani & von Hippel (2000) Lee & Cole (2000) Liechty, Ramaswamy & Cohen (2001) MacCormack, Verganti & Iansiti (2001) Park, Jun & MacInnis (2000) von Hippel & Kats (2002). von Hippel (2001a&b)
Product testing	Virtual product test Market test	Dahan & Srinivasan (2000) Thomke (1998); Thomke, von Hippel & Franke (1998) Urban, Weinberg & Hauser (1996)
Market launch	New product area Events Customized newsletter Virtual communities Viral marketing Customized assistance in product selection Mini Websites	Armstrong & Hagel (1996) Hagel & Rayport (1997) Jurvetson (2000) Kenny & Marshall (2000) Peppers & Rogers (1997) Reichheld & Schefter (2000)
Product life cycle management	Customized CRM Customized newsletter	Hart et al (1999) Peppers & Rogers (1997) Roberts & Berger (1999)

2.3   The Specific Use Of The Web In The Innovation Process

The frequency analysis mainly shows that the sample companies include Web-based tools to encourage customer participation particularly during the initial and final stages of new product development—specifically, during idea generation, product launch, and the management of the product life cycle (see Table 3, columns 3 and 4).

During the idea generation stage, almost all of the sample companies offer consumers the option of direct company contact, and about 37% of these firms carry out ad hoc online surveys or request specific feedback related to the product or site. Even the suggestion box, used to collect consumer ideas to improve existing products or launch new ones, is drawing attention and is used by 8% of the sample companies.

In contrast, online tools are not widely diffused during the idea selection stage. Regardless of industry, only 4% of the sample companies allow individual users to view the evaluations of other customers and none allows direct interaction among these customers. Furthermore, there is no evidence of online focus groups designed to involve customers in the selection of new product concepts. Compared to the other stages, product design relies on a wider range of collaborative mechanisms. At the simplest level, input for product design based on the customized aesthetic and functional features of the product (3% and 30% respectively) appears to be a common practice. At a more innovative level, in compliance with intellectual property rights agreements, some companies (1.4%) allow customers to submit their patents to develop new products. Although the web is not often

used during the product testing phase, digital environments are commonly used to verify the overall effectiveness of a particular marketing mix. In fact, almost one-fourth of the sample companies use this tool, especially those operating in the mass-market industry. Finally, a wide range of tools is used to support the new product launch and the management of the product life cycle. For instance, it is common to find one area of the site dedicated to informing customers about the history and features of new products (63%); there are also mini-sites dedicated to new products, especially in the electronics (e.g., Siemens) and technology (e.g., IBM) industries. In addition, the communication of online events, often combined with offline activities (49%), appears to play a key role in promoting the product launch on the market. In all the sample industries, customized newsletters, sometimes supported by viral marketing mechanisms, are also commonly used to promote a new product launch (41%), or recruit for activities related to subsequent stages of the product life cycle.

Numerous other tools are used to carry out activities related to Web-based customer relationship management (32.5%). By resorting to chat rooms and forums, virtual communities not only promote the spread of product or service information within specific user groups, but also contribute to further reinforcing the customer's tendency to buy. Other mechanisms widely used to support a new product launch provide personalized assistance to help consumers select a product. These instruments are often based on product comparison or model selector programs designed to assist the user in identifying the product that best satisfies his or her needs. Such comparison tools are most common

among electronic products (e.g., personal computers, Dell; televisions, Blaukpunt; cellularphones, Nokia) and automobiles (e.g., Mercedes, Ford). Some versions of this instrument go beyond merely comparing brands and even compare features of the different models produced by a company. In conclusion, within the framework of growing personalization and enhancement of the interactive features, typical of digital environments, the web plays a fundamental role: at the beginning of the new product development process, during the stage of customer knowledge absorption for idea generation, and at the end of the process, during the product launch and life cycle management stages.

2.4   The Impact Of Industrial Specificity

We found that companies vary across industries in their use of online customer feedback in the new product development process (see Table 3). For instance, web sites run by companies operating in the toiletries, food, and motorcycle industries provide several tools in the early and final stages. In the earlier stages of the process, the food and toiletries companies prefer more traditional tools—such as consumer contact with the company or the option for the analysis of other customers' opinions. Companies in these industries offer recipes or advice in dedicated sections, but only in a few cases they systematically attempt to directly involve customers. For example, the Kashi site's "My recipe" section

invites customers to "send in your recipe." Although the food and toiletries companies generally prefer one-way communication, there are some interesting exceptions. For example, P&G has a section devoted to new product development that provides a customer advisor option and a collection area for suggestions in the "Share Your Thoughts" section. The Ben & Jerry's and Findus sites also include suggestion boxes. Reward mechanisms for proposing innovative uses of company products can be found on the Hellman's site, while market tests offering customers product samples are available on the P&G and Nestlé sites. In the early stages of the new product development process, companies in the motorcycle industry also include tools on their web sites such as suggestion boxes, reward mechanisms for new product concepts, and customer advisor programs. Motorcycle companies, such as Ducati and Aprilia, also encourage direct consumer participation by offering rewards such as spare motorcycle parts. In most cases, this application of Web-based tools is governed by copyright regulations that define the intellectual property rights of customer "projects."

The situation is substantially different in the electronics and automobile industries. These companies provide online mechanisms to support almost all the stages of the innovation process, even the middle stages, which involve product development and testing. However, although electronics companies are more likely to include specific tools in these stages (such as consumer patents for new product solutions, open source mechanisms, product design tools, and virtual product tests), the automobile companies seem to prefer less-innovative tools (such as mass customization and market tests), mainly

designed to obtain suggestions from the users indirectly. In the electronics industry, there are many interesting cases. For example, in its "Clip It Covers" section, the users registered with Siemens can design their own mobile phone covers. The company also promotes a contest designed to advance the development of Java technology applied to mobile phones. In its "forum for technology developers" section, Nokia uses the open source mechanism to develop new technologies applied to mobile phones and related value added services (VAS) as well as to applications for computer connectivity. More classic examples of web site sections dedicated to developing new concepts or technologies can be found in the automobile industry. Volvo's and Fiat's "Build your Car" sections as well as "BMW Individual" or "Audi Configurator" sections allow users to combine the colors, components, accessories, and functional attributes of their automobile and also put together financial and insurance service packages. BMW's "Virtual Innovation Agency" allows users to submit innovative ideas that are subsequently evaluated. If the ideas are accepted, the company patents them and the submitting person is duly remunerated. Finally, both the electronics and automobile industries offer Web-based tools supporting the testing stage, especially market tests to assess the appeal of the finished product. In the automobile industry, these tests include driving simulations; in the electronics industry, they include viewing three-dimensional images of the product and simulating its use. A final note relates to the automobile and motorcycle industries that are both keen to cultivate online customer relations once the product is launched. This need for an ongoing

customer relationship is mainly due to the fact that the product is durable and can arouse the owners' interest. For this purpose, CRM tools are widely used.

2.5   Profile Of Companies Most Likely To Adopt Web-Based Customer Tools

The results of the final step of the research—the PCA/cluster analysis— show that large, brand-name companies and multinationals use Web-based tools the most (see Appendix II). The composition analysis of the clusters confirmed the earlier results of the frequency analysis. To some extent, most of the sample companies generate ideas through consumer input online and involve customers at the new product launch stage. However, only the largest and more diversified companies belong to the cluster in which online support tends to be used in more than one stage of the development process, adopting particularly innovative tools.

Our interpretation of the underlying online approaches to customer integration is based on the analysis of the factor loadings emerging from the PCA (see Appendix I for the detailed output of the analysis)." According to these premises, we interpret factor 1 as being a "mass customization" dimension that portrays the approach to the web as strongly oriented to developing personalized products (both in their aesthetic and functional attributes) and customer service based on customer inputs. A good example of this is the Siemens web site where customers can select both their cell phone cover color and its software attributes.

We call factor 2 "product choice." This factor reflects companies using the web in order to strengthen customized assistance in supporting the selection of a new product. The customers' final decision is also facilitated through viral marketing initiatives, while active customer involvement is limited to survey initiatives. Design toolkits and formalized mechanisms of competition for new ideas are associated positively with factor 3. This factor expresses a "user input" dimension, representing customers that participate in contests in order to provide the best innovative solution and receive an appropriate remuneration. Competition among users prevails on peer-to-peer collaboration and appropriate incentives play a key role in supporting effective contributions. We called factor 4 "lead users" and consider it an approach that represents the strong positive coefficients for an "agreement area" to manage intellectual property rights and the user's patent for new products, as well as for the use of suggestion boxes. We interpret this factor as the expression of the firms' desire to cooperate with particularly competent customers, encourage their creativity and allow them to completely develop and patent a new product. A good example is Procter & Gamble, in the "Patents & Technologies" area of its corporate web site where customers are asked to send in their patented ideas and technologies developed independently. Factor 5 may be defined as "market research" because it presents positive coefficients for the analysis of other customers' opinions, the presence of customer advisor programs, and the use of market tests. It describes the approach of companies involving customers online essentially as "censors" of their own products. We interpret factor 6 as a one-way customized communication or "newsletter"

dimension. It emphasizes a limited approach to the web, confined to personalized advertising and customer relations management to support new product

launch and management. Factor 7 shows the strongest positive coefficients for complaint areas and mini web sites, such as the sites systematically run by Ferrero for Nutella. This factor therefore expresses a "two-way communication" approach that can include interactions both with and among individual users. We call factor 8 "social collaboration" since it shows positive coefficients for virtual communities enhancing idea generation and events supporting the product introduction phase. Consequently, it represents the typical approach of companies leveraging the web to involve customers in order to enhance creativity and image, i.e., both product and branding strategies. Finally, open source mechanisms and virtual communities are associated positively with factor 9, labelled "open sourcing." It reflects an approach to collaboration based on peer-to-peer mechanisms, describing customers that work together on the same product, contributing to it according to an incremental approach, as in the Nokia Club where customers can participate in the Developer Platform and contribute to the evolution of Java and Bluetooth applications.

These factors were subsequently used as the variables according to which the sample firms were grouped into six clusters based on their approach to collaborative Web-based innovation (Table 4).

Three of the resulting clusters are extremely limited in size, and composed of the top performer companies[16] . Specifically, cluster 2 is made up of only one company, Siemens, and clearly stands out because of the relevance of user input. This factor is very weakly (see cluster 6) or negatively related to any other cluster. In fact, the company shows an unusual tendency to involve customers in virtual product testing activities by creating contests to select the best innovation and offering toolkits to allow customers to design their own products. Ad hoc two-way communication is also relevant. Similarly, cluster 5 is made up of a single company, BMW. It is strongly characterized by lead-user involvement that allows users to submit patents to the company and by customizing offerings (at the aesthetic and the functional level). Finally, cluster 3 includes only two companies: Nokia and HP. The dominant characteristic of this cluster is peer-to-peer collaboration for innovation. Virtual communities and open source tools are very relevant for this purpose. Personalized communication is also an important feature of this cluster, characterized by an approach that goes far beyond simply using the web to support only a new product launch.

The remaining three clusters comprise the largest part of the companies analyzed. The largest cluster is the sixth one, which includes 123 cases. It is characterized by a low tendency to leverage the web to cooperate with customers. In particular, this cluster

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[16] These top performer companies can be considered as outliers that implement unique behaviour when using the web to support their NPD process. In order to make our principal component analysis and the following cluster analysis strong enough, we eliminated the outliers and reran both the former and the latter. The emerging results confirmed the evidence described here and they are provided in detail in the final appendix. We thank both anonymous reviewers for suggesting this further step in our analysis.

records negative results compared to the other clusters at all stages of the innovation process. This means that more than half of the web sites analyzed still do not include specific functions to support customer collaboration in new product development. Cluster 6 is mainly made up of food & beverage companies (over 75% of the sector companies belong to cluster 6), with a strong concentration of their sub-brand web sites. However, some important toiletries companies—such as Gillette, Shiseido, Elizabeth Arden, Vichy, and Sephora—and a few consumer electronics companies, especially those operating in consumer electronics and household appliances—such as Acer, Philips, LG, Electrolux, Sharp, and Epson—also belong to this cluster.

Cluster 1 includes 27 cases and is characterized by the tendency to use the web to collaborate with customers at the end of the new product development process, especially to support market launch. In any case, this approach still does not fully exploit the online capacity to promote real product co-development through peer-to-peer competition and collaboration. In this sense, virtual communities are used only to support the initial product launch on the market together with other online events. An attempt to use the web to evaluate products through market tests and the analysis of other customers' opinions is made by firms such as Aprilia, Volvo, and Nissan. Generally speaking, most of the very large automotive companies with a well-established brand name—including Chrysler, Ford, Jaguar, Maserati, Mazda, Mercedes, Saab, Toyota, and Volkswagen— are grouped in this cluster.

Finally, cluster 4 is made up of 55 companies that show an incremental approach to using the web to support collaboration with customers throughout their innovation process, especially in the initial stage (idea generation) and final stage (new product launch and management on the market). Specifically, this group of companies is mainly characterized by factor 2, i.e., by using the web to facilitate product choice and enhance communication activities supporting the introduction of the new product at the end of the innovation process. Cluster 4 companies also use the web to gather customer input through feedback sessions and surveys at the beginning of the innovation process. This cluster is also characterized by factor 6 (i.e., using the web to support one-way customized communication) and by factor 8 (i.e., using the web to obtain new stimuli through social collaboration at the idea generation stage and enhance brand image by means of events). Excluding cluster 5—made up of only BMW—this is also the only cluster showing a positive coefficient for factor 4, i.e., collaboration with lead-users. Cosmetics, motorbikes, and consumer electronics companies (especially those operating in the mobile phone and computer sectors) mainly make up this cluster. However, it is worth noting that a few food companies that cooperate quite intensively with customers at the idea generation stage, such as Ben and Jerry's and Hellmann's, are also included in this cluster. Similarly, some automotive companies—Ferrari, Peugeot, and Subaru—also belong to cluster 4 and interact with customers online to carry out market research and support the launch of new products. Generally speaking, this cluster comprises multinationals and leading operators, such as P&G, l'Oreal, Lancome, Revlon, IBM, Sony, Dell, Toshiba, Motorola, Ducati,

Yamaha, and Honda. In particular, this cluster shows a high concentration of corporate sites of multi-brand companies.

TABLE 3. Measuring the Use of Web-Based Tools in the Five Industries

Industry	Main stages	Main tools	% of firms that use the tool
TOILETRIES	Idea generation	"Contact the firm" option Feedback session/survey Suggestion box Agreement area to manage intellectual property rights	94% 43% 9% 6%
	Ideas selection	Analysis of customer opinions	9%
	Market launch	New product area Customized newsletters Customized assistance in product selection Viral marketing	91% 69% 66% 46%
CONSUMER ELECTRONICS	Product design	Mass customization of functional attributes User patents for new products Open source mechanisms	72% 7% 7%
	Product testing	Market test Virtual product test	17% 3.5%
FOOD	Ideas generation	"Contact the firm" option Feedback session /survey Complaint area	86% 17.5% 7%
	Product launch on the market	Customized newsletter Events Viral marketing Virtual communities	20% 17.5% 9% 7%
	Product life cycle management	Customized newsletters	51.5%
MOTORBIKE	Ideas generation	"Contact the firm" option Suggestion box Complaint area Agreement area to manage intellectual property rights Customer advisor programs	93% 29% 14% 14% 14%
	Product testing	Market test	21%
	Market launch	New product area Events Mini Websites Viral marketing Virtual communities	93% 93% 36% 29% 43%
	Product life cycle management	Customized CRM Customized Newsletters	86% 71%
AUTOMOTIVE	Ideas generation	Feedback session /survey Virtual communities Suggestion box	47% 21% 12%
	Product development	Mass customization of functional attributes Mass customization of aesthetic attributes	68% 65%
	Product testing	Market test	38%
	Market launch	Events New product area Customized newsletters	94% 68% 47%

TABLE 4. Non-Hierarchical Cluster Analysis: Final Cluster Centers

	Cluster					
	1	2	3	4	5	6
Mass customization	2.15970	1.33187	-.54274	-.28995	3.17889	-.37228
Product choice	-.24172	.67352	.92691	.71377	-1.10979	-.27763
User input	-.28107	13.94470	-.03129	-.00646	-.17846	-.04682
Lead users	-.21674	-.42127	-.00034	.05752	10.4424	-.05961
Market research	.24131	.30444	-.51748	-.12163	.06677	.00681
Newsletters	.30699	-.56042	.63097	.95171	-1.90077	-.48320
Two-way communication	.55714	.85465	.71522	-.19851	-.73502	-.04614
Social collaboration	.03949	-.62535	-1.08689	.44466	-.61165	-.17977
Open sourcing	-.08626	.17747	8.63913	-.13086	1.58350	-.07734
Number of Cases	27	1	2	55	1	123

2.6   Discussion And Conclusions

Customer involvement in the innovation process represents one of the most promising areas of development in connection with the collaborative marketing strategies that the new virtual customer environments make possible. The over 200 brand and corporate sites analyzed in this study show, however, that Web-based tools are not always implemented to accelerate and improve new product development through customer involvement. In fact, only specific stages of the innovation process are supported by the web, a limited set of two-way communication tools are still included and not all companies seem to show an optimal level of interest in leveraging these tools.

First, the analysis highlights that Web-based tools designed to involve customers in the innovation process tend to be concentrated in the early stages (i.e., idea generation) and in the later stages (i.e., product launch and management).

The core activities of the innovation process are still controlled and managed by the company. In other words, there is a growing tendency to "listen to the customer's voice" through Web-based tools, even if this "voice" is then reinterpreted and transformed into specific product features through autonomous, in-company activities. Moreover, only after the product launch does the company go back to considering Web-based tools for two-way communication and direct customer involvement. However, industry specificity tends to play a significant role. In particular, some companies in the electronics and automobile industries stand out in their implementation of tools that involve customers even in the most important stages of the innovation process, i.e., product development and testing.

Second, the Web-based tools that companies tend to prefer are still those that perform traditional offline activities at a lower cost online. What seems to emerge is a gradual approach in which companies initially adopt Web-based tools to support activities already functioning offline and then use these tools more intensively to develop more radical forms of customer interaction and involvement. The tools most commonly considered include direct contact with the company, Web-based surveys and feedback sessions, newsletters, personalized support for activities related to customer relations management, and events to support the launch of new products and services. The less commonly used tools include more innovative instruments, especially those designed to

support the development stage, such as open source mechanisms and toolkits to design products. However, it is worth mentioning the increasing number of new options, including suggestion boxes and reward mechanisms during the idea generation stage and patents with explicit copyright regulations in the new product development stage. Although these tools are still not widely available, they point the way to greater customer involvement in the innovation process and the industries that develop products with high levels of digital content are taking the lead.

Finally, large companies, especially multinationals and well-established brand-name companies, are the ones that mainly involve consumers directly in the innovation process. However, across industries, these companies tend to exhibit more qualifying features. The companies in the motorcycle and automobile industry that involve customers more intensively in new product development online tend to have focused consumer groups sharing a common passion.

Companies in the toiletries industry and the food industry maintain corporate web sites that promote collaborative marketing together with more traditional sites at the brand level. In the electronics industry, companies operating in mobile phones and personal computers have a wider range of Web-based tools than those operating in consumer electronics and household appliances.

To sum up, the dominating approach in leveraging the web to support collaborative innovation is still incremental, and apparently companies are gradually integrating the traditional activities of new product development with online tools to promote systematic

customer interaction. However, our results also show that using web tools can go beyond their association with specific stages of the product development process. These tools can, in fact, be aggregated according to the degree of customer involvement they allow. By combining our review of past literature and empirical findings with the results of our data analysis, we have come up with an alternative picture of Web-based collaborative innovation (Table 5). Identifying the principal advantages and limitations of each tool provides managers with guidelines to help them in the decision making process.

TABLE 5. Managerial Guidelines: Advantages and Limitations of
Web-Based Tools for Collaborative Innovation Depending on the
Degree of Customer Involvement these Tools Allow

Web-Based Tools	Advantages	Disadvantages
MASS CUSTOMIZATION		
Product customization options	- Easy to implement for the firm - Experiential to use for customers - Opportunity to define ideal combinations of attributes - Enhanced customer loyalty through personalization	- Product modularity needed - Technological competences - Usage for incremental innovation only - No access to customer competences
Customized CRM	- Reduced information overload - Customer decisions support - Customer loyalty and lock-in => higher profits	- Challenges implementation - Constant need of customer information - Management of customer life cycle - Dedicated organizational competences
PRODUCT CHOICE		
Customized assistance in products selection	- Increased customer satisfaction - Time-purchase decision reduction - Affective commitment - Incentive for "parking" on web site	- Need for collaborative filtering applications - Dedicated organizational competences
New product area	- Enhanced product exposure and product trust at low cost	- High customer expectations - Need for continuously up-to-date information
Viral marketing	- Enhanced product exposure and product trust at low cost - Dissonance reduction - Strong power of incentives	- Low possibilities of control - Rapid diffusion of negative opinions also
"Contact the firm" option	- Huge reach at limited costs - Enhancement of firms' direct ties - Point of entrance for interactivity	- Low richness - Generic usage - Low incentives for users
Feedback session/survey	- High versatility (opportunity to get feedback on site, product, services..) - Limited costs and real time feedback to reduce uncertainty	- Sample control - Self filled-in questionnaires - Predominance of pre-codified items

Web-Based Tools	Advantages	Disadvantages
USER INPUT		
Virtual product test	- Response flexibility and possible changes in market and technology reducing product development time - Learning from low cost mistakes - Multimediality	- Product-related limitation: not all products can be virtually tested - Lack of sensory experience; - Technologies constraints: limited bandwidth.
Design toolkits	- Access to sticky customer knowledge - Learning by doing process - First-mover advantages - Contribution to radical innovation	- Translating user designs into inputs for production - Need for user-friendly technologies - High development cost
Formalized mechanisms of competition on new ideas	- Selection of the best customer assets - Strong power of incentives	- Participation constraints: time-related, product dependent - Cost of payoffs and intellectual property rights management
LEAD USERS		
Agreement area to manage intellectual property rights	- Selection of the best customer assets - Strong power of incentives	- Need for strong focalization - Use of standard models for different contributions
User patents for new products	- Completely developed new product - Original and quality-certified ideas	- Property right recognition - Patent management
Suggestion box	- Leveraging customer ideas and competences - Loyalty: it provides individuals with a sense that firms care about what they think and want - Easily supported through incentives	- Risk of not focused content → time consuming - Difficulties in turning the contents into a solution - Usage limited to support incremental innovation
MARKET RESEARCH		
Analysis of customer opinion	- Eliciting and comparing information from a large number of dispersed customers at the same time	- Group-thinking phenomena - Management costs
Customer advisor programs	- Cost-effectiveness - Continuous feedback - Positive effect on loyalty	- Need for continual updating - Great commitment required
Market test	- Low cost of simulating product use - Estimating future market share	- Great amount of information required to reproduce a simulation of the purchasing experience
NEWSLETTERS		
Customized newsletter (for market launch and product life cycle management)	- Proactivity: news, innovations, events at mouse-length - Permission-based marketing: sensitive-use of customer profile	- Low tolerance towards spamming effects - Customer database management costs
TWO-WAY COMMUNICATION		
Complaint area	- Focused content - Immediate applicability - Low cost - Real time feedback	- Immediate answer expected from the company - Dedicated personnel needed - Time consuming
Mini Websites	- Close access to single product features - Experiential marketing	- Costs of creating and managing new Websites on a contingent basis
SOCIAL COLLABORATION		
Virtual communities	- Enhanced product trust and loyalty - Leveraging other customer experiences to reduce the perceived risk of new product purchases	- High motivation needed: restricted number of participants - Dedicated community managers enforcing participation rules - Animation costs
Events	- Individual involvement - Customer retention	- Need to continuously integrate on and off line initiatives
OPEN SOURCING		
Virtual communities	- Enhanced product trust and loyalty - Leveraging other customer experiences to reduce the perceived risk of new product purchases	- High motivation needed: restricted number of participants - Dedicated community managers enforcing

Web-Based Tools	Advantages	Disadvantages
		participation rules - Animation costs
Open source mechanisms	- Reciprocal relationship in creating a high quality product - Flexibility - Knowledge sharing and integration - Enhancement of user reputation - Sense of group responsibility	- Clear participation rules and incentives needed - Modular project structure - Undirected innovation and potential chaos - Low internal coordination

Source Our Elaboration

3   Chapter 3 – Collaborative Innovation: Case-based Validation and Emerging Cues

The importance of user innovation is widely acknowledged and numerous empirical studies and authors have stressed the outstanding importance of creating tools and methods for customer integration in new product development; while anecdotal evidence abounds on how best practice firms are leveraging the Internet to connect with customers, there is little formal research on the actual implementation of this collaborative phenomenon (e.g. Franke and Piller, 2004; Shah, 2000)

This work takes a first step in this area: an exploratory approach using in-depth case study has been adopted to support the results emerged from previous analysis, provide further insights in this direction and derive strategic and organizational lessons and implications for academics as well as managers. This case study conducted at Fiat illustrates the application of virtual customer integration in practice. The project is focused on the development of the New Fiat 500[17]; the redesign of a car which has signed the story of the Italian mobility after the Second World War.

Through the description of Fiat 500 experience, it is possible to map the collaborative process according to the actual implementation of the identified Web-based

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[17] From here to then, only Fiat 500

tools and provide an understanding of the organizational and marketing implications underlying the collaborative approach.

3.1   Case Building Methodology

This exploratory case study is carried out in a single firm, with a grounded theory approach (Glaser and Strauss, 1967). The choice of Fiat is justified by the high visibility of the object of the study (i.e. advising the adoption of collaborative innovation strategy). Data are collected first through Website navigation and then through in-depth individual and semi-structured interviews – that are flexible, but also controlled (Burgess, 1982) - with the top management and several managers involved in a recent innovative projects (i.e. Fiat 500), adopting the so-called key informant approach (Philipps, 1981; John and Reve, 1982; Kumar, Stern and Anderson, 1993). An open-questions frame helped us in categorizing the basic points regarding customers' knowledge absorption through the Web. We will stop interviewing when saturation is reached. Secondary data have been collected as well (archival data, financial statements, annual reports, industry publications, etc.). The unit of analysis is set at the project level; thus, the case study can be classified as an example of single-holistic design (Yin, 1984).

According to the grounded theory methodology, the analysis of data followed an iterative process, during which the author interpreted the informants' descriptions and

integrate them in an emergent theoretical framework. In order to raise the reliability of the study, the data were analized more than once and in different moments; further, improvements of the fit between data and the conceptual framework were obtained through several stages of revision and adjustment. Indeed, the earlier focus was only on the process of web-tools adoption, while their usage and the underling organization and marketing implications emerged in response to the interviewees' accounts. We have accompanied the Fiat 500 project from its initiation to project conclusion.

The adoption of a qualitative methodology is consistent with the fact that collaborative innovation is a process and presents an embedded nature (Lee, 1999).

Although, we admit that focusing on one case might prevent us from applying our results on a wider basis, we believe that the contribution of our study rests more on the attempt to analyze concretely a concept that has been subject to theoretical speculation but scant empirical research.

3.2   Fiat 500: "The First Car for the People, Created by the People"

3.2.1 Fiat Story: Sometimes, To Move Forward You Need To Take A Step Backwards

The history of Fiat began many years ago, at the dawn of Italian industrialisation, in which the company has always played a leading role. From that moment on, the Fiat brand

spread throughout the world and developed extensively. Periods of glory and crisis spaced out, giving rise to a continuous regeneration. The last big challenge[18] has led to a new standpoint in the company strategic plan; firm orientation toward profit maximization through cost reduction has been replaced by a progressive focus on innovation based on market knowledge. In particular, Fiat has understood the necessity of grasping customer knowledge to enhance the firm's innovation processes:

> << We don't want to produce cars at low cost and profit maximization for Fiat; we want to produce better cars for all our customers, cars that reflect their desires and at the same respect them; so, that are safe and environmentally committed[19]>>

That is just what Fiat has done recently, by returning to the company's original mission, namely to build cars with attractive styling and exciting engines, cars that are accessible and improve the quality of everyday life. The development and launch of the Grande Punto, the New Croma and the New Panda are first signals of this transformation in the Fiat 's innovation approach; an evolution that sees a climax in the development of the Fiat 500.

The Fiat 500 project responds to a profound change in corporate culture and mentality, so that it is now focused on a continuous, rapid overhaul of its products, on

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[18] In 2005 when General Motors broke the agreement with Fiat , increasing the Italian company's funds for new entrepreneurships

[19] Marchionne, Fiat Managing Director; from an interview reported on the main Italian journals in 2005.

technological research, on the quality of its designs and on a new, constructive relationship with the customer.

In particular, the purpose of customer interactions is to import their "voice" into the firm in order to enhance innovation, to refine and enhance ideas on products that they already know, that they have already experienced[20].

To celebrate this new approach, Fiat has decided not only to create a new brand logo[21] but also to exploit the revolutionary potential of the Web to support the interactive dialogue with customers.

Recognizing that the Internet and, in general, the instruments based on ICT serve to reinforce in a remarkable way the company's capacity to absorb market knowledge and systematically interact with the market, Fiat has started to use the Web for both communicating and actually implementing its innovation strategy.

3.3   From "Fiat.Com" To "500 Wants You": The Online Strategy Evolution

The use of the Web for Fiat is not new: what is new is the rationale ascribed to it. The development of the Fiat 500 has represented the shift from the use of the Web as communication channel to the use of the Web as collaborative innovation tool.

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[20] With this project, Fiat is following an affirmed tendency in the automotive industry: redesigning old product success (i.e. Mini, New Beetle, Citroen 2CV).

[21] A modern reinterpretation of the famous shield that graced Fiat cars between 1931 and 1968.

<< Internet for us is an open-window on the market; it compels us to get a move, to be fast as the Web, as customers' preferences change[22]>>

Fiat.com, as well as *fiatgroup.com*, *fiatprofessional.it* Websites (to name some of the over 20 official Fiat Websites), have the purpose of re-conquering the credibility the company was progressively loosing because of previous product flops - i.e. Stilo car. The mission of these Websites was manifestly to inform customers about company's commitment toward the implementation of technical know-how. A first attempt to integrate the Web in Fiat's value chain has been made with *pandamonster.it* and *quellichebravo.it*. In both cases, Fiat wanted to increase customers' perception of the value of its cars, through an exclusive proposal (in the first case) and an increasing understanding of its innovation activities.

Pandamonster Website was mainly created for marketing purpose to sponsor a new car (co-developed with Ducati) or commercialize it; Pandamonster, in fact, has been sold exclusively online to a selected group of customers: "Pandamonster waiting to be discovered. Only online".

Instead, *quellichebravo.it* represents a first effort for introducing a new car starting from its innovation process. Through this blog, Fiat opens its innovation labs to customers; interview, articles and documents, all related to Bravo car, are reported on the Website in order to inform customers about the project functioning and evolution.

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[22] Fabio Galletto, Marketing Brand Manager

The evolution from one-way communication to two-way dialogue sees the light with the "500 wants you" project. Different motivations, indeed, reside in the development of "500 wants you" Website; the company wants to use the Web for listening to customers desires, passions and needs and transform it into products attributes.

<<Informing customers about what the company is doing is not enough. We want to learn from them[23]>>

The *"500 wants you"* project is an online laboratory, where users discover the stylistic concept of the new car, express their preferences, propose ideas and contribute to its creation, in a combined, active way; public's contributions and expectations are assessed and possibly used during the actual development of the product.

<< A car is successful only when customers immediately understand its value, its potentialities. For this reason it is important to directly ask them what they want it to represent[24] >>

Fiat theoretical premises on customers' involvement in product development have found a positive practical confirmation; for this reason, according to Pettigrew (1990), it represents a fertile ground for better investigating the phenomenon of collaborative innovation.

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[23] Luca De Meo, Brand Fiat Manager.
[24] Salvatore Leotta, Product Manager Fiat 500

3.4 "500 Wants You" Facts And Figures

Customers' responses to Fiat Website initiatives show the existence of a positive attitude toward the actual implementation of collaborative approaches.

After 50 days of its debut, *"500 wants you"* has reached a record figure of 500,000 visitors, 5,000,000 pages visited; through its Concept Lab I[25], has received more than 50,000 ideas for accessories and customisations for the new model.

Up to now[26], 3.700.000 users have visited 51.700.000 Web pages. The community counts for 76.000 members. Over 275.000 of customization ideas and suggestions for accessories have been gathered up through Concept Lab I and more than 17.000.000 cars have been configured by using the Concept Lab II. Contests have shown high levels of participation; empirical evidences are reported in the following box (Box 1)

Box 1. Data on Contests' Participation

- Designboom: 5433 creative individuals and institutions from 97 countries
- 500 Mascot: 1263 entries
- 500 Stickers: 800 projects
- 500x500: 500 requests in less than 500 minutes (8h30m)
- 500 wants youR ADV: 3300 ideas received
- Baby Boom: 3943 mother-to-be have participated
- 500 Face: 600 pictures have been sent
- Jingle Box: 8.600 jingles were created
- Speak 500: more than 50 audio file have been registered

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[25] For tools explanation see § 2.1.
[26] Data updated at the end of September 2007.

These "virtual data" have reflected upon "strategic numbers". As for selling, in less than 2 months from the car launch, more than 70.000 purchasing orders have been delivered, reaching Fiat's goal for the current year 2007. The time to market, that is the time elapsed between product specification and market launch has been of only 18 months, against the 30 months usually used by the company for developing a new car. A positive return in term of customer-firm relationships has been assessed: customers have shown high levels of trust toward the Fiat brand; through the 500x500 section customers have made one order every 40 seconds, even if they didn't know the price, the product final characteristics and its performance.

3.5   The Usage Of Web-Based Tools For Fiat 500 Development

To understand the actual integration of the Web-based tools introduced on "*500 wants you*" Website, data drawn from Website navigation have been expanded and validated with information collected through interviews with product, marketing and communication mangers[27].

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[27] As prearranged: Mr. Liotta; Mr. De Meo and Mr. Galletto; Mr. Perosino.

3.5.1 Mapping The Tools Presence Through An Ongoing Process

As suggested in Chapter 2 (Prandelli et al, 2006), it is possible to map the Internet-based collaboration mechanisms according to the contribution they can provide to each phase of the new product development process. Table 6 summarizes the identified tools.

Table 6. *"500 wants you"* Tools

Phase	Tools
Idea Generation and Selection	Box Suggestion - How do you image the new Fiat 500? and 500-OLOGY Competition – Design Contest; 500 Stickers; 500 Mascot; 500 Adv; 500 rolls with you Concept Selection – Concept Lab I and II
Product Development	Mass Customization – 500 Video Configurator Toolkit – Homepage Redesign and 500 Jingle
Test	Product test – 500x500 Market test – Opening Edition
Launch and Product Life Cycle Management	CRM – 500 Overland; 500 Star Maker; Feelings of 500; 500 faces; speak on video Newsletters – 500 Newsletter Viral marketing – Invite/send to a Friend; Have you seen 500? Baby Boom; Community – 500 Lovers

Source Our Elaboration

Tools included in the *"500 wants you"* Website reflects the purpose for which it has been created: << www.Fiat500.com ' site *is a case of work in progress, which will welcome new content, activities and initiatives, according to a plan that envisages several updates during the 500*

days that precede the launch of the new car, and which will gradually be introduced over the coming

months>>

The following paragraphs will provide a picture of the tools adopted by the firm for supporting the front-end (Idea Generation and Concept Development stages), and the back-end of the process (Product Design, Testing and Launch stages) and show how the contributions resulted from each of them have been actually integrated in the final car.

3.5.1.1 Fiat 500 Co-Idea Generation And Selection

"500 wants you" embodies a series of mechanisms that are useful in the front end and aim both at explore new and validate formerly generated suggestions (Figure 4a,b,c).

A *suggestion box* is included in the Website in order to allow customers to contribute with their own innovative ideas. Through **500-OLOGY –** an online encyclopaedia of stories and pictures dedicated to the Fiat 500 - people can share their own thoughts on the Fiat 500 to inspire firm's initiatives on the product. Initially developed for telling company all about the old 500, now user are called to free their imagination and tell the company about their hopes and dreams for the new Fiat 500.

The most competent users are encouraged to compete with each other in Web-based *innovation marketplaces* to provide suggestions or solve specific problems. These

marketplaces are both integrated in the *"500 wants you"* Website and hosted by third-parties, because of their ability to aggregate communities of experts.

All these contests are mainly oriented to support both product components and complementary marketing variables.

Issued in partnership with Designboom, the **DESIGN CONTEST** allows professionals, students and design amateurs from all over the world to design object connected to the Fiat 500 world.

The **500 STICKER ART CONTEST** invites customers to free their own creative spirit and come up with their very own decoration for the outside of the new 500.

With the **500 WANTS YOUR AD, 500 WANTS A MASCOT** and **500 ROLLS WITH YOU** competitions, the company asks customers to use their creativity for proposing an advertising idea for the launch of the new Fiat 500, a mascot inspired by the new Fiat 500 and a video to capture the spirit of the 500.

Figure 4. Fiat 500 Co-Idea Generation and Selection Tools

Fig. 4a Examples of Idea Generation Contests for Developing Product Components

Source"500wantsyou.com"

Fig. 4b. Examples of Idea Generation Contests for Developing Complementary Product Variables

Source"500wantsyou.com"

Turning to mechanisms that provide validation at the front-end of the new product development process, fiat has included an *online survey* – the simplest and most traditional use of the Internet for collaborative innovation. Through **HOW DO YOU IMAGE THE NEW FIAT 500?**, Fiat seeks to reduce uncertainty by interacting directly with customers to understand their articulated or explicit needs and consequentially define the basics for the development of the new Fiat 500.

The company has even directly created two online *concept labs* to examine customer reactions to the new product that was under development. Customers are invited to send suggestions for new design options (**CONCEPT LAB I**) and to configure and add accessories to the new Fiat 500 (**CONCEPT LAB II**). These labs are part of an integrated process involving customers in the definition of the single components ideation up to the final product. Indeed, the outcome of the first Concept Lab have been used by the firm as basic elements for the second Concept Lab; furthermore, once finished, new projects are published under the author's name and then viewed and modified by the public. This last step allows customers to have *visibility of other customers' opinion* and firm to collect quantitative data on customer preferences identifying which configuration is liked most, as for *conjoint analysis techniques.*

Fig. 4c. An example of Tool for Product Attributes Selection

ce"500wantsyou.com"
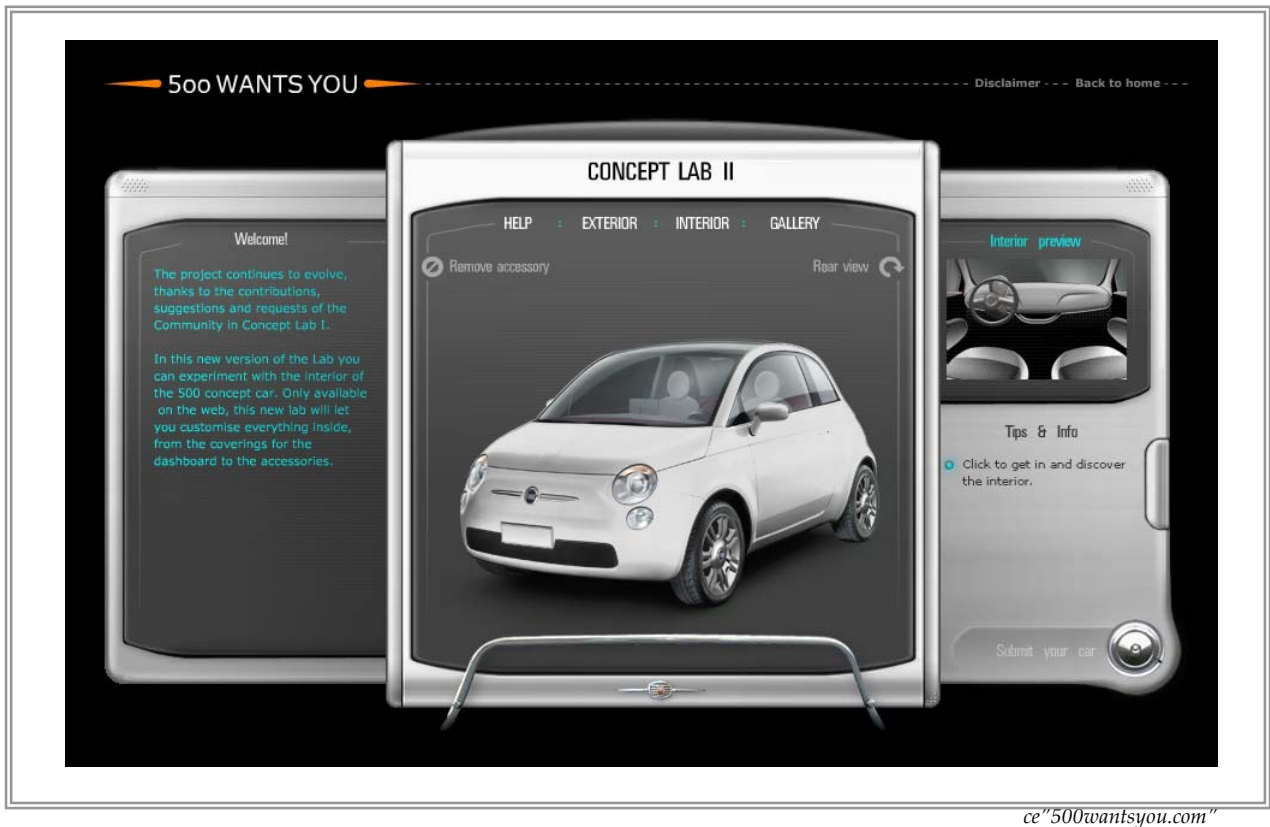
3.5.1.2 Fiat 500 Co-Product Development, Testing And Launch

Moving to the back end stages of the new product development process, digital environments allow a deep customer engagement to even design and develop the new product and define its market strategies (Figure 5a,b,c). At this end, Fiat has adopted *toolkits for user innovation* to support the development of corollary accessories of the product, such as jingles and homepages - **500 JINGLE** and **HOMEPAGE REDESIGN**.

Figure 5. Fiat 500 Co-Product Development, Testing and Launch

Fig. 5a Example of Toolkits for User Innovation

Source"500wantsyou.com"

Furthermore, Fiat involves customers broadly to product validation. The most advanced applications lead to the *mass customization* of products; through **500 VIDEO CONFIGURATOR,** customers can build their new 500 using the video configurator – color, wheels, fabrics and options can be chosen for building the car and a wide variety of accessories and stickers are offered for customizing it.

"The 500 can be whatever you want it to be: you can configure it in 500,000 different ways!" Fiat is committed to actually allow customers to purchase their customized cars, in the next future.

<< producing the car the customer really wants, design would be the best for us. But, we can't do it; the industrial time doesn't allow us to do that. What we can do, up to now, it's to act on exterior elements that can be customized as the customer desires >>

Fig. 5b Example of Product Configurator

Source"500wantsyou.com"
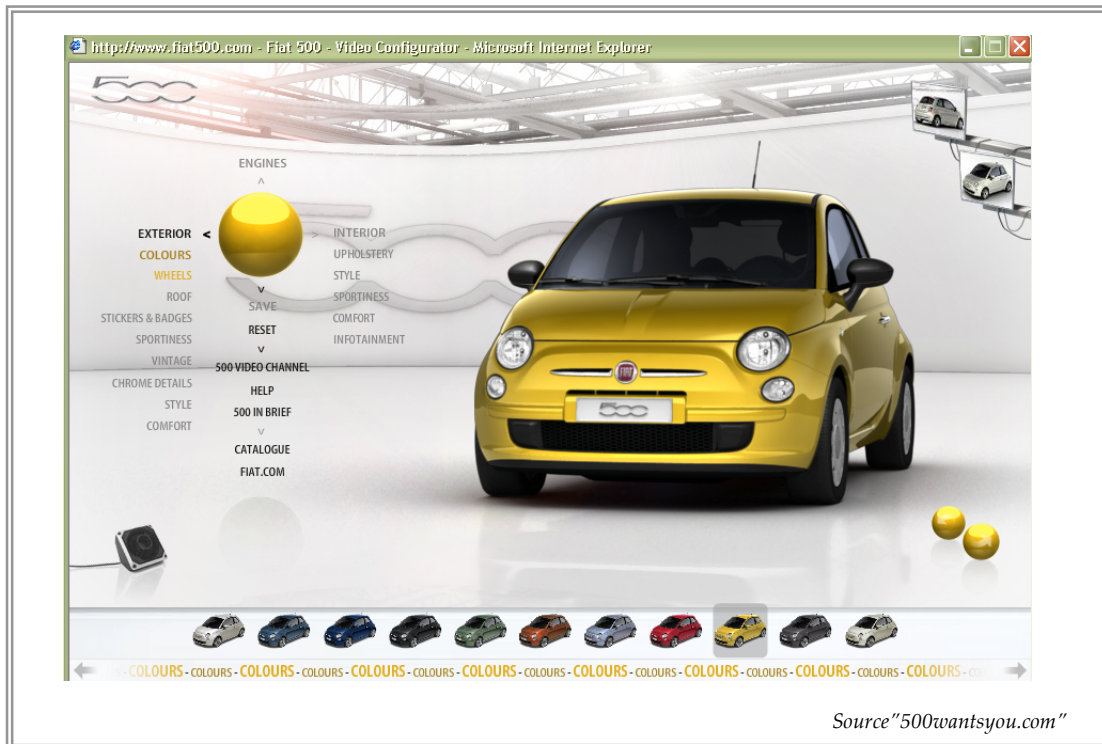
Some other tools have been integrated in Website to support product and market testing. Given the physical manifestation of the product, market and product test are restricted to promotional activities, such as: participation to events - invitation to a limited **OPENING EDITION**[28] for product inspection**;** and, online product advance booking **- 500x500.** The **BABY BOOM CONTEST**, even allows future mums-to-be to win one 500.

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[28] At the entrance to the Cappellini Temporary Store, you will also find a black box measuring about 250 m², fitted with a special 'stethoscope' system; on the outside there is a multimedia station where you can configure the Fiat 500 concept car by choosing your favourite body colour, stickers and a variety of accessories. Once you have finished, you can enter the black box to see a 3-D projection of your 500 Concept

By allowing customers to judge what participants to contests have proposed, Fiat has used its Website to test different marketing mixes that complement the supply.

Viral Marketing and CRM initiatives have been developed in order to support pre-launch and post-launch. With the **HAVE YOU SEEN 500?**, Fiat wanted to enhance customers curiosity about the new 500 before its official launch; after the launch, this tool has evolved into **500 OVERLAND -** comments about new 500 travelling around the world are included in a blog: "*Get ready, and don't be caught out by the new 500! Keep your eyes open for the 500s that will be making their way around the roads and tracks of Europe as they are put through their paces in a final series of quality tests: find out where they will be, get hold of a MMS mobile phone or digital camera, get snapping and send us your photos. By sending us the photos, you'll be helping create a live map showing all the routes covered by the new 500!* ".

Through **500 PREMIÈRE,** community members were able to see an exclusive preview of the car's definitive contents, as suggested and requested by users in the Concept Labs and other "*500 wants you*" initiatives.

The most traditional viral marketing tools such as **SEND TO A FRIEND** or **INVITE A FRIEND** and **NEWSLETTER** are used with the specific purpose of informing customers about the latest developments of the project and stimulate them to participate to the new initiatives.

Car on a scale of 1:1, and when you come out you will be presented with a paper copy of the prototype you have configured.

Fiat has included several other tools in order to let the customers play and render with the Fiat 500 image, in this way insights of customers' opinions about Fiat 500 are indirectly provided. Examples of these tools are: **500 STAR MAKER** that allows customers to (funny) interpret the spirit of the new 500, by providing associations with famous people: *"If the new 500 were a famous person, who would it be?"*; with **FEELINGS OF 500** customers can write down how they would like their 500 be and what they like about it and why; through **SPEAK 500 ON VIDEO** customers can send and listen to the various interpretations of how 500 is said in all the languages of the world; **500 FACES** initiative allows customers to look for similarities among them and the different model of Fiat 500.

Fig. 5c. An Example of Viral Marketing Tools

Source"500wantsyou.com"

In order to favour collective knowledge exchange, Fiat has created a *online community*, **500 LOVES YOU**, where customers (500 owners, as well as those who love the new 500 and are looking forward to getting one) can get to know what other 500 fan like. It is a place to exchange ideas, share experience through stories, photos and videos. It could

be even seen like a tool for organizing and managing exclusive initiatives, such as meetings, rallies, etc. An official community for formalizing the over 350.000 already existing and spontaneously generated ones.

To make these suggestion and validation mechanisms effective, Fiat has established clear rules regarding intellectual property rights, so that the company can use the innovative ideas suggested by customers, while customers can benefit through financial or non-monetary incentives, for both customers providing suggestions and customers selecting the best ideas. Table 7 summarizes the different incentives all along the innovation process.

Table 7. Incentives Associated to Different Mechanisms

Tool	Incentive
DESIGN CONTEST	The winning projects have been displayed in Milan, at "Salone del Mobile 2007" and participants can get in contact with important designers and a broad community. A check of the value of 5,000.00 euros
500 STICKER ART CONTEST	- 1st prize: a 500 wants you gold ingot and the honor of seeing your design created as a sticker for the new Fiat 500. - For the 5 finalists: We will create a special section online that contains their work and information about them; - 50 prizes for the voters: 50 scale models of the Fiat 500 for the 50 lucky winners drawn from all those who voted for the decorations.
500 WANTS YOUR AD	A new Fiat 500 and a travel associated to a full registration entry to the "Advertising Festival".
500 WANTS A MASCOT	- 1st prize: 18 carat gold lingot, with the "500 WANTS YOU" logo engraved, worth 3,000.00 euros. - prizes for the 5 finalists: A sheet of personal details and a portfolio of the 5 finalists will be presented on the Website. - prizes for 50 voters: 50 toy models of the Fiat 500 will be drawn among all the Website users taking part in the voting of the mascots
500 ROLLS WITH YOU	4 Samsung Ego-Camera Sport videocameras for a total value of 3,000.00 euros
HOMEPAGE REDESIGN	Homepage use from Fiat group.
BABY BOOM	A Fiat 500
500 FACES	All the snapshots selected are used to create an exclusive screensaver with morphing effects.

Source Our Elaboration

3.6   Web-Based Tools Implementation: The Organizational Support

The great importance ascribed by Fiat to product innovation has also imposed a complete change of the organization and management of new product development projects.

Aside from acquiring user knowledge through interactions with them, Fiat has realized it needed capabilities of fostering organizational environment to share knowledge across functional boundaries, and enabling user knowledge to act in new product development process.

This has implied the development of competences for user knowledge management in term of infrastructures and process.

As for infrastructure capabilities, it implied a reassessment of technology, structure and culture.

With reference to technology infrastructure Fiat has introduced new collaborative technologies, such as software applications, aimed at helping new product development teams to overcome traditional communication and information access problems, and eventually improve new product development team performance in term of information gathering, information sharing, and decision-making activities.

In order to favour knowledge flows inside the new product development group, Fiat has adopted several multidomain collaborative Intranet-Extranet software.

To easily assess and check design proposals against production criteria, Fiat has introduced a high-tech tool that, using mathematical models, makes it possible to analyze and improve the quality of all the car components. Through continuous visualization of the various phases in the evolution of the mathematical models, one arrives at a final definition of the model with a very high level of quality, providing precise mathematical data for any changes that need to be made, which can then be checked using virtual tests.

Considering the structure, Fiat has designed processes to facilitate and encourage sharing and collaboration across functional boundaries within the new product development groups; in the organization, employees are encouraged to discuss their work with people in other workgroups or departments. Both formal and informal mechanisms are adopted in order to supports the role of user knowledge in the firm; the objective is to spread a common positive attitude toward an effective usage of customers knowledge along the innovation process.

A re-organizaton of the innovation structure has taken place, to this purpose. New departments and ad hoc committee have been created.

The guidelines for each new Fiat are drawn up at the Centro Stile Fiat. Initially this Centro was part of the Fiat Technical Department, and designed a range of products, including industrial appliances and fridges; over time it has been transformed into an articulated organization dedicated exclusively to the automobile. The Centro Stile Fiat main task is to define the guidelines for future Fiat models: beginning with the concept for a new model and then moving on to the search for style.

Consistently, the firm has introduced processes for converting the information acquired during interactions with users into a useful format, for applying or using it in new product design, and protecting it.

To support its activities and favour the integration of different knowledge-bases the Centro teams up with two other centers: Fiat Reality Center and Fiat Design Laboratories.

Concept cars are nothing less than laboratories where designers from the Fiat Style Center can experiment with new design concepts to be used on future production cars. Working on a concept car is an opportunity to concentrate more on the car's design and on potential customers' future needs, while trying to incorporate as much as possible the design traits typical of the brand.

The Reality Center helps to focus on the design quality and in particular on individual details: the process starts at the Style Center, where the individual details are studied, and then switches to the visualization by the Reality Center, which allows the team to concentrate on each individual component of the model, to see how it is looks alongside the other elements, and to enlarge it in every detail. Here the team of designers and platform engineers can look at the interactions between the model's design and engineering problems, pre-empting and solving problems that would otherwise only be visible on prototypes constructed at a later date. Thanks to this system of virtual visualization of the models, the company can test suggestions provided by user and verify their feasibility. Specialist departments – such as Exterior and Interior Design and Trim

and Colour Design - have worked together for translating into reality the colours, the stickers and the wheels suggested by users through the Website.

To give visibility and explicitly recognize the importance of the project, a Comitato di Lancio has been created ad hoc for the Fiat 500 development; members from marketing, design, engineering, manufacturing and sales - already operating at the Centro Stile Fiat - periodically aggregate in order to share knowledge, opinions and information about the state of the art of the project and discuss about future decisions. It's during these meetings that marketing managers discuss about the Website content. Even if the marketing department is the one officially enrolled in the development and management of the Website[29], given the purposes associated to this communication tool, it continuously share its ideas, both at the strategic and the more operative level, with the other functions involved in the product development.

Tools included in the Website[30] are designed, developed and refined in cooperation with the design and engineering functions; the aim is to define a mechanism that is able to collect information that are helpful and easily understandable and sharable all along the innovation process.

In order to avoid any possible misinterpretation, the marketing department endows them with an elaborated and a raw description of the users' data collected through the Website; indeed, final renditions are the results of a common agreement.

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[29] Supported by the expertise of external collaborators from Arc Leo Burnett, in the role of web designers and content managers.
[30] See § 3.5.1 for a detailed description

<< we listen to customers, we capitalize their information and when possible, we intervene [31]>>

Recognizing its Website potentialities and limits in term of audience reach and richness, Fiat has even looked to third independent parties, such as Designboom - in order to support the most creative phases of its product development; and, Web Populi Vox - in order to tracking and profiling customers' opinions and desires.

The knowledge actually included in the innovation process is, hence, the result of a multiple creation process involving socialization, externalization, combination and internalization.

Even if the adoption of a collaborative innovation process implies the implementation of an extensive knowledge management process - from acquisition and assimilation to transformation and exploitation – the support of ICTs, along each intermediate step, has allowed for an improvement of the product innovation process in terms of cost, quality and speed.

Development costs have been cut by 20 percent. As for quality, the Fiat 500 has won the prize for the safest car, according to the European standards (Euro NCAP), and for the body's innovation component (EuroCarBody); the company got an award for design (Top Gear 2007) and the 500 has been declared the "Car of the Year 2008". In term of speed, the development process for the Fiat 500 has almost halved respect to a traditional process; 18 months from the ideation to the launch on the market.

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[31] Perosino, Fiat Communication Manager

To these 'reductions' a rise in customers' trust and purchase actions has corresponded.

3.7   Fiat 500 Case Study Implications

Fiat case study shows how a firm's attention toward collaborative approaches can impact on its value creation process.

Interpreting these results according to a longitudinal perspective, it is possible to identify a sort of evolution of the Web-based collaborative approach: the presence of web-tools is progressively transforming into an effective and explicit usage.

The Web has been seen as an ideal tool for supporting a process of incremental innovation (redesigning a "mito"), and customers as the most importance source for this kid of innovation. *"500 wants you"* represents an example of product web-site specifically created for supporting the born of the new product.

Fiat has believed in the crowdsourcing promises: "a large number of enthusiasts can outperform a small group of experts". Fiat has relied on ideas and suggestions deriving from a combination of volunteers and amateurs, not only for identifying new combination of existing elements, but even for creating ad hoc new elements. To enhance the collective customer commitment, Fiat has organized its strategy around two points: collaborative play and incentive mechanisms (even for the voters!).

The company has admittedly recognized and stressed the importance of customers in driving the innovation process; all Website initiatives are open to everyone, in keeping with the 500 philosophy: "*A car created for the people, from their ideas*". Customers involvement has been established around the belief that they are considered as a strategic part of the innovation process, in order to increase their commitment and exploit their potentialities: "500wantsyou"," You a … designer; creative; video maker, musician; talent scout"; "Entirely dedicated to the 500, this collection of thoughts and images is created by you, the users".

This 'explicit' approach has implied a strong Fiat's commitment to the actual usage of users' generated ideas: Stickers, Colours and Wheels, Mascot and future models.

Fiat has been able to actually use customers' knowledge because of its ability to manage an articulated knowledge process; knowledge acquisition and assimilation through digital environments has been integrated with an effective knowledge transformation and exploitation within the organization. Evidently, knowledge infrastructures along with knowledge processes resulted to be essential organizational competences for effective user knowledge management.

Fiat uses cross-functional teams in its product development process. The team is customer focused and the new product development ensures frequent contact with customers as well as with different functions in the company. The team consists of people from several departments in the company; usually representatives from the marketing, sales, production and design functions are involved. Even if the car is a particularly

design-sensitive product, and the designer is considered a crucial member of the team, at Fiat a key-role has been even attributed to the marketing. It represents the *liaison* between customers' knowledge collection and organization's potential to exploit it. Fiat 's organizational commitment toward collaborative innovation has reflected in both marketing and innovation outcome: having good processes and systems to manage user knowledge is important for better designing and better timing of new product, and at the same time allows to improve firm's brand image.

Customers have proved to be an especially precious source of new solutions for different product categories, ranging from sportswear to mechanical equipment; Fiat example deepens these results demonstrating the potentialities of virtual customer environments for supporting innovation even in context where the object of investigation (and innovation) is not a non durable convenience good but a durable specialty good for whom the customer's purchase decisional process is complex.

This case shows that collaborative innovation has opened to an evolution; what is relevant is that the collaborative innovation definitely contributed to changing Fiat's capacity to innovate and gain competitive advantage through innovation. As a matter of fact, in the last years Fiat changed its performance and now can be cited as an outstanding innovator in the automotive industry[32].

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[32] See prizes won by Fiat for the 500 model.

4   Chapter 4 – Collaborative Innovation: Time to Come

This work has tried to reverse an omission in the literature by placing past and recent research results into an overall framework that should enhance understanding of the collaborative innovation approach.

The newness of the topic, its richness and the limitations of the emerged results leave room for many interrogatives and suggestions that future research projects should take into account.

Starting from these considerations, this closing chapter presents an inventory of research questions, addressing future directions for research. Each proposal is supported by theoretical and empirical evidences and is accomplished with suggestions for methodological development.

4.1   From The Presence To The Actual Usage

The presence of Web-based tools for absorbing customer knowledge is a necessary but not sufficient determinant for collaborative innovation; it requires an effective exploitation of this knowledge.

The multivariate empirical analysis illustrated in Chapter 2 has shown that there is a clear consideration of the existence of Web-based tools for supporting a collaborative approach and that quite a few companies are starting to invest in this direction integrating these tools into their innovation process. However, observed evidence about the presence of specific tools supporting virtual customer collaboration in innovation was collected through Website navigation only, without directly interviewing managers from individual companies. Furthermore, the analysis didn't demonstrate the actual usage of these tools.

Future studies should seek to extend the analysis, at least along a main stream. Following a quantitative approach, studies should try to understand whether and how companies actually use customers' information and knowledge collected through the tools placed on their Website. To this end, the research should be integrated through extensive analysis, in order to collect data related to the logic underlying specific Web-based tools usage and the actual use that companies make of the information collected through the Web to support their innovation process.

The study should directly involve managers responsible for new product development activities to gather first hand information about the actual usage of the Web to support collaborative innovation. It should also cover a larger sample of companies, operating in different industries and countries; it could be helpful to deploy an articulated questionnaire, mostly based on close-end questions, for a mail survey. A key informant approach should be embraced (e.g., Philipps, 1981; John and Reve, 1982; Kumar, Stern and

Anderson, 1993); according to its structure, each questionnaire has to include both a section of questions addressed to the marketing manager and new product development supervisor and a section of questions addressed to the IT manager of the same company. Whenever needed, primary data could even be integrated with detailed archival and Internet data.

Since the emerging nature of the explored field, the scale adopted in this research will be either specifically developed for this study or adapted from existing scales to suit the context of the research, considering both the suggestions derived from the review of the existing literature and the main evidences provided by the previous analyses. A first attempt to develop the items for the survey is reported in the Appendix III – Section C.

Even if this further investigation can provide us with insights about the actual presence and usage of Web-based tools, these results are not comprehensive; they do not take into account an emergent phenomenon that is characterizing innovation strategies: the innovation network.

4.2   Actual Presence And Usage: Are These Results Comprehensive?

The network becomes the locus of innovation, broadening the knowledge repertory of individual firms (Powell, Koput, Smith-Doherr, 1996). A firm that wants to innovate in a context where knowledge is complex, distributed and disorganized, not only must

leverage an interorganizational learning network, but also a network of actors that are able to catalyze knowledge in the imperfect market. Firms need to combine direct virtual customer connectivity with *mediated channels* based on virtual customer environments that allow firms to absorb customer knowledge in ways that they simply cannot do by themselves – i.e. they have to integrate third-party actors that mediate interactions between firms and their customers to support innovation activities.

As we broadly reviewed in the first part of this work, firms may find it convenient to look for customer knowledge outside its own boundaries and to do that they can rely on the competences and experience shown by specialized actors such as the innomediators[33].

Summarizing, firms have two options for interacting with customers in order to support their innovation process: they can use their own Websites ("Make" approach) or third parties ones ("Buy" approach).

Since the simple Website navigation cannot detect companies' propensity toward this "outsourcing" approach, in order to have an exhaustive frame of firms' collaborative innovation, it is important that interviews are formulated in order to reveal the presence of a "Make" and/or a "Buy" procedure for absorbing customer knowledge. For this purpose a series of items have been included in the proposed survey (Appendix III –Section C).

The detection of "Make" and "Buy" approaches paves the way for several other interesting related research issues.

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[33] For advanced comprehension of the topic please see §1.5.2.

4.2.1 When "Disclosing" Is Better Than "Withholding"?

At first, future research could explore the conditions that cause one option ("Make" or "Buy") to be preferred to the others and the organizational mechanisms supporting their integrated usage.

Starting from the idea that several complementary channels can be used to manage customer integration in the product development process, both in the traditional and the virtual environments, in order to benefit of the specific core advantages of each of them, it could be interesting to in-depth investigate the contingencies that influence firms choice between "Make" or "Buy" mechanisms in pursuing market research for innovation on line.

This idea of research resides in the understanding that a twofold meaning can be attributed to the definition of both the "Make" and "Buy" approaches, according to the wideness of the explanation ascribed to these concepts.

Assuming that the "Make" approach implies the presence on the firm Website of Web-based tools either internally developed by the firm or managed by companies specialized in market research activities, it is possible to assert that this approach includes a "Disclosure" strategy - explicitly declaring that the firm is conducing market research for supporting its own innovation process.

As well, a "Withholding" strategy can be uncovered - that is, not declaring to the customer that the (or a specific) firm is conducing market research for innovation purpose – when a "Buy" approach implies the presence of Web-based tools on other firms' Website

or on unbranded Website, but managed by the firm itself - in this first case tools are developed and managed by the company specialized in market research activities, in the second case they could be also directly developed by the firm.

Building on the assumption that a correlation can be identified between firm's choice and the nature of customers' contribution - in particular, the choice between one of the two options could deeply influences customers' contribution to new product definition, and consequently firms' type of innovation (Booz, Allen, and Hamilton 1982; Olson et al, 1995)[34]- future research should understand whether and how the adoption of a "Disclosing" or a "Withholding" approach differently affects customers' contribution to product definition and consequently, firms' type of innovation.

The research goal is to understand whether there is a correlation between the mechanism firms adopt for acquiring customer knowledge and the nature of knowledge customers transfer to the firm. These considerations can be synthesized in the following propositions:

> P1: The adoption of a "Disclosing" approach is (positively) related to lower level of customers' creativity in product definition.
>
> P2: The adoption of a "Withholding" approach is (positively) related to higher level of customers' creativity in product definition.

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[34] Me-too products are considered new to the business organization but familiar to the market; that is, imitations of competitors' products. New-to-the-world products are considered new to both the business organization and the market.

More generally:

> P1a: The adoption of a "Disclosing" approach is (positively) related to new to the firm innovation.

> P2a: The adoption of a "Withholding" approach is (positively) related to new to the market innovation.

The theoretical structure of these relationships can be identified in both the anchoring and strategic marketing management literature. The anchoring effect describes the common human tendency to heavily rely, or 'anchor', on one trait or piece of information when acting (Park et al., 2000); it implies the presence of a trigger that reflexively alters the state of mind of an individual, biasing both its decisional and action process.

The common belief is that the "Disclosing" approach presents anchoring effects that affect customers' attributes preference - that is, the way in which customers either weight the different product's attributes or combine product's attributes; knowing which kind of firm has asked for their support can consequently influence their contribution, especially in term of creativity.

Since the "Disclosing" approach implies revealing some company information such as its brand or product, it can influence customers in the selection of product attributes, sticking them with the firm's existing products and, thus, leading to more incremental innovation.

On the opposite direction if, with the "Withholding" approach, customers do not know who are they 'working for' they will probably give more space to their own fantasy or imagination and come out with more original and innovative product definition, leading to more creative innovation.

According to the strategic marketing literature, these results could be further supported by the fact that virtual customer integration may allow to access new potential customers. These mechanisms could consent firms to interact with a different audience; third parties Websites, in fact, allow firms to more easily connect with a broad variety of customers, making easier acquire knowledge from other firms' customers[35].

The results of this research could provide firms with guidelines for identifying which approach ("Make"/"Disclosing" *versus* "Buy"/"Withholding") is most suitable according to their innovation strategies (new to the market or new to the firm). Furthermore, firms can even use the implications derived from this study to support their marketing strategies, and in particular their relationships with the market in term of customers' perception of firms' commitment toward their needs – i.e. a positive correlation between a disclosure approach and customers' satisfaction can be hypothesized. This topic will be studied in depth in the following part of the work (§ 4.4.4.2)

From a methodological point of view, an experiment could be helpful in order to observe how the customer's contribution to product definition (i.e. customer's level of

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[35] To expand the topic see again §1.5.2

creativity) changes according to the knowledge absorption mechanism adopted by the firm - i.e. "Make"/"Disclosing" versus "Buy"/"Withholding". A tentative experiment design is reported in the Appendix IV.

An initial exploratory approach should be embraced to demonstrate the most general propositions (P1a and P2a).

4.3   Web-Based Approach Design

Additionally, it could be interesting to expand this area of research, incorporating a more technical-oriented topic, to identify the characteristics associated to virtual environments enabling customer interactions that better support each form of collaboration; to understand how firms should define their Web-based approach in order to enable customers to optimally express their contribution (e.g. Kari and Shalev, 2004). A particular attention could be directed toward the design of the firm Web site and of its Web-based tools. In the former case, studies should investigate how tools positioning within the firm Website or inside the Web page impact on customers' propensity to collaborate; while in the latter case, research should examine which variables impact on the intensity of customers' contribution, even in term of creativity (i.e. questions statement, product presentation, presence *versus* absence of incentive, use of games *versus* use of explicit market research tools).

In both cases, an experiment seems to be the most feasible methodological technique because it allows comparing the responses achieved at different settings of the controllable variables. Appendix V suggests a preparatory draft for experiment building.

In the following paragraph, it is presented a proposal of research for investigating how firms should design their Web-based tools to enable customers to optimally express their contribution to innovation development. In particular, starting from a behavioural perspective, it could be interesting to understand how much freedom these tools should leave to customers for truly benefiting from their contribution.

4.3.1.1 The Presence Of Incentives In The Web-Based Approach

Building on previous considerations, this section takes into account the role of incentives as variables potentially influencing customers' ability and motivation to collaborate.

Moving from previous research on the topic of incentive mechanisms (e.g. Schneider and Bowen, 1995; Feller and Fizgerald, 2002; Toubia, 2005, Toubia and Flores, 2005; Chan et al, 2004; Cockburn, Henderson and Stern, 2000), future studies could propose new suggestions for reflection along two main streams: understanding whether there are opportunities of virtual stock markets to support the early stages of new product

development (Skiera and Spann, 2004) and whether the presence of an incentive-based mechanism positively affects the individual creative process.

Differently from previous suggestions that broadly investigate the innovation process, without any specific restriction, these research projects focus on specific steps of the new product development process – i.e. idea generation and selection (Fuzzy Front End) – and on a specific customer contribution – i.e. creativity.

The 'idea management' process is generally regarded as one of the greatest opportunities for improvement of the overall innovation process. In particular, among the fuzzy front end activities, the process of ideation is considered as the most critical one; it drives the creativity route that is considered as the fundamental element for an innovation success - "whether you can have innovation without creativity is debatable" (Crawford, 1977; Stevens, Burley and Divine, 1999).

Since years, scholars have been trying to identify methods for improving the quality and productivity of the inventive process; both new sources and new methods for (enhancing) creativity have been deeply investigated.

Building on the belief that "ideas are everywhere, inside and outside the company […] firms should not constrain themselves in relying solely on internal ideas" (Cooper et al., 2002) and that "[…] without good customer input and creative ideas, the process is doomed from the start" (Dahan and Hauser, 2002), numerous studies have started to look at customers as co-creator (Nambisan, 2002) and have demonstrated that co-opting customer competence and involving them into the new product development process

positively affect firm's level of creativity (e.g. Vissers and Ben Dankbaar, 2004; Im and Workman, 2004).

Customers generally not only assess innovative ideas differently from the company (Kristensson, Magnusson and Matthing, 2002) but also allow firms to access to very sticky information (von Hippel, 1994). Once an idea has been identified, many different techniques can be applied to generate and expand upon it. For this purpose, researchers have recognized the importance of identifying alternative methods that allow managing this 'emerging' knowledge and fostering the creation of unorthodox ideas (Griffin and Hauser, 2005).

In order to assess a proper climate for enhancing creativity, studies have progressively moved from psychological random-based mechanisms (Osborn, 1957; Prince, 1970; De Bono, 1970), that attempt to stimulate ideas through undefined problem-solving activities, to structured approaches (Goldengerb et al., 1999; Goldengerb and Marzursky, 2002) that see creativity as a consistent and regular process.

Within this last stream of research, it is possible to position a new idea of research; in particular, attention can be focused on the incentive-based perspective. According to Toubia's (2005), it could be interesting to examine whether the presence of ideation incentives can influence the customers' creative process. Moving along Chan et al.'s (2004) and Dahan and Hauser's (2002) works, studies can try to explore the alternative application of the market mechanism to marketing research by using securities trading of ideas to identify the power of customers' contribution to idea generation.

By developing a market ideation mechanism it is possible to understand whether the presence of both an economic incentive - a virtual stock market usually remunerates participants for their successful participation (Spann and Skiera, 2003; Dahan and Hauser, 2002) – and an interactive learning mechanism – participants can observe others' valuations of their/others ideas and understand how updating and adjusting their own ideation process - stimulate consumers to express and discuss new product ideas, revealing their true assessments (Forsythe et al., 1999).

In particular, the basic idea of this mechanism is to bring a group of customers (i.e. traders) together and let them trade shares of virtual stocks, that represent mother-ideas (Toubia, 2005) generated by the customer him(her)self. These stocks represent a bet on the impact of a particular idea and their value depends on the utilization of these mother ideas for generating daughter-ones. The price of one share of a virtual stock reflects the virtual stock's market aggregation prospect of the idea because traders use their individual judgment of the particular idea to derive an individual expectation of the cash dividend of the related share of virtual stock.

Differently from the traditional incentive mechanisms that consider only a specific incentive at time, the virtual stock market for idea generation permits not only to examine how a variety of incentives (e.g. awards; peer recognition; performance appraisal) simultaneously stimulate the generation and enrichment of ideas, but also to solve the trade-off between the desire to generate a large quantity of ideas and the need to identify the optimal ones.

Summing up our ideas into two propositions, it is possible to assume that:

P3: The presence of an incentive system positively impacts on customers' contribution to idea generation.

P4: The presence of an incentive system positively impacts on customers' level of creativity.

Both simulations with artificial agents and experiments with human subjects should be provided to empirically validate these theoretical insights. A sketch of the experiment is described in Appendix VI.

Future studies should attempt to compare this mechanism with others incentive-based mechanisms, such as Toubia's ideation game (2005) and examine which, if one, better enhances customers' creativity.

Researchers oriented to understand how they should design the virtual interaction in order to meet consumers' expectations, as well as innovation managers intending to integrate consumer into their innovation process, can find helpful to integrate results about collaborative innovation implementation with information about the benefits this approach can bring to customers. In other worlds, it implies understanding the reasons behind customers' choice of participation.

From a producer's perspective the obtained benefits of virtual consumer integration such as risk reduction, identification of upcoming trends, or increased number of creative ideas seem to be obvious, but, why should consumers engage in virtual new product

development projects initiated by producers and share their ideas and know-how with them? What are their benefits? Up till now, no empirical data is available for this emerging field of research.

4.3.2   What Do Motivate Consumers To Engage In Virtual Customer Environments?

Opening up this perspective, studies should more generally understand what motivate consumers to engage in virtual customer environments.

Drawing on the rich body of motivation research found in related fields such as leisure (Unger and Kernan 1983), online communities, open source software (Hemetsberger 2001; Hennig-Thurau et al. 2004), user innovation (Franke and Shah 2003), and survey participation (Groves et al. 2000; MacElroy and Gray 2003) various intrinsic and extrinsic motives can be found to explain why consumers may engage in virtual new product development initiated by producers. Among the extrinsic reasons, it is possible to identify aspects such as: personal rewarding, proving their own self efficacy or real tangible compensation and monetary reward; to become visible and get recognition from other participants as well as from the producer; to improve their skills and gain additional knowledge; to seek for innovation or product related information; to get in contact with like-minded people. Along with the intrinsic motivations, there are curiosity and the desire to escape boredom; and personal altruism.

An online survey administered to consumers that already participated in virtual new product development could be used for data collection. Based on an extensive literature review (Butler et al. 2002; Constant et al. 1996; Unger and Kernan 1983), measurement items for all the above described potential motives can be identified. Discussions with experts in the field of virtual consumer integration can help complete the initial questionnaire.

However, this study leaves with many, so far unanswered, questions such as: How do customer characteristics affect their motivation for participation? What is the effect of different customer motives on the creativity, quality and quantity of their contributions? Further, it is interesting to know what the consequences of consumers' participation experience are. Does it evoke consumers' interest for the virtual new product?

4.4   Antecedents And Consequences Of Collaborative Innovation

The outcome of these studies could be considered as an intermediate step of a broader research design that tries to identify the antecedents and consequences of the adoption of a collaborative innovation approach (Figure 6).

In particular, it could be interesting to identify which variables influence companies' adoption of a collaborative approach and which results this process produces from both a marketing and an innovation perspective. Considering the key role of customers'

knowledge, the moderating role of organization mechanisms has to be taken into consideration.

FIGURE 6. Antecedents and Consequences of Collaborative Innovation
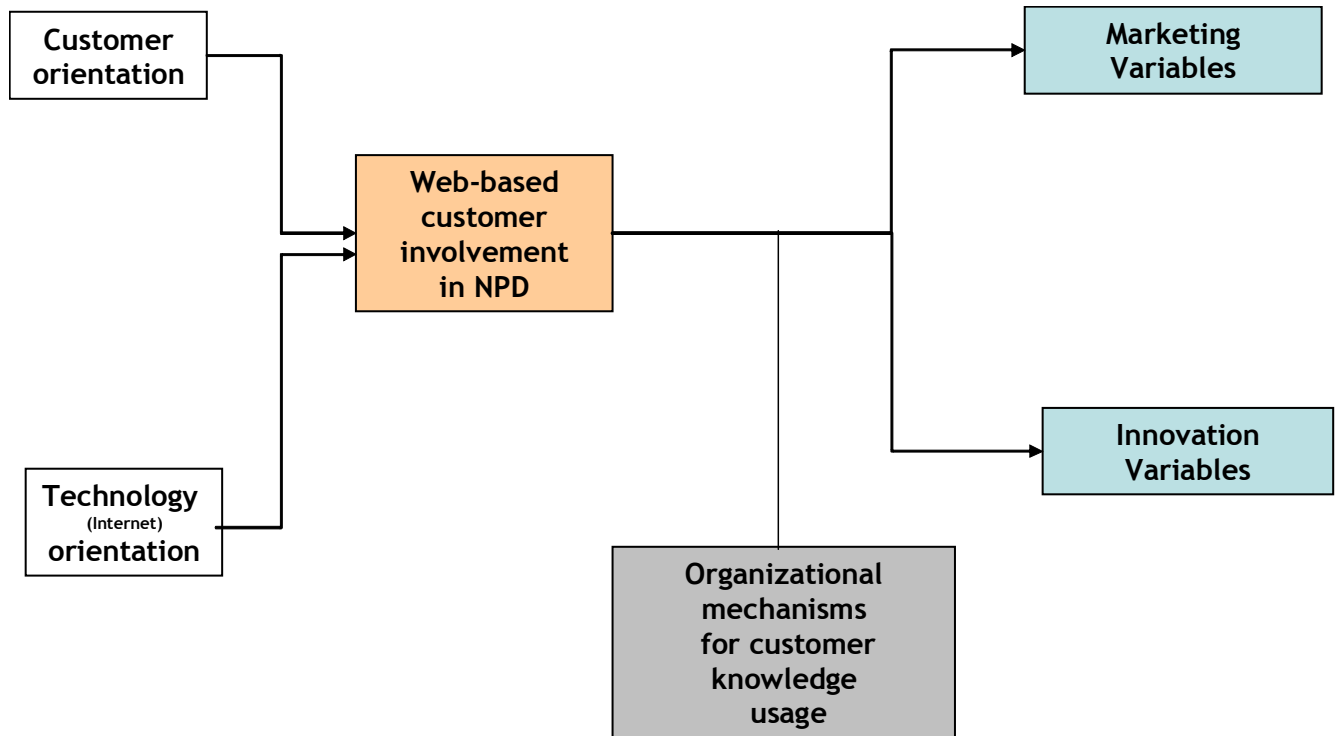
Source Our Elaboration

The aim is to plan further investigations on how customers actually create value jointly with organizations and how organizations should adjust their corresponding organization platform and management ideas.

For this purpose three self-supporting studies can be developed as suggested in the following sections: Identifying Collaborative Innovation Antecedents (§4.4.1);

Organizational Implications: "the Inside of Collaborative Innovation" (§4.4.2); The Payback of Collaborative Innovation (§4.4.4).

4.4.1 Identifying Collaborative Innovation Antecedents

The first study should investigate the variables affecting virtual environment definition and implementation; that is, which strategic variables encourage firms' development of collaborative innovation.

Firms showing both higher technology (e.g. Cooper, 1984; 1994; Kanter, 1988; Workman, 1993) and customer orientation (e.g. Naver and Slater, 1990; Deshpandè, Farley and Webster, 1993) seem to be more inclined to the use of the Web for absorbing customers' knowledge in order to support their innovation process.

It is possible to identify a strict relationship among technology and customer orientation, even if their definitions conceptually lead to different meanings; customer orientation is the firm's sufficient understanding of its target buyers in order to be able to create superior value for them continuously (Narver and Slater 1990), while technology orientation means that the company can use its technical knowledge to build a new technical solution to answer and meet new needs of the users (Gatignon and Xuereb, 1997). The stance is that customer and technology orientations are not mutually exclusive, and that it is important for organizations to be able to assess the extent of their orientations in whichever (including both) directions these lie. By providing customers with new

products, services or processes, advancing technology invariably induces changes in their basic behavior – "changes that are sometimes so fundamental that before long they cannot imagine living any other way" (Pilzer, 1990: 53-4).

Evidence from various sources (e.g. Deshpande et al., 1997; Deshpande and Farley, 1998) suggests that both technology and market orientation have significant effects on different measures of corporate performance; and, one cannot reduce technology orientation to market orientation, or vice versa. Neither construct is an exclusive antecedent to the other, yet while they are distinct, they can interact; managers and their companies learn from the market and the market (customers), learns from new technologies. This two-way flow or dialogue is present, to a greater or lesser extent, for every product or service in every market (Berthon et al., 1996; 1998; 1999; Carpenter and Nakamoto, 1989; Carpenter et al., 1994). The recognition of both technology and customer importance for an unique goal - producing enhanced business performance - drives companies toward the adoption of technological mechanisms that integrate and support customer knowledge assimilation.

The basic assumption is that, firms showing higher level of customer and (or) technology (Internet) orientation are more inclined to the adoption of Web-based mechanisms for importing customers' knowledge in order to support their innovation process

P5: The higher the customer orientation, the higher the Web-based customer involvement into new product development processes

P6: The higher the technology (Internet) orientation, the higher the Web-based customer involvement into new product development processes

To test these propositions, from a methodological point of view, it could be useful to integrate the suggested previous analysis through the administration of an ad hoc survey, measuring how at different levels of customer and innovation orientation correspond a different propensity to Web-based customers' involvement in new product development.

As for the previous research on Web-based actual usage measurement, a set of items for measuring technology (Internet) and customer orientation is suggested in the Appendix III – Section A and B.

As graphically represented in Figure 6, a key role in the analysis of collaborative innovation's antecedents and consequences is assumed by the firm's organizational mechanisms; the presence of internal organizational mechanisms for customer knowledge sharing and usage is assumed to moderate the effect of Web-based customer involvement in new product development on marketing - such as satisfaction and value perception - and innovation aspects - such as time to market, external fit. The following paragraphs (§4.4.2; §4.4.4) focus on this issue.

4.4.2 Organizational Implications: The 'Inside' Of Collaborative Innovation

There is little academic literature on the organizational experience of firms that have (successfully) used the Internet as a platform for engaging customers in experiences of co-creation and collaborative innovation.

The proposed second study places in this area of research highlighting the importance of assessing a Web-based climate for enhancing customers' collaboration, according to firm's innovation strategy.

In particular, it is oriented to comprehend which organizational variables impact on companies' capability to outside their new product development activities. That is, understanding which organizational mechanisms are effective in supporting firm's ability to absorb customers' knowledge; which organizational mechanisms allow companies to concretely deploy such a process of collaboration with external players and optimize its efficiency and effectiveness internally.

To that purpose literature on innovation and marketing need to be integrated with the main contribution produced in the field of organization theory (e.g. Cohen and Levinthal, 1990; Vicari, 1991; Nonaka and Taketuchi, 1995; Davenport and Prusak, 1998).

The theoretical review underlines the strategic role that organization capabilities and structure have on the success of the innovation process. Many managerial studies have, in fact, focused their attention on the role played by specific agents and different organizational mechanisms in fostering the efficiency and effectiveness of the innovation

process (Brown and Eisenhardt, 1995), on the various organizational features corresponding to different mechanisms that facilitate knowledge flows among different actors and enable dissemination and production of new knowledge (e.g. Carayannis et al, 2000; Ciborra, 1991; Foray, 1997), on the organizational capabilities needed in order to generate and leverage the knowledge underlying the innovation process (Verona, 1999), and on the tools to support the integration of external stimuli for innovation under a technological perspective (Ulrich and Eppinger, 1995), and a marketing one (Urban and Hauser, 1993; Wind and Mahajan, 1997).

Relying on these considerations and on insights from the Fiat case study (see Chapter 3), future researches should investigate, on one side, which organizational forms are suitable for distributed innovation contexts - that is which organizational mechanisms firms should deploy in order to allow customers' knowledge effective sharing within the individual company - and, on the other side, how the adoption of a collaborative innovation approach for new product development impacts on the organization dynamics, specifically new product team 'nature' and internal coordination.

More in general, future studies should be addressed to understand whether firm's propensity to implement collaborative innovation actually reflects into the organizational approach for new product development. A pool of items for a survey is suggested in Appendix III – Section D.

4.4.2.1 Organizational Forms Supporting Distributed Innovation: The Outward Perspective

The question of what organizational mechanisms deploy in order to allow customers' knowledge effective sharing within the individual company still remains open.

Traditionally companies have been limited in their ability to overcome their own boundaries to find new ideas for their innovation process, because of the lack of open standard for communication and of the idiosyncratic nature of knowledge (Arora, Fosfuri and Gambardella, 2001).

The advent of ICTs has reinforced, in a remarkable way, the company's capacity to conveniently absorb market knowledge, facilitating the creation of new approaches for supporting open, decentralized and geographically distributed forms of innovation.

Differently from the traditional closed and hierarchical innovation models, today innovation is characterized by a crescent opening, even from the organizational point of view – i.e. distributed innovation (Chesbrough, 2005).

Organizational structures supporting external knowledge acquisition and the deriving internal knowledge reconfiguration[36] serve as a platform for producing both adapted and new product-market combinations that easily exploit and respond to changing market opportunities. The challenge to create new knowledge configurations within the firm implies the presence of efficient internal mechanisms that support the absorption of different types of new component knowledge, by favouring both the transfer

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[36] The term combination is referred to Kogut and Zander's (1992) definition that, as they report, is associated with integration as used by Grant (1996) and configuration by Henderson and Clark (1990).

of knowledge across and within subunits and the structure of communication between the firm and its external environment.

An effective absorptive capacity implies the presence of an organization that has the flexibility necessary either to quick-connect (Sanchez, 1996) with other firms in rapidly configuring a changing array of development, production, distribution, and marketing resources (Sanchez, 1996), or to coordinate loosely coupled self-organizing processes (Sanchez and Mahoney, 1996).

Distributed innovation mechanisms require, indeed, combining both firm and market centric models of governance and integrating hierarchical and non-hierarchical approaches.

Evidences from empirical analyses (e.g Fiat , Ducati, Ideo, Linux, P&G case studies[37]) show that, in order to support different aspects of the innovation process in different ways, companies need to adopt an integrated portfolio of organizational mechanisms - ranging from traditional hierarchical private structures (Miller and Drexler, 1988) to open source systems (Constant, Sproull and Kiesler, 1996; Kogut and Metiu, 2001; von Hippel and von Krough, 2003), moving through communities of creation (Sawhney and Prandelli, 2000) and virtual knowledge brokers (Hargadon and Sutton, 2000).

Future studies should try to comprehend which organizational forms are effective in supporting firm's ability to absorb customers' knowledge according to the nature of

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[37] For Fiat case study see Chapter 3 of the present work; for Ducati see Sawhney, Verona and Prandelli (2005); for Ideo case pop in Hargadon and Sutton (1996); Linux from Raymond (1999); and, for P&G read Sakkab (2002).

knowledge needed (implicit versus explicit) or the nature of relationship required (individual versus collective) and the level of firm government (unconstrained versus controlled).

A set of propositions is proposed, at this juncture:

P7: Traditional hierarchical private structures and virtual knowledge brokers are more suitable for absorbing individual explicit knowledge on sporadic occurrence compared to communities of creation and open source systems.

P8: Communities of creation and open source systems are more suitable for absorbing collective implicit knowledge on continuous incidence compared to traditional hierarchical private structures and virtual knowledge brokers

Reversing the reasoning process, it could be interesting to understand whether the presence of certain levels of absorptive capacity can create an appropriate bridge between customers' needs and firms' product definition and transform collaborative innovation into managerial actions. Recent studies (e.g. Fosfuri and Tribó, 2008) have demonstrated that absorptive capacity is a source of competitive advantage in innovation, especially in the presence of efficient internal knowledge flows. This consideration leads to assert that:

P9: Firms endowed with greater absorptive capacity are expected to show higher Web-based customer involvement into new product development processes

It implies understanding whether the presence of absorptive capacity is a necessary condition for supporting collaborative innovation processes. A statement for a broader research area wonderings: "How do different levels of absorptive capacity affect innovation performance?"

Suggestions for testing the level of absorptive capacity can be derived from previous works on the topic (e.g. Szulanski, 1996; Jaworski and Kohli, 1993; Jansen, Van de Bosh and Volderba, 2005).

4.4.2.2 Organization Dynamics: The Inward Perspective

Starting from the assumption that an organization's absorptive capacity does not simply depend on the organization's direct interface with the external environment, but also on transfers of knowledge across and within subunits and on the individual who stand either at the interface of the firm and the external environment or at the interface among the subunits within the firm, research attention should be directed toward the organizational conditions and operative processes that make such integration effective by integrating aspects of virtual organizations, cross-functional teams and boundary spanning roles.

The organizational roles that favour customer knowledge sharing within the organization, till the creation of virtual teams participated by selected organizational players and selected customers, need to be explored.

For this purpose both the literature on virtual and cross functional teams - that has frequently addressed the process of combining varied sources of expertise to create innovative outcomes (Cohen and Ledford, 1991; Donnellon, 1995; Katz and Allen, 1985; Pelz and Andrews, 1976; Takeuchi and Nonaka, 1986)- and the work on departmental influence in new product development process (Souder, 1977; Saunders, 1981; Enz, 1988; Song and Parry, 1992; Song, Thieme and Xie, 1998; Katrichis and Ryan, 1998; Atuahene-Gima and Evangelista, 2000; Atuahene-Gima and Li, 2000) have to be taken into account.

Virtual teams

According to the dominant definition of virtual customer environment as the setting that enables firms to establish distributed innovation models that involve varied customer roles in new product development (Holmstrom, 2001; Kambil, Friesen and Sundaram, 1999; Prahalad and Ramaswamy, 2000), it is possible to grasp that firms adopting a collaborative approach for new product development are inclined to adopt virtual new product development teams, participated by selected organizational players and selected customers (Jarvenpaa and Leidner, 1999; Maznevski and Chudoba, 2000), in order to favour customer knowledge sharing within the organization and its integration with the internally deployed one. As stated by Lipnack and Stamps (1997:7) a virtual team is "a group of people who interact through interdependent tasks guided by common purpose" and that "works across space, time, and organizational boundaries with links strengthened by webs of communication technologies". A virtual team, thus, is perceived as an

evolutionary form of a network organization (Miles and Snow, 1986) enabled by advances in information and communication technology (Davidow ands Malone, 1992; Jarvenpaa and Ives, 1994), where the concept of 'virtual' implies the presence of permeable interfaces and boundaries; of project teams that rapidly form, reorganize, and dissolve when the needs of a dynamic marketplace change; and of individual with differing competencies who are located across time, spaces and cultures (Mowshowitz, 1997; Kristof et al., 1995).

According to Lau et al. (2000) effective communication is the key to successful virtual teams and it is determined by how well team members are able to build and maintain their personal relationships. The real power of the virtual form is realized when relationship among electronically connected people or firms produce new and/or qualitatively different communication that yields product innovation (DeSanctis and Monge, 1999).

From a collaborative perspective, all these elements can be seen as key-features of those virtual customer environments that allow enhancing new product development. Consequently it is possible to assume that a firm's implementation of collaborative innovation processes through the Web and the creation and utilization of virtual teams for new product development are positively related.

> P10: The higher the presence of virtual teams for new product development, the higher the likelihood of Web-based customer involvement into new product development processes

In particular, since the creation of virtual teams assumes the presence of different actors – as marketing managers, Website (IT) managers, and engineers - who interact sharing their specific competencies, both constituents from cross-functional[38] (Brown and Eisenhardt, 1995) and boundary spanning (Ancona, 1990) approaches should be investigated in order to better understand the nature of the organizational mechanisms that allow an effective and efficient exploitation of virtual customer environments for innovation purposes.

Cross-functional teams

The availability of a diversified and large amount of information requires organizations and individuals to be able to overcome those internal barriers that have been built during the process of differentiation (Lawrence and Lorsh, 1967; Dougherty, 1992; Griffin and Hauser, 1996) and to implement a new product development process based on collaboration of structurally separated, yet independent, functional units.

The use of the Web in order to gather information about and possessed by customers for supporting a firm's new product development process implies that different subunits or teams (i.e. marketing and R&D; Website managing team, as content or community manager, and new product expert team) constantly interact for transferring and valuable integrating the customer acquired knowledge. The need of individuals'

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[38] Function, subunit and department are here used as synonymous; thus, talking about cross-functional teams we refer to those teams that are composed by members of different departments within the same organization.

cooperation in order to accomplish a specific task that requires integrating different knowledge and orientations has determined the move from traditional teams to cross-functional teams (Pitta et al, 1993).

In cross-functional teams individuals share perspectives from different functional disciplines and interact to offer creative solutions to problems - which become the basis for new product ideas - by allowing a constant mutual adjustment to the information provided by each subunit member (Pitta et al, 1996). In particular, it can be expected that those (i.e. content/community managers – marketing units) who first acquire customer knowledge through the Web have been progressively assuming more importance in their relationship with all the other departments that contribute to new product development, as R&D, manufacturing and sales. In any case, it is possible to suppose that the presence of virtual customer environments makes increase the level of communication and interaction among all these subunits increase.

The key principles involved in collaborative innovation - gathering, co-ordinating and analysing of customers' knowledge - call for a considerable degree of cross-functional cooperation. Organising the whole firm around its customers, in fact, requires the convergence of different departments' interests toward a unique purpose: developing products that effectively respond to customers' needs. It leads to the identification of new product cross-functional teams as one of the fundamental mechanisms that allow an effective designing and implementation of Internet-based collaborative settings (Joshi and Sharma, 2004).

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A positive relation between the creation of Internet-based collaborative settings and the presence of new product cross-functional teams could be hypothesized.

> P11: The higher the presence of cross-functional new product development teams, the higher the likelihood of Web-based customer involvement into new product development processes.

Level of interdependence, resource dependency and coordinating mechanisms are some of the variables that affect the nature of the interaction among the different functions. Forms of cross functional cooperation (Bonama, 1985; Heany, 1989) are necessary to enhance the quality of the relation; the need for cross-functional cooperation stems from the complex interdependencies among members of functional groups working together on project teams. These mechanisms allow different units to overcome one of the main obstacles to cross-functional integration (Dougherty, 1987), that is, each function resides in its own 'thoughtworld' and speaks its own language. Among the means that innovating organizations can use to deal with the necessity of cross-boundary communication the most relevant ones are the so-called boundary roles (March and Simon, 1958; Thompson, 1967; Allen and Cohen, 1969; Allen, 1970; Aldrich and Herker, 1977; Schwartz and Jacobson, 1977). Boundary spanning individuals (Tushman and Scanlan, 1981a; 1981b) can be seen as those individuals who are not only able to gather information from external areas but who can also disseminate it within the organization (von Hippel, 1976), allowing different units to overcome one of the main obstacles to cross-functional integration

(Dougherty, 1987); that is, the assertion that each function resides in its own 'thoughtworld' and speaks its own language.

Boundary spanning individuals

Extending the theoretical lens from the team boundary outward, in her 1990's work, Ancona underlines the linkage between the concept of boundary spanning and cross-functional relationships. The focus shifts to a group in its context, and the group is assumed to have an existence and a purpose apart from serving as a setting and apart from the individuals who compose it. Internal team activities are not ignored but the focus is mainly on internal processes that influence and are influenced by people in the environment, rather than in decision-making or roles *per se* (Ancona, 1987).

Here, the interest is on the concept of boundary spanning individuals[39] as defined by Tushman and Scanlan (1981a) who have distinguished from the more traditional concept of boundary spanning activity (Adams, 1976; Leifer and Huber, 1977; Keller and Holland, 1975): as the individuals who complete substantial boundary spanning activity, boundary spanning individuals may gather information from external areas but, differently from them, they can also disseminate it within the organization (von Hippel, 1976; Helfert and Vith, 1999).

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[39] Here with the term boundary spanning individuals we refer to all the diverse names have literature has attributed to people functioning as boundary spanners: Input Transducer (Miller, 1972); Linking pins between organizations and environment (Organ, 1971); Gatekeepers (Utterback, 1971); Unifiers (Crossman, 1969); Boundary Spanner (Aiken and Hage, 1972); Innovator (Knight, 1967).

Informational boundary spanning is a two-part process: obtaining information from outside units and disseminating this information to internal users. Individuals fitting this role are capable of translating contrasting coding schemes and therefore acting as boundary spanners between the more locally oriented work units and the external information areas (Baldridge and Burnham, 1975; Whitley and Frost, 1973). From this point of view, not only boundary-spanning individuals gather, translate and encode external information but also facilitate the external communication of their colleagues (Blau, 1963). Since boundary spanners have role senders located in external organizations as well as in their own organization, they must have the background, the skills and the training to deal with the communication impedance separating their unit from external areas. Marginality has been found to be positively associated with individuals that cover boundary-spanning roles; they not only take an active training, development and socialization role within their work units but also have enough expertise for standing between and dealing with two or more groups with different value systems.

Following Tushman (1977), boundary spanning individuals can be classified on the basis of the scope of their interaction that is defined considering the area in which the source with whom they interact resides: intra-organization and extra-organization boundary. In the first case, it is considered the interaction among subunits within the same organization; while in the second case, the interaction between innovating team and customers is investigated. In both cases, substantial research indicates that boundary-spanning individuals, by virtue of their position, are an important mechanism for linking

their organization or subunits to external sources of information (Aldrich and Herker, 1977; Coleman, Katz and Menzel, 1966; Tushman, 1977; Rodgers and Shoemaker, 1971). Since the implementation of Web-based collaborative new product development implies both external than internal boundary spanners - in order to first collect and understand 'virtual' customer information and then transfer to and integrate it into the innovating team (that is expected to have a cross-functional nature, as stated by our second proposition) – it is possible to assume that a positive relationship exists between the creation of virtual customer environments and the presence of boundary-spanning individuals within the organization.

P12a: The higher the presence of intra-organization boundary spanners individuals, the higher the likelihood of Web-based customer involvement into new product development processes

P12b: The higher the presence of extra-organization boundary spanners individuals, the higher the likelihood of Web-based customer involvement into new product development processes

An effective identification and support of boundary spanning individuals allows organization a valuable integration between internal cross-functional team members and external members and, consequently, the creation of innovative boundary spanning teams (Pitta and Franzak, 1996).

Boundary spanning teams

Although ICTs make it easier than ever to form teams that consist of members from different functions, organizations and cultures, this diversity in membership can present enormous challenges to team members, team processes and team outcomes, particularly when teams function across time and distance. While the virtual product development is interesting, it suffers from its essential character: external contributors may never meet the internal team members face to face; consequently organizations have recognized the importance shifting toward the creation of boundary spanning team by integrating both cross-functional teams and boundary spanning individuals.

Spanning traditional boundaries both inside the firms - where they might provide a closer coupling between functional units - and outside the firms - where they might provide links to customers, suppliers, or competitors (Clark and Fujimoto, 1987; von Hippel, 1988) - organization may create a boundary spanning team that offers potential benefits to competitive organizations since, when effective, they can materially increase the quality of new products ideas (Herstatt and von Hippel, 1992). The value of boundary spanning teams is that they can reduce misunderstanding that arises in the different values found inside and outside the organization. Like cross-functional teams by sharing information early and throughout their operation, boundary-spanning teams can identify problem areas early in process attention and solution. However, their effectiveness is strictly related to firms' ability in using interdisciplinary product development teams and boundary spanning individuals, which are able to bridge the gap between internal and external members.

Assuming that the realization of virtual collaborative innovation activities is associated with the presence of cross-functional teams and boundary-spanning individuals, we can also hypothesize that the implementation of virtual customer environments is positively related to the presence of boundary-spanning teams.

> P13: The higher the presence of boundary spanning new product development teams, the higher the likelihood of Web-based customer involvement into new product development processes.

The attractiveness of this understanding stems from learning organizations - the one that intensively search for new knowledge by adopting collaborative approaches - as well as for market oriented organizations that view interdepartmental coordination as an integral component of market orientation for assessing general business performance: interfunctional orientation is " among other things, an alignment of functional areas' incentives and the creation of interfunctional dependency" and being "extremely sensitive and responsive to the perceptions and needs of all other departments in the business" (Naver and Slater, 1990: 22).

From a methodological perspective, since the emerging nature of the organizational topic, the logic of grounded theory should be followed by building the research on a multiple-case study methodology (Eisenhardt, 1989). The research should be structured into two main sections. The first phase will be based on an exploratory analysis through qualitative case study research, while the second part will be based on an extended dataset

through a quantitative research design. The first phase should analyze and map the organizational processes and the dynamics among organizational departments that characterize the new product development processes of a 'sample of few' firms (Pettigrew, 1991) when implementing VCEs. Then, in order to be able to generalize the emerging results and extend theoretical and managerial implications the defined model has to be tested with a quantitative basis of information. In this case also firms that do not implement VCEs for supporting their innovation process should also be taken into account. Reasonably, the study should be based both on primary and secondary data.

Building on the results of the multivariate statistical analysis, as reported in Chapter2, a first attempt to address this topic has been done. Evidences can be even derived for supporting previous proposals of research.

4.4.3 The Overall Strategic And Organizational Commitment Behind The Effective Usage Of The Tools: Evidences From Case Studies.

In order to go beyond the proposed contingency explanations, we in-depth analyzed through a series of semi-structured interviews and internal company data the top performing companies of the multivariate analysis sample. In addition to the four outliers – i.e., Siemens (cluster 2), BMW (cluster 5), Nokia and HP (cluster 3) - we also included two representative firms from cluster 4 which was the only cluster with above average presence of all the tools throughout the process - Ducati (motorbike) and P&G (food and toiletries).

This further analysis had the objective to: (a) more clearly understand whether the public Internet site is overall representative of the tools firms use in product development; (b) identify some similarities in the process of Web-based tools adoption with regard to top performers. In brief, this explorative analysis based on personal interviews with managers from the Marketing departments should allow to better understand the actual usage of the tools, and the activities undertaken by the companies to integrate the customer voice in the process of product development.

While we identified firm specificities in the Web usage (see below), all our informants stressed the strategic value of customer integration through virtual environments. According to them, digital media provide a brand new information channel with respect to traditional off line research activities. The value extracted from these activities seems to depend on the firm's commitment (Ghemawat, 1991) – i.e., the organizational investment made by the company and the experience the company has matured using these tools. Independently from this, all interviewees explicitly maintained that today their departments strongly rely on this new form of customer voice import in order to reinforce and sustain traditional research activity across the innovation process. Actually, part of our sample posited that they tend to also use Websites protected by password in order to involve customer commenting on prototypes or on beta version of their products – which are seldom put on the public Website. With the exception of one company (which by the way was the latest one that started to invest in the Web-based customer integration process), marketing managers saw a potential long term opportunity

to progressively internalize market research activities for product development. With this respect, Figure 7 formalizes the different options that our informants pointed out describing their current opportunities to manage customer integration in the product development process.

Figure 7 – The Different Organizational Options for Absorbing Customer Knowledge

Type of Governance

	Make	*Buy*
Offline	**Market Research Department**	**Market Research Operator**
Online	**Intranet and Company Public Website**	**Virtual Research Operators**
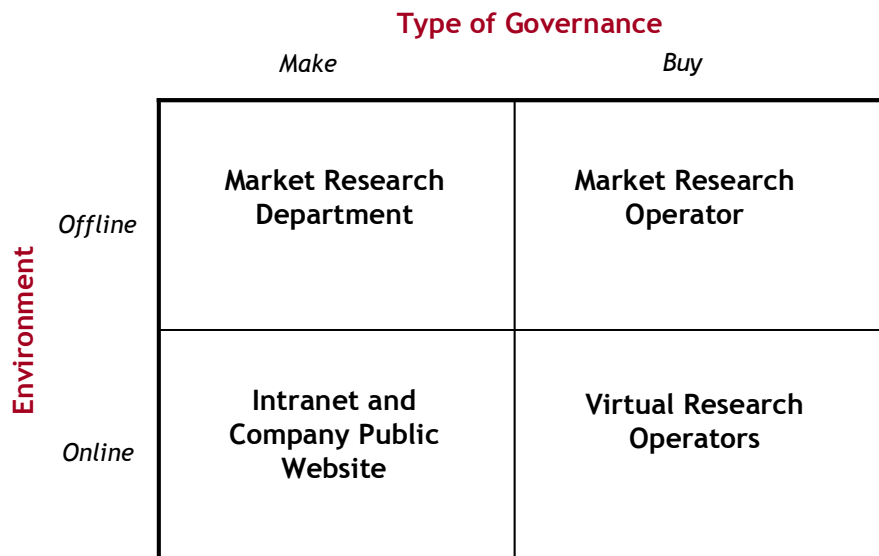
Environment

Source Our Elaboration

On the one hand, they can today rely on two complementary environments – in addition to the more traditional physical environment that required geographical proximity, they can also use virtual environments. On the other hand, while they can still outsource the process of customer integration to specialized third parties, i.e. traditional Market Research Operators, they can even decide to vertically integrate and in-source the

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process of market research. Hence, to a sort of ""Buy"" option in market research for innovation, they can prefer a "Make" one. All our informants saw the different channels as complementary. In fact they associated specific core advantages to each of them. For instance, when they need to extend the scope of customer insights and gain unbiased feedback they rely on the huge customer databases provided by independent Virtual Research Operators. On the contrary, if they need real time and on going feedback on specific initiatives and new products, they prefer to use their own Intranet and Public Website to manage systematic interactions with the target served market and to disclose some of the lead users among them. According to them, the ability of the firm to transport the target segment into the Website is the basic condition to leverage the uniqueness of Web-based customer integration. A good example is the Web community of Ducati in the Ducati.com Website – the Marketing VP with all the effort of the Ducati.com team succeeded in transferring the "physical" community of Ducatisti (the Ducati fans) from the yearly events to the everyday Website activities. The quality of the information that can be produced makes the investment worth pursuing.

The effective usage of these tools seems strictly related to the commitment of the company. In the case of a high degree of presence of such tools the firm seems to have made a strong organizational investment in the overall process of customer integration. Marketing managers of the outliers seem to rely on results coming by these types of market research and provide specific incentives to the usage of such resources. BMW Auto, for instance, operated a relevant reorganization to support an effective usage of the customer

knowledge absorbed through the Web. A new function called Customer Prospect Relationship Management (CPRM) has been created and since its birth it has been in charge of both customer relationship management and proactive marketing strategies. Responsibilities of market research and the Internet have been reallocated from the Marketing department to the CPRM as well. The Web is intensively used especially to absorb the customers' inputs and to profile users in order to develop customized commercial initiatives. Interactive mini Websites are often created to support the launch of specific new products (for instance, the brand Mini was a major success). The content developed on-line by customers through interactions - both in the company's Websites and in independent communities spontaneously created by the same users - is systematically analyzed by specific roles within the CPRM and then selectively distributed to individual departments according to contingent needs. Especially the Marketing Department shows a positive attitude towards customers' feedback emerging from the Web that is then verified on bigger samples of customers through traditional market research tools.

Similarly, Ducati proved to have strong organizational mechanisms supporting collaboration with customers in innovation. Community management is so central to Ducati that management has replaced the words "customer" and "marketing" with "fan" and "community". The Community function is tightly connected with the Product Development and the fan involvement in the community strongly influences product development. Ducati shows effectiveness in using the tools for cooperation with customers included in its public Website. For instance, it gets high response rates in its

surveys, usually in excess of 25%, and exceptional participation in its competitions among users, where winning ideas are selected by teams including the CEO, the chief manager of the Design Department, and the Creative Director. The functions and layout of Ducati's Website are actually shaped by customer feedback, and the guests for live chats on the Website are chosen based on customer input. Ad-hoc surveys are also created to get feedback about specific products and strategic directions for marketing activities like new product concepts selection. Within the virtual community, Ducati fans are allowed to discuss together and to review – or to reject – proposed product modifications that can even be tested on-line in the form of virtual prototypes. For instance, when the new Ducati Sport Classic was presented on October 2003 almost 15,000 answers were collected in five days, with more than 95% recommending the production. Ducati's CEO has mandated the involvement of all the company's product engineers in customer relationship management activities. They are required to periodically interview selected Ducati owners from the company's on-line database of registered fans – adding the off line dimension to the on-line interaction. All the above mentioned tools are implemented by Ducati to interact with its registered users. In order to gather more disruptive ideas, the company is also committed to monitor the forums hosted in independent Websites, such as in the huge community of American Ducati fans running on Yahoo. Ducati community managers take part in the emerging dialogue, sometimes declaring and other times omitting their real identity, according to the degree of independence required by the covered topics. To generate new stimuli for innovation, they also actively contribute to conversations

developing within other on-line forums and vertical portals created for bikers, such as Motorcyclist.com; within Websites collecting influential people for Ducati's target, such as sites aggregating women bikers - the fastest growing demographic group in motorcycling; and within other virtual communities that have strong lifestyle associations with the Ducati brand.

P&G also proved to have an organizational structure conceived to support customer involvement in innovation, both in traditional and virtual environments. Focusing on the Web, the Global Business Unit at the headquarter level is responsible for the core strategy on-line, but the Market Development Organization at the local level can interpret it according to context-based contingent needs. In this way, every Website results more customer-centered than product-centered. The company started to use the Web from the beginning of the Eighties, but it is only since 2001 that it has been using the virtual environment to involve customers in the innovation process. More precisely, the interactive tools that are present in the public version of individual Websites are effectively used especially to collaborate with customers at the idea generation stage and at the product launch stage, using virtual communities, viral marketing initiatives and two-way communication enhancing brand image. Surveys on-line and suggestion boxes – to solicit both advice and complains - are extensively used with success. The customer feedback gathered on-line is systematically integrated by information collected through the traditional call center, that still remains the most important channel to absorb the customer's voice. Virtual concept tests are instead hosted in private areas of specific

Websites, where only pre-defined customers, who have been carefully selected from the data base, can participate. A restricted group of customers considered lead users for specific product categories is often involved for this purpose. In order to support the market test and the product launch stage on a more extended customer base, P&G systematically cooperate also with market research institutes running their own Websites, which are considered to provide a fundamental contribution to make the new product development process more successful. Inter-functional meetings and informal brainstorming activities - involving Marketing, R&D, and Customer Market Knowledge - are then organized to share the customer inputs internally. The company considers these activities to be strategic, because both customer satisfaction and competitive advantage result greater when customers are involved into the innovation process.

The systematic integration of information collected through the corporate Website with information gathered by research institutes is common to Siemens. Within its Website the company uses surveys and suggestion boxes especially to collect customers' complains, as in the Trouble Shooting area, where customers can identify the model of their cell phone and share the specific problems that they have faced while using it. This content is then analyzed by Siemens, together with the customer feedback obtained via e-mail, in order to find out possible solutions. Beta testing activities are also often centrally developed on-line, while open source mechanisms and contests are applied within both the global Website and its local versions, especially for Java applications. The emerging solutions suggested by customers are then effectively implemented, even if some problems

in managing intellectual property rights still limit a more extensive usage of peer-to-peer tools in new product development.

Finally, also Nokia and HP resulted particularly oriented to support on-line cooperation through their Websites. By recognizing the potentiality of the Web, Nokia has integrated its traditional mechanisms for absorbing customer knowledge with more innovative ones, such as cooperation forums and on-line communities, intensively used to evolve its products. Through the Forum Nokia - an on-line community created to bring together professional developers working with technologies and platforms supported by Nokia mobile devices – the company is able to promote open standards that match its customers' needs and where they can directly participate. This program connects developers with tools, technical information, support, and distribution channels to build and market applications around the globe. In order to sustain the effective implementation of these collaborative open mechanisms, Nokia freed itself from a stifling centralized bureaucracy and reorganized into four platforms: mobile phones, multimedia, networks and enterprise solutions. The purpose was to give potential growth areas both greater exposure and flexibility, ensuring that new products match the overall vision. Each division acts like an incubator, where actors feel free to imagine new products or services taking root. Ideas flow faster, since individuals have more opportunities for contact with customers, and an "essential market insights" group is tasked with steering customer insights toward product development. To extend the scope of these insights, cooperation with market research institutes running ad hoc Websites is selectively pursued.

Likewise, in a section named "Collaborate With Us" customers can work with HP engineers and business representatives in an on-line environment. Customers can contribute to current or future, private or public projects in order to develop tools and solutions for the market, create tools for internal use, and participate in an open source project. Customers' active participation is constantly stimulated by the firm who asks them to join the Developer & Solution Partner Program (DSPP), where customers can either tell how they use HP software developer resources and downloaded tools to integrated their application with HP OpenView or HP OpenCall (cf. "Share your integration story" section), or suggest, discuss a topic and exchange ideas with the Resource Central's developer community (cf. "Your perspective" section). Collaboration through on-line forums, mailing lists and feedback areas is also welcomed. HP customers' involvement is not limited to idea generation and product development phases but is also extended to the product test phase. Both private and public systems are employed: in the former, by joining the DSPP, individuals can take secure test drives (behind firm's firewall); in the latter, through the HP Test Drive section customers can test drive some of the most recent hardware and Open Source operating systems in an open environment. HP's aptitude to integrate both traditional and virtual tools for supporting its new product development also resides in its organizational structure. Thanks to its decentralized organizational structure and cooperative corporate culture the firm has developed a strong ability to communicate and understand both the division or product-line strategy and the design process; individuals with R&D, marketing, or manufacturing experience have the

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requisite knowledge of market, product, and business issues. At HP, information has become the key facilitators to design-for-environment; information - contained and shared in a database called Fountainhead - and Internet - seen as the most efficient ways for driving it - are considered the strategic factors that allow HP to produce solutions that range from consolidating and improving its global operations to serving as a platform for ongoing researches.

In conclusion, firms showing an above average degree of presence in Web-based tools for customer integration seem to have embraced a philosophy that is rooted first in their strategy and consequently in their organizational structure and incentives. They systematically support customer knowledge distribution across departments, according to contingent needs. Firms need specialized competencies to select the right communities to analyze, share their languages, and manage and opportunely synthesize the huge amount of customer knowledge emerging through spontaneous interactions and on-line conversations. Specific organizational roles can be proficiently created to this end. These reasons push them towards a higher internalization of market research for innovation. Putting in the extreme, such as e-commerce applications allowed some companies to manage transactions by themselves, without relying on retailers and general intermediaries (e.g., Evans and Wurster, 1999), Web-based tools enabling customer knowledge absorption might allow companies to gather customer feedback throughout the new product development process by themselves and pursue disintermediation in market research, at least for those groups of customers well represented in virtual environments.

In this respect it is fairly predictable to find that the traditional approach of buying market research from external actors in the market for market research will progressively leave space to a "Make" approach where the Internet provides the very tool to allow the company to internalize the fundamental market research competences. While this might be the case, it is fundamental to notice that the firms that opted for such an approach are the firms that strongly invested in both culture and organizational mechanisms.

Firms that outperform the others in terms of presence of such mechanisms have shown a positive attitude towards the actual usage of Web-based tools. In addition, they all seem to have made substantial investments in the organizational structure and the incentive systems in order to make proper usage of the knowledge they help import. The companies that have started to include tools enabling customer collaboration in new product development within their own Websites seem to be aware that the Internet is an easy to use global medium with unprecedented reach, which allows to communicate (and absorb) rich information from a very large audience in a short time and at a low cost. To some extent they seem to rely on a greater internalization of the process of market research and, hence, they show specific investments in that direction.

Up to now what they can't determine, given the freshness of the implementation, it's whether to their efforts are associated to an effective return. The following paragraph tries to address this topic.

4.4.4 The Payback Of Collaborative Innovation

The third and last suggested study should analyze the impact firms' virtual customers involvement in new product development has on both innovation and marketing outcomes. It implies not only verifying if companies deploying collaborative strategies are actually more profitable or innovative than companies that do not, but also if this collaborative innovation approach positively impacts on customers-firm's relationship.

4.4.4.1 Innovation Consequences Of Collaborative Innovation

Market orientation literature has advanced and empirically validated a positive correlation between market orientation and organizational performance[40] (e.g. Narver and Slater 1990), also across different environmental conditions (e.g. Jaworski and Kohli 1993; Slater and Narver 1994). The adoption of a market oriented perspective - that is of a superior skill in understanding and satisfying customers (Day, 1990) - allows firms not only to monitor changing customer needs as well as competitor activity but also to market products with superior value to their customers (Cooper and de Brentani, 1991; Weerawardena, 2003).

Since mid '90s – when, in the face of intensifying competition and environmental uncertainty, innovation has become increasingly important as a means of survival and the

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[40] The term performance is here used for generally indicating the variety of constructs authors have used in the market orientation literature for indicating the final outcome of a market oriented behavior (i.e. business performance, profitability, etc.).

capabilities approach in the strategic marketing literature has offered a useful theoretical basis for analyzing the relationship between marketing capability and product innovation (e.g. Verona, 1999) –innovation[41] has been pointed out as one significant mediating variable in the relationship between market orientation and performance. Consistently with Zaltman, Ducan and Holbek (1973), innovation has been proposed as one of the core value-creating capabilities that drive the market orientation-performance relationship.

The integration of two streams of previous researches - market orientation-innovation link (e.g. Quinn, 1986; Slater and Narver, 1994) and innovation-performance link (e.g. Deshpandé, Farley and Webster, 1993) - has progressively led to the development of a debate similar to that of the relationship between market orientation and performance.

While the innovation link with business performance has been trustily assumed, two opposite perspectives emerged as for the conceptualization of the connection between market orientation and innovation. The first perspective, closer to a technology-based view of innovation, advance that market orientation led to an excessive focus on existing customers' needs, limiting the capability of firms to catch emerging market and technological opportunities (e.g. Christensen and Bower, 1996); consequently, a strict adherence to the tenets of the marketing concept philosophy leads to poorer innovation activities and performance in the long run. The second perspective, more rooted in the

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[41] As for performance, in this work I use the term innovation for generally indicating the variety of constructs authors have used in the market orientation literature for indicating the mid outcome of a market oriented behavior (i.e. new product performance, new product activities, innovation success, innovation profitability, organizational innovation, innovation processing capability).

marketing literature, supports a beneficial effect of market orientation on innovative performance (e.g. Han, Kim and Srivastava 1998). To date, this controversy has not been univocally solved by empirical research, which generated mixed results, supporting sometimes the positive (e.g. Li and Calantone, 1998) and some other (the majority) the negative or non-significant relationship (e.g. Atuahene-Gima, 1996; Gatignon and Xuereb, 1997; Hurley and Hult, 1998; Han, Kim and Srivastava, 1998; Lukas and Ferrel 2000; Noble, Sinha and Kumar, 2002).

Given the multidimensionality characterizing both innovation and market orientation construct, researches have addressed further investigations aimed, along with several others goals[42], at understanding market orientation impact on innovation dimensions – like creativity, novelty and radicalness of new products (e.g. Im and Workman, 2004; Voss and Voss, 2000; Atuahene-Gima, 1995; Atuahene-Gima, 1996; Lukas and Ferrel, 2000; Zhou, Yim and Tse, 2005).

Starting from insights on market orientation studies - asserting that it has a significant relationships with innovation characteristics such as innovation-marketing fit, product advantage and product newness (Atuahene-Gima, 1996) – and, given its complementary ties with innovation orientation (Siguaw, Simpson and Enz, 2006),

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[42](1) uncovering the mechanisms that determine the superiority of market orientation with respect to alternative strategic orientation (e.g. Gatignon and Xuereb, 1997); (2) analyzing the interactive effect of the 'other' strategic orientation components – such as entrepreneurship, technological and innovation orientation (e.g. Atuahene-Gima and Ko, 2001; Gatignon and Xuereb, 1997; Berthon et al., 2004) – and capabilities – as technology capabilities (e.g. Moorman et al., 1999; Weerawardena, 2003) - on product innovation performance and outcome; (3) comprehending single market orientation components influence on organizational innovativeness (e.g. Han, Kim and Srivastava, 1998)

researches oriented to analyze collaborative innovation consequences cannot deserve from considering the impact that the adoption of a collaborative innovation approach has on innovation performance (e.g. von Hippel, 2005); in particular, the impact that it has on time to market[43] (e.g. Leonard-Barton, 1995; Kaulio, 1998), product fit – i.e. new product response to customer needs or product success (Li and Calantone, 1998) - and, type of innovation (e.g. Reinartz et al., 2004; Dahan and Srinivasan, 2000; Thomke and von Hippel, 2002).

As previously reported in Chapter 1, thanks to presence of VCE customer-oriented businesses are becoming more proficient in uncovering latent customer needs and stimulating customers to suggest new products beyond their usual frame of mind as well as what they believe to be technologically possible. A greater emphasis on customer collaboration leads to both the introduction of new-to-the-world products and of me-too products launched (Booz, Allen, and Hamilton 1982; Olson et al, 1995).

Evidences from empirical analyses and theory direct to assume the presence of a constructive relationship between the implementation of a collaborative orientation and each variable; however, future investigations need to be developed in order to properly address the sign of the relationship. For better portraying this reasoning, a set of propositions is reported as follows:

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[43] When users aggressively participate in the complete process of product development, the average time spent is shorter. Campbell and Cooper (1999) felt that this was because the first interaction with customers could effectively gather market information, could also provide the ability and other resources that the company lacks internally, and could further shorten development time and reduce costs.

P14: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the product fit for customers.

P15: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the shorter the time to market.

P16: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the generation of new-to-the-world products.

To test the first two theorizations and complete the wide collaborative innovation frame, a survey has to be built on (Appendix III – Section E). Items, as those recently proposed by Sarkar and Chakrabarti (2006), should be added in order to measure product's level of innovation. As for all the other investigations, to optimize the response rate a direct recall after one-month from the delivery will be provided; in order to avoid the risk of possible sample distortions (Goode and Hatt, 1952) also a non-response analysis has to be performed by comparing early versus late responses (Armstrong and Overton, 1977). It will be done in order to control that there are no statistically significant differences in the mean responses between early and late respondents and therefore non-response bias is not an issue in interpreting the findings of the study. The sample of investigated companies should include both national and international players, operating in a selected number of industries; the sample of firms chosen for investigation should have enough

internal variety to test the effects of different levels of commitment in absorbing customers'

knowledge in digital environments.

Literature on consumer behavior asserts that the development of an offer which is

able to create superior value for the customers is positively related to high levels of

customer satisfaction and loyalty (Fornell et al., 1996; Anderson, Fornell and Lehmann

1994; Anderson, Fornell and Rust 1997; Bolton 1998; Oliver, 1980; Anderson and Sullivan,

1993; Szymanski and Henard, 2001). This clue, as well as the suggested proposition on

product fit, paves the way for a new interesting research area relating collaborative

innovation to customer' satisfaction.

4.4.4.2 Marketing Consequences Of Collaborative Innovation

Coherently with the general definition of customer relationship management

(Gronroos, 1995; Morgan and Hunt, 1994; Rigby, Reicheld, and Schefter, 2002) – that is,

leveraging technology to engage individual customers in a meaningful dialogue so that

firm can customize its offer - studies in the field of innovation and customer relationship

have focused on analyzing how to use data about customer satisfaction for supporting

innovation activities (Wilson 2002; Maltz and Kohli 1996; Slater and Narver, 1995; Menon

and Varadarajan, 1992; Moorman 1995; Deshpandé and Zaltman, 1987). The key idea is to

improve the fit between the firm's offerings and customer needs, wants, and preferences

by surveying customers and importing customer understanding into the firm (Clark and Wheelwright, 1993).

In particular, studies have tried to recognize either how customer satisfaction's data can be translated into new product development inputs or how it is possible to improve the associated tools for collecting customer feedback[44]. What misses it's the understanding of the consequences generated by firms' collaborative orientation for innovation on components of customer relationship management (CRM) strategy[45]and how this relates to company performance and profitability.

In particular, future studies should try to understand whether there is a relationship between firms' propensity to absorb customers' knowledge – knowledge *of*, not only *about* – and customers' level of satisfaction and customers' trust and loyalty (Moorman et al., 1993; Morgan and Hunt, 1994; Hart and Johnson, 1999).

This research proposal lends for a twofold interpretation. As first, it could be interesting to understand whether customers' perception about firm's ability to absorb their knowledge for innovation purposes impacts on their level of satisfaction – does

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[44] Among the most used tools, as cited in chapter 2, we recall: surveys and complaining areas. The former are more useful for understanding articulated or explicit customer needs, and where the firm can accurately identify customers it needs to target with its offerings; they further allow understanding how customer preferences are evolving with changing market conditions, and can guide the development and refinement of new concepts. The latter can help in identifying what customers don't like about existing products.

[45] Studies have identified the following components of CRM strategy, such as the link between satisfaction and business performance (Kamakura et al. 2002), the link between customer loyalty and profitability (Reinartz and Kumar 2000), customer profitability heterogeneity (Niraj, Gupta, and Narasimhan 2001), and customer loyalty programs (Verhoef 2003).

knowing that a certain firm is implementing a collaborative approach for innovation increase customers' level of satisfaction?[46]

Virtual product development, as a compelling experience, itself creates trust and commitment (Morgan and Hunt, 1994; Morgan et al., 2000). While customer integration can improve new product performance, it also can serve as a means of establishing and improving the relationship with existing and potential customers (Gruen et al., 2000; Sirdeshmukh et al., 2002).

One explanation may be simply that more customers are well-informed, have high expectations, and thus are less likely to take for granted what the market offers. If customers' contribution is actually used for new product development overall satisfaction with the company and its products increases.

Even if it is probably too premature to classify Fiat 500 example as a case of success, first collected data show high levels of customer satisfaction associated to a positive perception about Fiat's ability to absorb customers' knowledge for innovation; implications on the concept of trust can be even identified. These considerations guide toward the hypothesis of a positive relationship between these two variables:

> P17: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the level of customer' satisfaction.

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[46] As previously suggested in the "Make" and "Buy" research proposition (§4.2)

Then, attention should be focus on investigating the presence of a relationship between customers' satisfaction and firm's actual level of collaborative innovation – does a satisfied customer provide more useful support to collaborative innovation implementation?

According to the theoretical assertion that different customers provide different levels of knowledge and show different levels of involvement in firms' value creation (see §1.4), it is possible to hypothesize that

> P18: The higher the customer' satisfaction the higher the contribution they provide for supporting firms' innovation process through Web-based mechanisms.

A comparison of data about customers' satisfaction across firms adopting different levels of new product development Web-based mechanisms for absorbing customers' knowledge should allow for a verification of the first proposition.

An experiment should be designed to address the second perspective of research, relating customers' contribution to new product development and their level of satisfaction (Appendix VII). In both cases, the focus shifts from company to customer; the main unit of the analysis is the customers-firm's relationship

From previous considerations, it is possible to derive a robust relationship between collaborative innovation and marketing implications, in general.

Evidences from empirical analyses, further enhance this consideration by providing insights on the use of the collaborative innovation strategy for achieving specific marketing purposes, such as brand positioning and image definition (e.g. Park, Jaworski and MacInnis, 1986). Multivariate empirical analyses show that a wide range of tools are present to support the new product launch and the management of the product life cycle[47]. From Fiat case study emerged that collaborative innovation approach has been also used for repositioning Fiat's brand and image after a difficult period. This evidence reinforces the recurrent idea that there could be a relationship between firm's management of its collaborative innovation strategy and its relationship with customers, from a marketing perspective.

An additional question of research deserves for an answer: is collaborative innovation a tool for marketing strategies?

To provide an exhaustive agenda for collaborative innovation studies in the managerial field those, and further questions have to be addressed.

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[47] For instance, it is common to find one area of the site dedicated to informing customers about the history and features of new products; there are also mini-sites dedicated to new products. In addition, the communication of on-line events, often combined with off line activities seems to play a fundamental role in promoting the product launch on the market. Customized newsletters, sometimes supported by viral marketing mechanisms, are also commonly used in all the industries to promote a new product launch as well as to run the activities related to the following stages of the product life cycle. Numerous other tools are used to perform activities related to Web-based customer relationship management. Virtual communities, relying on chat rooms and forums, not only promote the spread of product or service information within specific user groups, but also contribute to further reinforcing the customer's tendency to "Buy". Other mechanisms widely used to support a new product launch are those providing personalized assistance to help consumers select a product. These instruments are often based on model selector or comparison programs designed to allow users to identify the product.

According to the recognition that firms exist to generate value, more in general, researches should focus on the impact of the capacity to cooperate with customers and to effectively integrate them within the organization on the firm's ability to generate economic value.

By comparing economic performance of companies that show different commitment in leveraging virtual environments to cooperate with their customers, it is possible to indirectly measure the economic value of collaborative innovation through the Web.

In this sense, relevant implications will emerge in driving companies' investments in digital platforms and tools enabling collaborative innovation strategies.

4.5   Collaborative Innovation Time To Come Comes To An End

The first two parts of this work, combining both literature review and empirical investigation on research on user innovations, point out that the phenomenon of user-initiated product development is anything but rare.

However, the complexity associated to the methodological measurement of Web-based implementation and the associated results, makes the collaborative innovation become an area that extremely needs to be investigated, both theoretically and practically, especially under the organization issue of product innovation. For this purpose, the last part of the work suggests a component-wise approach to answering the question of

whether collaborative innovation orientation is 'good' or 'bad' for product innovation and company's value generation (Table 8).

Several contributions emerge from this work.

For scholars interested in analyzing collaborative innovation this work offers not only a analytical framework for understanding the evolution of firms' innovation approaches and tools, but also a comprehensive agenda of future directions for research. However, in facing this last point, scholars have to be aware of the priority rank embedded in the research agenda; for this purpose, before proceeding, the meaning of the above questions have to be properly addressed.

Highest priority of future research must be the measurement of the actual usage of Web-based mechanisms; only after the identification of different level of collaborative innovation execution, it is possible to understand which organizational procedures support the effective absorption of customers' knowledge. Studies on both marketing and innovation implications have to wait for the product life cycle progression.

Furthermore, researchers should be conscious of the time needed for observing and analyzing the different relationships. Indeed, even if a reduction in time to market is broadly acknowledged, in order to examine the established relationships, the research activity has to proceed along with the evolution of each step of the new product development process. Finally, the already acknowledged difficulties related to the different measurement issue have to be taken into consideration.

Firms can use the empirical evidences derived in this work to define guidelines for the identifying industry and firm's typologies in the presence of a collaborative approach. However, for practitioners intending to integrate customers virtually into new product development it is important to consider a number of aspects. First of all, the virtual customer integration has to be in line with a company's goals and support its core competencies. Then, it is important to balance the expected benefits of an intensive interaction with customers against possible costs of integrating them; managers have to be aware of the benefits of virtual customer integration – summarized into risks and market uncertainties reduction; identification of future needs; greater variety of ideas; contact to new potential customers; increased customer retention; broader decision basis – as well as of the critical aspects of virtual customer integration - intellectual property problems; disturbance of internal processes - 'not invented here syndrome'; niche market orientation; lack of secrecy; required expertise. Additionally, project restrictions like budget restraints or interface problems between marketing and R&D departments often force managers to accept compromises when carrying out such a project. To balance benefits and costs it is necessary that the virtual customer integration is carefully planned and crafted. This does seem to be a trivial challenge as there is a huge variety of design parameters and many alternative ways to actually identify and motivate customers to actively participate in a company's innovation process. Furthermore, future academic researches' results on this topic could establish the foundation for new managerial implementations.

Table 8. The Agenda for Future Direction of Research

AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
From the Presence to the Actual Usage: the Make & Buy Approaches	Do companies actually use customers' information and knowledge collected through the tools placed on their own Website and on third parties' ones?	Quantitative approach via survey (Appendix III - Section C)	Dahan & Hauser, 2002 Nambisan, 2002
When Disclosing is better than Withholding?	P1: The adoption of a Disclosing approach is (positively) related to lower level of customers' creativity in product definition. P2: The adoption of a Withholding approach is (positively) related to higher level of customers' creativity in product definition. P1a: The adoption of a "Disclosing" approach is (positively) related to new to the firm innovation. P2a: The adoption of a "Withholding" approach is (positively) related to new to the market innovation.	P1 & P2 - experiment design as reported in the Appendix IV. P1a & P2a - exploratory approach	Booz, Allen, & Hamilton 1982 Im & Workman, 2004 Olson et al, 1995 Park et al., 2000 Vissers & Ben Dankbaar, 2004
Web-based approach design: how should firms define their Web-based approach in order to enable customers to optimally express their contribution?	The design of the firm Website - how do tools positioning within the firm Website or inside the Web page impact on customers' propensity to collaborate?	The experiment seems to be the most feasible methodological technique because it allows comparing the response achieved at different settings of the controllable variables. Appendix V	Kari & Shalev, 2004

AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
	The design of firm Web-based tools - which variables do impact on the intensity of customers' contribution, even in term of creativity	suggests a preparatory draft for experiment building.	
The Presence of Incentives in the Web-based Approach: the role of incentives as variables potentially influencing customers' ability and motivation to collaborate.	P3: The presence of an incentive system positively impacts on customers' contribution to idea generation. P4: The presence of an incentive system positively impacts on customers' level of creativity.	Virtual stock market mechanisms. Both simulations with artificial agents and experiments with human subjects. A sketch of the experiment is described in Appendix VI.	Chan et al, 2004 Cockburn, Henderson, & Stern, 2000 Dahan & Hauser, 2002 De Bono, 1970 Feller & Fizgerald, 2002 Forsythe et al., 1999 Goldengerb & Marzursky, 2002; Goldengerb et al., 1999 Griffin & Hauser, 2005 Im & Workman, 2004 Kristensson, Magnusson & Matthing, 2002 Osborn, 1957 Prince, 1970 Schneider & Bowen, 1995 Skiera & Spann, 2004 Spann & Skiera, 2003 Toubia, 2005; Toubia & Flores, 2005 Vissers & Ben Dankbaar, 2004
What motivates consumers to engage in VCEs? Identifying intrinsic and extrinsic motives	Why do consumers engage in virtual NPD initiated by producers?	Survey administered to consumers that already participated in virtual NPD	Butler et al. 2002 Constant et al. 1996 Franke & Shah 2003 Groves et al. 2000 Hemetsberger 2001 Hennig-Thurau et al., 2004 MacElroy & Gray, 2003 Unger & Kernan 1983
Identifying Collaborative Innovation Antecedents: to	P5: The higher the customer orientation, the higher the Web-	Ad hoc survey, measuring how at different levels of customer and	Berthon et al., 1996, 1998, 1999 Carpenter & Nakamoto, 1989; Carpenter et al., 1994

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AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
investigate the variables affecting virtual environment definition and implementation	based customer involvement into new product development processes P6: The higher the technology (Internet) orientation, the higher the Web-based customer involvement into new product development processes	innovation orientation correspond a different propensity to Web-based customers' involvement in new product development. A set of items for measuring technology (Internet) and customer orientation is suggested in the Appendix III - Section A and B.	Cooper, 1984, 1994 Deshpande & Farley, 1998; Deshpande et al., 1997; Deshpandè, Farley & Webster, 1993 Gatignon & Xuereb, 1997 Kanter, 1988 Naver & Slater, 1990 Pilzer, 1990 Workman, 1993
Organizational Implications: "the Inside of Collaborative Innovation"	Does firm's propensity to implement collaborative innovation actually reflect into the organizational approach for NPD?	A pool of items for a survey is suggested in Appendix III - Section D.	Brown & Eisenhardt, 1995 Carayannis et al, 2000 Ciborra, 1991 Cohen & Levinthal, 1990 Davenport & Prusak, 1998 Foray, 1997 Nonaka & Taketuchi, 1995 Vicari, 1991
Organizational Forms Supporting Distributed Innovation: the outward perspective; which organizational forms are suitable for distributed innovation contexts?	P7: Traditional hierarchical private structures and virtual knowledge brokers are more suitable for absorbing individual explicit knowledge on sporadic occurrence compared to communities of creation and open source systems. P8: Communities of creation and open source systems are more suitable for absorbing collective implicit knowledge on continuous incidence compared to traditional hierarchical private structures and virtual knowledge brokers P9: Firms endowed with greater absorptive capacity are expected to show higher Web-based customer involvement into new	Explorative analysis through case studies	Arora, Fosfuri & Gambardella, 2001 Chesbrough, 2005 Constant, Sproull & Kiesler, 1996 Hargadon & Sutton, 2000 Kogut & Metiu, 2001 Miller & Drexler, 1988 Sanchez & Mahoney, 1996; Sanchez, 1996 Sawhney & Prandelli, 2000 von Hippel & von Krough, 2003

AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
	product development processes		
	P10: The higher the presence of virtual teams for new product development, the higher the likelihood of Web-based customer involvement into new product development processes		Adams, 1976 Aldrich & Herker, 1977 Allen & Cohen, 1969; Allen, 1970 Ancona, 1987, 1990 Atuahene-Gima & Evangelista, 2000; Atuahene-Gima & Li, 2000 Baldridge & Burnham, 1975 Blau, 1963 Bonama, 1985 Brown & Eisenhardt, 1995 Cohen & Ledford, 1991 Coleman, et al., 1966 Davidow & Malone, 1992 DeSanctis & Monge, 1999 Donnellon, 1995 Dougherty, 1987, 1992 Enz, 1988 Griffin & Hauser, 1996 Heany, 1989 Hitley & Frost, 1973 Holmstrom, 2001 Jarvenpaa & Ives, 1994; Jarvenpaa & Leidner, 1999 Joshi & Sharma, 2004 Kambil et al., 1999 Katrichis & Ryan, 1998 Katz & Allen, 1985 Keller & Holland, 1975 Kristof et al., 1995 Lau et al., 2000 Lawrence & Lorsh, 1967 Leifer & Huber, 1977 Lipnack & Stamps 1997 March & Simon, 1958 Maznevski & Chudoba, 2000
	P11: The higher the presence of cross-functional new product development teams, the higher the likelihood of Web-based customer involvement into new product development processes.	The research should be structured into two main sections. The first phase will be based on an exploratory analysis through qualitative case study research, while the second part should be based on an extended dataset through a quantitative research design.	
Organization Dynamics: the inward perspective; which organizational conditions and operative processes do make effective integration?	P12a: The higher the presence of intra-organization boundary spanners individuals, the higher the likelihood of Web-based customer involvement into new product development processes P12b: The higher the presence of extra-organization boundary spanners individuals, the higher the likelihood of Web-based customer involvement into new product development processes		

AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
	P13: The higher the presence of boundary spanning new product development teams, the higher the likelihood of Web-based customer involvement into new product development processes.		Miles & Snow, 1986 Mowshowitz, 1997 Pelz & Andrews, 1976 Pitta & Franzak, 1996; Pitta et al, 1993, 1996 Prahalad & Ramaswamy, 2000 Rodgers & Shoemaker, 1971 Saunders, 1981 Schwartz & Jacobson, 1977 Song & Parry, 1992; Song, Thieme & Xie, 1998 Souder, 1977 Takeuchi & Nonaka, 1986 Thompson, 1967 Tushman, 1977; Tushman & Scanlan, 1981a
The Payback of Collaborative Innovation: the impact firms' virtual customers involvement in new product development has on both innovation & marketing outcomes.	P14: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the product fit for customers. P15: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the shorter the time to market. P16: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the generation of new-to-the-world products.	To test P14 & P16, a survey has to be built on (Appendix III – Section E). Items, as those proposed by Sarkar & Chakrabarti (2006), should be added in order to measure product's level of innovation. As for the third one, a comparative case studies analysis has to be addressed. A comparison of data about customers' satisfaction across firms adopting different levels of new product development Web-based mechanisms for absorbing customers' knowledge should allow for a verification of P17. An experiment should be designed to address P18, relating customers' contribution to new product development and their	Anderson & Sullivan, 1993; Anderson et al, 1994, 1997 Atuahene-Gima, 1995, 1996 Bolton 1998 Booz, Allen, & Hamilton 1982 Christensen & Bower, 1996 Clark & Wheelwright, 1993 Cooper & de Brentani, 1991 Day, 1990 Deshpandé & Zaltman, 1987; Deshpandé, Farley & Webster, 1993 Fornell et al., 1996 Gatignon & Xuereb, 1997 Gronroos, 1995 Gruen et al., 2000 Han, Kim & Srivastava,1998 Hart & Johnson, 1999 Hurley & Hult, 1998 Im & Workman, 2004 Jaworski & Kohli 1993 Kaulio, 1998 Leonard-Barton, 1995

AREA OF RESEARCH	RESEARCH QUESTION or PROPOSITION STATEMENT	METHODOLOGY	LITERATURE BACKGROUND
	P17: The higher the adoption of Web-based mechanisms for absorbing customers' knowledge for supporting the innovation process the higher the level of customer' satisfaction. P18: The higher the customer' satisfaction the higher the contribution they provide for supporting firms' innovation process through Web-based mechanisms.	level of satisfaction (Appendix VII). In both cases, the focus shifts from company to customer; the main unit of the analysis is the customers-firm's relationship	Li & Calantone, 1998 Lukas & Ferrel, 2000 Maltz & Kohli 1996 Menon & Varadarajan,1992 Moorman 1995; Moorman et al., 1993 Morgan & Hunt, 1994; Morgan et al., 2000 Narver & Slater 1990 Noble, Sinha & Kumar, 2002 Oliver, 1980 Olson et al, 1995 Quinn, 1986 Reinartz et al., 2004 Rigby, Reicheld, & Schefter, 2002 Siguaw, Simpson & Enz, 2006 Sirdeshmukh et al., 2002 Slater & Narver 1994, 1995 Szymanski & Henard, 2001 Thomke & von Hippel, 2002 Valdani & Busacca, 1999 Voss & Voss, 2000 Weerawardena, 2003 Wilson 2002 Zaltman, Ducan & Holbek 1973 Zhou, Yim & Tse, 2005

APPENDIX I – Diffusion Of Web-Based Product Innovation Methodology

Data Collection and Measurement

First, we made an explorative analysis on a group of web sites characterized by high visibility, i.e., companies that extensively use their web sites to collaborate with customers in their innovation activities. We considered two cases for each of the five sample industries. Our exploratory analysis led us to include a final stage of the new product development process related to the management of the product life cycle. In order to improve the reliability of the classification that relates each tool to a specific stage of the new product development process, we also ran a focus group involving five managers responsible for the innovation activities of their companies (one for each sample industry). By combining the evidence from both the literature and this explorative analysis, we identified 28 variables. They represent the online mechanisms that companies can adopt to interact with customers in order to support the different stages of the innovation process. To make the analysis as objective as possible, each variable is described by using a number of different attributes. In order to simplify the descriptive analysis, company performance indexes are provided that incorporate the information collected in the single attributes for each variable identified. The indexes were created by giving the same weight to each attribute. In this way, we consider that all the variables have the same relevance for the company. Each attribute has a value of 1 if present and 0 if absent. For each company, the

sum of all the attributes considered per variable made it possible to obtain absolute indexes, which were subsequently relativized. For instance, at the idea generation stage, different tools were considered, including a suggestion box. This variable was then described by means of seven attributes: simple presence, use targeted to web site innovation, use targeted to service innovation, use targeted to product innovation, presence of pre-defined leading topics, offer of monetary incentives, and offer of non-monetary incentives. In the case, for instance, of the presence of a suggestion box that is targeted to both web site innovation and product innovation, and whose usage is enhanced through monetary incentives, four out of seven attributes are included. Therefore, the absolute index assumes the value 4 and the relativized index is equal to 4/7, that is 0.57. Consequently, each variable obtained a score between 0 and 1, where 0 means that the sample company did not include the specific tool and 1 that it included the tool in the most complete way. It is worth highlighting the fact that these variables are not dummy, but rather can assume any value included between the two extremes— 0 and 1. The higher the value of the index, the greater the intensity of presence of the related tool in the company's web site[48]. By measuring the average frequency of tool presence, we were able to assess to what extent companies actually include tools supporting customer collaboration in their own Websites.

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[48] We are not differentiating between heavy and light users of each Web-based tool. The fact that the web is still not widely used to support innovation makes the median always equal to 0. Therefore, we included among those using a specific tool any player which obtains a result greater than 0, considering the index related to the same tool.

Sample Definition and Data Analysis

The five sample industries selected were characterized by the great importance given to absorbing customer knowledge in the product innovation process and the intense use of the web to support customer interaction. The sample firms were chosen from three geographical areas: Europe, North America, and Asia. They were selected by using both offline and online sources; specifically, we relied on industry reports, the Dun & Bradstreet database, and the Chamber of Commerce annual reports. For each company, we contacted the official corporate web site in order to have a complete list of both global and local versions of the core web site, as well as a detailed list of all the related brand web sites. We then focused our analysis on the global versions of our sample companies' web sites, both at the corporate and brand level. Specifically, the survey covered a sample of 209 web sites, classified as follows: 35 in the   automotive industry; 13 in the motorcycle industry; 28 in the consumer electronics industry; 36 in the toiletries industry; and 13 in the food industry (considering, in this case, an additional 84 sub-brand sites).

We analyzed the web sites of all the relevant international players, except for the food industry, which is extremely fragmented. In this case, we focused on the multinational corporations and their related brand sites. By analyzing each site, it was possible to identify the specific tools used to interact with consumers in defining new products or redefining existing ones. Where necessary, we took part in specific Web-based initiatives limited to registered users, in order to better clarify the kind and the intensity of the interaction. The same analysis for each web site was repeated three times over a six-

month period (January to June 2004) to ensure that the data collected was influenced neither by short-term initiatives nor by the elimination of some tools for unaccounted reasons.

Additional data were subsequently processed by carrying out a cross-industry cluster analysis, in order to show how companies supporting Web-based collaboration in new product development share similar features. More precisely, since high correlation among clustering variables can be problematic due to the overweighting of one or more underlying constructs (Ketchen and Shook, 1996), we first addressed the multicollinearity problem by running a principal component analysis. This allowed us to re-group Web-based tools not based on the phases of the new product development process, but rather on the type of data sought and the goals the firm is trying to pursue. To that end, we first eliminated the variables always equal to 0-Web-based tools used by no companies, and then we applied the principal component analysis to the remaining 25 variables, using the Varimax with Kaiser Normalization as a rotation method (see in Table A1 the rotated component matrix). In this way, we were then able to use the resultant nine uncorrelated factor scores as the basis for clustering[49]. Specifically, we based our cluster analysis on a deductive approach, so that the number and sustainability of clustering variables, as well as the expected number and nature of groups in a cluster solution are strongly tied to

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[49] Punj and Stewart, op. cit

theory[50]. We used a non-hierarchical algorithm because of it can optimize within-cluster

homogeneity and between-cluster heterogeneity.

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[50] Ketchen, Thomas, and Snow, op. cit.

APPENDIX II - Diffusion Of Web-Based Product Innovation Further Analysis

Four outliers emerged from our cluster analysis. In order to ensure that the presence of these outliers would not make our principal component analysis and the following cluster analysis potentially distorted, we followed the suggestion of one reviewer and we reran the analysis after eliminating the outliers. The results did not change significantly from the analysis presented in the main text of this article. Specifically, we found that eight factors explain 69.4% of total variance. The first factor is the synthesis of the previous factors 4 (lead users) and 5 (market research). Factors 2 and 4 perfectly overlap, respectively, with the previous factors 1 (mass customization) and 6 (newsletter). Factor 3 is basically similar to the previous factor 2 (product choice). These four factors comprehensively account for more than 40% of the total variance. Factor 5 here better expresses the use of virtual communities; factor 6 can be related to viral marketing; factor 7 and factor 8, respectively, are the expression of the presence of complaint areas and formalized mechanisms of competition on new ideas and they can not be aggregated with other variables.

The new factors were then used as the new variables in the cluster analysis. By using again a non-hierarchical algorithm, we achieved the best results when we grouped companies into three clusters. In fact, when analyzing the F tests, factors 4 and 7 are the

only factors that are not significant when three clusters are considered. Therefore, we focused our attention on the remaining six factors to describe the characteristics of each group of companies (Table A2). The most populated cluster is still the first one, which includes 169 companies. It is characterized by a low tendency to leverage the web throughout the entire innovation process in order to cooperate with customers. In particular, consistent with the results obtained in our previous analysis, this cluster records negative results compared to the other ones as regards all stages of the new product development process. The second cluster is made up of 34 companies and is described especially by factors 2 (mass customization), 3 (product choice), 5 (virtual communities) and 8 (formalized mechanisms of competition on new ideas). It includes 3 toiletries companies (l'Oreal, Reflect, and Covergirl), 5 consumer electronics companies (Samsung, Toshiba, Sony, Apple, and Blaupunkt), 4 motorbike companies (Ducati, Aprilia, BMW, and Yamaha) and most of the sample automotive companies, which are characterized by the tendency to use the web to involve customers also at the new product development stage, especially by offering mass customization options. Tools to obtain customer feedback the beginning of the new product development process, support the new product launch, and facilitate the appropriate product choice by customers characterize this cluster which aggregates mainly corporate web sites of well established companies.

Finally, the last cluster is made up of only P&G, aggregating both its Cosmetic Division and Food Division. This large and diversified multinational company remains an outlier, because of its advanced approach to the web in supporting collaborative

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innovation with customers. In fact, it shows a positive correlation with factor 1 (lead user and market research) and factor 6 (viral marketing).

Considering that in our dataset only a few companies present Web-based tools throughout the entire new product development process, it seems reasonable that after eliminating the original outliers we found an additional outlier and a cluster grouping all the remaining companies which significantly stand out by using the web for innovation purposes.

TABLE A1. Results of the Principal Component Analysis: The Rotated Component Matrix

	Components								
	1	2	3	4	5	6	7	8	9
Mass customization of aesthetic attributes	**.945**	-.030	.122	N.R.	N.R.	N.R.	-.032	N.R.	-.017
Mass customization of functional attributes	**.939**	.112	-.009	N.R.	N.R.	N.R.	-.011	N.R.	N.R.
Customized CRM	**.515**	.388	N.R.	-.031	N.R.	N.R.	N.R.	.329	.166
Customized assistance in new product selection	.116	**.719**	-.089	-.116	.241	N.R.	-.254	-.030	N.R.
New product area	N.R.	**.647**	N.R.	-.001	N.R.	.227	.285	N.R.	N.R.
Viral marketing	-.100	**.534**	N.R.	.281	N.R.	.122	-.146	.296	-.027
"Contact the firm" optino	-.051	**.490**	N.R.	.310	-.226	.141	.245	-.373	N.R.
Feedback session /survey	.173	**.472**	N.R.	.213	.233	.150	.240	N.R.	.221
Virtual product test	N.R.	N.R.	**.969**	-.029	N.R.	-.039	N.R.	-.043	N.R.
Design toolkits	N.R.	N.R.	**.969**	-.029	N.R.	-.039	N.R.	-.043	N.R.
Formalized mechanisms of competition on new ideas	-.113	-.054	**.479**	.150	-.008	.358	-.108	.386	-.107
Agreement area to manage intellectual property rights	N.R.	.178	-.003	**.812**	N.R.	N.R.	N.R.	.314	-.069
User patents for new products	.165	-.047	-.018	**.787**	.203	-.093	-.060	-.073	N.R.
Box suggestions	-.025	.113	-.038	**.545**	**.488**	.151	.435	N.R.	-.098
Analysis of customer opinions	N.R.	N.R.	N.R.	N.R.	**.722**	N.R.	-.158	N.R.	N.R.
Customer advisor programs	-.157	N.R.	-.050	.138	**.705**	N.R.	.365	-.042	-.082
Market test	.308	.320	.134	.206	**.639**	-.013	N.R.	N.R.	-.020
Customized newsletter (for product life cycle management)	N.R.	.144	-.079	N.R.	N.R.	**.883**	N.R.	N.R.	N.R.
Customized newsletter (for market launch)	.160	.249	N.R.	-.045	.122	**.807**	.136	.113	N.R.
Complaint area	-.028	-.133	-.078	N.R.	-.022	.211	**.677**	-.037	.194
Mini Websites	N.R.	.171	.201	-.108	.114	-.125	**.672**	.174	-.097
Virtual communities for idea generation	N.R.	N.R.	-.043	.120	N.R.	N.R.	N.R.	**.814**	.159
Events	.193	.323	N.R.	.104	-.025	.137	.401	**.504**	N.R.
Open source mechanisms	-.053	.120	-.002	-.008	-.047	N.R.	N.R.	-.091	**.860**
Virtual communities for new product launch	.142	-.044	-.015	N.R.	N.R.	N.R.	N.R.	.390	**.791**
Share of Variance Explained Tot. Variance Explained = 70.66%	9,5%	9,0%	8,9%	7,8%	7,7%	7,2%	7,0%	6,9%	6,3%
Factor Meanings	Mass Customization	Product Choice	User Input	Lead Users	Market Research	Newsletters	Two-way Communication	Social Collaboration	Open Sourcing

TABLE A2. Non-Hierarchical Cluster Analysis Without the Outliers: Final Cluster Centers

	Cluster		
	1	2	3
Lead user and Market Research	-.12809	.20950	7.26224
Mass customization	-.36921	1.89039	-.93878
Product choice	-.09381	.48387	-.29926
Newsletter	.03049	-.20162	.85089
Virtual community	-.06271	.36116	-.84045
Viral marketing	-.05770	.15602	2.22307
Complaining area	-.02028	.10961	-.14967
Formalized competition mechanisms	-.05785	.36259	-1.27560
Number of Cases	169	34	2

APPENDIX III - Web-Based Usage Antecedents And Consequences

Questionnaire Cover

Mrs./Mr. XXXXX,

As we have already anticipated you at the phone, we would be really grateful if you want to take part to the research project coordinated by XXXXX University and entitled *"Collaborative Innovation: Current Findings, Conceptualization and Future Directions"*.

To this purpose, we ask you to kindly fill in the on line questionnaire that you can find at the following Web address: www.XXXXXXXXXXX.com.

We promise not to take more than fifteen minutes of your time. Your contribution would be really precious for the success of this research project, whose purpose is to prove to what extent companies are currently using the Web in order to support their innovation processes.

Specifically, we would like to understand what the Web-based tools that companies use more intensively to involve customers in their new product development activities are.

The questionnaire is organized in five sections, in order to explore: the level of Customer Orientation of the company [A]; the actual usage of the Web [B]; the relevance attributed to the Web to support innovation [C]; the organizational mechanisms implemented to favour customer knowledge sharing within the company [D]; performance indicators [E].

When the research project will be completed, we will be happy to provide you the entire report of results.

We thank you for your patience and cooperation
Best regards

The research project coordinator

Signature

Innovation and ICTs Research Questionnaire

Please, answer the following questions relating to your corporate Web site.

Section (A): Customer Orientation						
A1: We invite you to express your level of agreement of the following statements: 1- Strongly disagree; 2- Disagree; 3- Partially disagree; 3- Partially agree; 5- Agree; 6-Strongly agree.						
1- Our marketing function develops market researches on a systematic basis	1	2	3	4	5	6
2- Our business objectives are driven primarily by customer satisfaction	1	2	3	4	5	6
3- Our new product development activities are primarily driven by our R&D department	1	2	3	4	5	6
4- Our business strategies are driven by our beliefs that we can create greater value for customers	1	2	3	4	5	6
5- We work closely with lead users who try to recognize customer needs, months or even years, before the majority of the market can recognize them	1	2	3	4	5	6
6- We constantly monitor our level of commitment and orientation to serving customers' needs	1	2	3	4	5	6
7- Our strategy for competitive advantage is based on our understanding of customers' needs	1	2	3	4	5	6
8- We measure customer satisfaction systematically and frequently	1	2	3	4	5	6
9- Customers can directly contribute to define the main characteristics of our product	1	2	3	4	5	6
10- We involve customers before the realization of new products	1	2	3	4	5	6
11- We involve customers during the realization of new products	1	2	3	4	5	6
12- We involve customers after the realization of new products	1	2	3	4	5	6
Section (B): Technology (Internet) Orientation						
A1: We invite you to express your level of agreement of the following statements: 1- Strongly disagree; 2- Disagree; 3- Partially disagree; 3- Partially agree; 5- Agree; 6-Strongly agree.						
1- Our company uses sophisticated technologies in its new product development	1	2	3	4	5	6
2- Our new products are always the state of the art of technology	1	2	3	4	5	6
3- Our Information Technology department has a strategic role within the company	1	2	3	4	5	6
4– We constantly update our information technologies	1	2	3	4	5	6
5- Internet has a strategic role in our marketing activity	1	2	3	4	5	6
6- A high percentage of our marketing investment(s) is directed at the Internet	1	2	3	4	5	6
7- Our web site has an important role for improving customer relationships	1	2	3	4	5	6
8- We monitor our competitors web sites systematically and frequently	1	2	3	4	5	6
9- We constantly update our web site contents	1	2	3	4	5	6
10- We think that e-commerce will have growing importance in our industry	1	2	3	4	5	6
11- We organize events for promoting our on line activities	1	2	3	4	5	6
12- We frequently integrate traditional communication with on line communication	1	2	3	4	5	6

Section (C): Web-based Customer Involvement in NPD						
A1: We invite you to express your level of agreement of the following statements: 1- Strongly disagree; 2- Disagree; 3- Partially disagree; 3- Partially agree; 5- Agree; 6-Strongly agree.						
1- Our web site is an important tool for collaborating with customers	1	2	3	4	5	6
2 – Through our web site customers can suggest new ideas in order to contribute to the development of our new products	1	2	3	4	5	6
3 - Through our web site customers can help us in selecting which new product concepts can be introduced to the market	1	2	3	4	5	6
4 - Through our web site customers can contribute to the development of our new products	1	2	3	4	5	6
5- Through our web site customers can test our new products before their launch on the market	1	2	3	4	5	6
6 - Through our web site customers are involved in activities supporting the launch of our new products on the market	1	2	3	4	5	6
7- Through our web site customers can help us defining the price of our new products	1	2	3	4	5	6
8- Through our web site customers can choose what communication content they want to receive	1	2	3	4	5	6
9- Through our web site customers can contribute to define the values associated with our brand	1	2	3	4	5	6
10- On our web site customers can participate in on line surveys about our Web site services						
11- On our web site customers can participate in on line surveys about our products	1	2	3	4	5	6
12- On our web site customers can make complaints about existing products	1	2	3	4	5	6
13- On our web site customers can make suggestions about new products	1	2	3	4	5	6
14- On our web site customers can participate in virtual communities to share opinions and experiences with other customers	1	2	3	4	5	6
15- On our web site customers can participate in virtual concept tests	1	2	3	4	5	6
16- On our web site customers can participate in on line focus groups	1	2	3	4	5	6
17- On our web site customers can use tools for product customization	1	2	3	4	5	6
18- On our web site customers can use open source mechanisms	1	2	3	4	5	6
19- On our web site customers can autonomously design a new product	1	2	3	4	5	6
20- On our web site customers can virtually test the prototype of our products	1	2	3	4	5	6
21- On our web site customers are invited to participate to viral marketing activities (e.g., "send this message to a friend")	1	2	3	4	5	6
22- On our web site customers can find a virtual assistant helping them to identify the best product for their needs	1	2	3	4	5	6
23- On our web site customers can get newsletters with customized content	1	2	3	4	5	6
24- On our web site customers can suggest other customers how to improve our products' usage	1	2	3	4	5	6
25- We offer monetary incentives to reward customers' participation in our on line initiatives	1	2	3	4	5	6
26- We offer not-monetary incentives to reward customers' participation in our on line initiatives (e.g., hall of fame to support opinion leadership)	1	2	3	4	5	6
27 - To support our innovation activities, we use market analysis services developed on line by other independent companies	1	2	3	4	5	6
28 - We use independent companies to support the generation of ideas for new products	1	2	3	4	5	6

29 - We use independent companies to support the selection of new product concepts that can be introduced to the market	1	2	3	4	5	6
30 - We use independent companies to support the new product development	1	2	3	4	5	6
31 - We use independent companies to support the test of our new products before their launch on the market	1	2	3	4	5	6
32 - We use independent companies to support the launch of our new products on the market	1	2	3	4	5	6
33- Independent companies can develop a complete innovative solution for us	1	2	3	4	5	6
34- Independent companies allow us to absorb different customer information compared to that which we can absorb through our Web site	1	2	3	4	5	6
35 - The contribution of independent companies absorbing customer information through their own Web site is fundamental to the success of our innovative process	1	2	3	4	5	6

Section (D): Organizational Mechanisms for Customer Information Sharing and Usage

A1: We invite you to express your level of agreement of the following statements:
1- Strongly disagree; 2- Disagree; 3- Partially disagree; 3- Partially agree; 5- Agree; 6-Strongly agree.

1- All of our business functions (e.g., marketing/sales, manufacturing, R&D,..) are integrated to serve the needs of our target markets	1	2	3	4	5	6
2- Customer information is effectively shared within the marketing function	1	2	3	4	5	6
3- Our marketing function provides information about market trends and customers' preferences to other business functions	1	2	3	4	5	6
4- We organize inter-functional meetings to favor customer information sharing within our company systematically and frequently	1	2	3	4	5	6
5- We freely communicate information about our successful and unsuccessful customer experiences across all business functions	1	2	3	4	5	6
6- We have formal or informal processes which summarize customer information, reducing its complexity	1	2	3	4	5	6
7- We have formal or informal processes for organizing customer information in meaningful ways	1	2	3	4	5	6
8- We have formal or informal processes that rely heavily upon customer information to make decisions relating to new product development	1	2	3	4	5	6
9- We have formal or informal processes that use customer information to solve specific problems encountered in new product development	1	2	3	4	5	6
10- We value customer information as an aid to decision making regarding new product development	1	2	3	4	5	6
11- We ensure that all customer information sources are considered in decision making (not only those that support the preferred action)	1	2	3	4	5	6
12- Customer information absorbed through the Web is systematically analyzed and distributed across the business functions that might be interested in it	1	2	3	4	5	6
13- In our company there are informal mechanisms supporting the sharing of customer information emerging through the Web	1	2	3	4	5	6
14- In our company there is at least one collaborator responsible for supporting internal sharing of customer information absorbed through the Web	1	2	3	4	5	6
15- We use Intranet to favor customer information sharing within our company systematically and frequently	1	2	3	4	5	6
16- We use virtual communities among employees to favor customer information sharing within our company systematically and frequently	1	2	3	4	5	6

17- We have a virtual repository where we save customer information and make it reusable any time	1	2	3	4	5	6
18- In the past we developed new products on the basis of customer information absorbed through the Web	1	2	3	4	5	6
19- We are currently developing some new products on the basis of customer information absorbed through the Web	1	2	3	4	5	6
20- Our company is like an extended family. People seem to share a lot of themselves	1	2	3	4	5	6
21- Our company is dynamic and entrepreneurial. People are willing to stick their necks out and take risks	1	2	3	4	5	6
22- Our company is production oriented. The major concern is with getting the job done. People are not very personally involved	1	2	3	4	5	6
23- The glue that holds our company together is loyalty and tradition	1	2	3	4	5	6
24- The glue that holds our company together is a commitment to innovation	1	2	3	4	5	6
25- The glue that holds our company together is formal rules and policies	1	2	3	4	5	6
26- The glue that holds our company together is an emphasis on task and goal accomplishment	1	2	3	4	5	6

Section (E): Performance variables - External Fit, Time To Market and Customer Satisfaction

A1: We invite you to express your level of agreement of the following statements:
1- Strongly disagree; 2- Disagree; 3- Partially disagree; 3- Partially agree; 5- Agree; 6-Strongly agree.

1- Relative to our competitors, we register better results in terms of customer satisfaction	1	2	3	4	5	6
2 - Our new products usually gain a market share that is superior relative to our competitors' products in the same category	1	2	3	4	5	6
3 – Our customers are extremely loyal	1	2	3	4	5	6
4 - Relative to our competitors, we register better results in terms of time-to-market	1	2	3	4	5	6
5 – Our new product development process is usually well-timed	1	2	3	4	5	6
6 - Marketing and engineering conduct NPD activities in parallel for the same project in order to speed up the development process	1	2	3	4	5	6
7 – We typically innovate more than our competitors	1	2	3	4	5	6
8 – We typically fail less than our competitors with new product	1	2	3	4	5	6
9 - Customer satisfaction is greater when customers are involved in the new product development process	1	2	3	4	5	6
10 – The time-to-market of a new product is shorter when customers are involved in the new product development process	1	2	3	4	5	6
11 - Our competitive advantage for new product is greater when customers are involved in the new product development process	1	2	3	4	5	6
12 - Our ability to generate profit with new product is greater when customers are involved in the new product development process	1	2	3	4	5	6
13- Relative to other industries our company operates in an exceptionally turbulent environment	1	2	3	4	5	6
14 – Relative to our competitors our company has consistently performed well in terms of ROI, market share and overall competitive position	1	2	3	4	5	6
15 – Relative to our competitors our company is more self-centered	1	2	3	4	5	6
16 – Relative to our competitors our company serves its customers better	1	2	3	4	5	6
17 – Relative to our competitors our company provides a higher level of customization	1	2	3	4	5	6

E2. Please, put an X in the box associated with the right answer	
18. The main target for our product is*****:	
a. age	
<18	
18-34	
35-54	
>55	
this variable is not important for our target identification process	
b. sex	
Men	
Women	
c. socio-cultural level	
high	
medium	
low	
this variable is not important for our target identification process	
d. lifestyle (you can give 3 answers max)	
cosmopolitan	
tradizionalist	
sporty	
sedentary	
introvert	
extrovert	
this variable is not important for our target identification process	
E3. Open questions	
18 – What is the primary business of your company?	
19 – How many years has your company been operating a Web site?	
20 - How many years has your company been operating a Web site in its present form?	
21 – What was your firm's approximate sales revenue (turnover) in the last financial year?	
22 – What is your formal job title?	
23 – What is your primary function?	
24 - Number of people employed in the R&D function/number of employees	
25 - Number of people employed in the marketing function/number of employees	
26 - Number of people working on Web marketing/number of employees	
27 - The name of the company you work for (optional)	

Scales used for this questionnaire already existed; however, appropriate scales were not available. The following steps were taken to develop new measures for the addressed constructs: first of all, we reviewed relevant literature and generated a pool of items to tap the domain of each construct. From this pool of items, unique items were selected for

inclusion in initial scales. Next, we conducted in-depth interviews with 15 managers. The managers were asked to complete the questionnaire and indicate any ambiguity regarding the phrasing of the items. During follow-up interviews, they were invited to suggest improvements to the questionnaire. Subsequently, the phrasing of items was further enhanced by the authors and peers, a process that resulted in a final version of the questionnaire.

However, measurement models should be estimated to assess the system of relationships between the items and associated constructs. The reliability of each construct has to be verified as well as the unidimensionality of the measures.

APPENDIX IV - When Disclosing Is Better Than Withholding?

The experiment is designed to compare the response achieved in term of customers' creativity in product definition at different settings of the environments adopted by firms to interact with customers in order to support their innovation process.

> P1: The adoption of a "Disclosing" approach is (positively) related to lower level of customers' creativity in product definition.
>
> P2: The adoption of a "Withholding" approach is (positively) related to higher level of customers' creativity in product definition.

Between-subjects Experiment

Three groups: (A) one "plays" with a firm Web-site, (B) another with a third party Website but where there is a clear exposure to firm's intentions; (C) and the last one "plays" with third parties Web-site (control group). Those playing in the two first groups will experience all the aspects related to the Disclosure approach, so they will be exposed to company information. On the opposite side, those playing with third parties Web-site, according to the Withholding approach, won't be exposed to any company information.

With the term "play" we mean performing a specific task related to new product definition: product attribute suggestion or combination.

Specific web sites will be designed by taking hints from the already existing ones.

Subjects

Actual company customers/users. The number of individuals per group (at least 20 subjects) will be big enough for addressing the variety individuals can show in term of different level of creativity.

Variables

Independent Variable

(A&B) Disclosing approach => presence of innovating company information – i.e. presence on the Web site of some already existing firm product and of firm's brand.

(C) Withholding approach => absence of innovating company information and of any other company operating in the same industry – i.e. no reference points on the Web site.

Dependent Variable

Customer level of creativity is measured considering both quantitative and qualitative aspects. As for product attribute suggestion, it is measured counting the number of suggested attributes and the newness of the suggestion (compared to the already existing attributes - that is, attributes already present in firm's product). As for attributes combination counting the number of combinations and how many times the combinations reflect firm's (already existing) products.

In both case we should control for:

- time individuals have for defining/combining product attributes;

- general conditions (situational and individual factors: do they really know the companies' product?).

- brand/product which customers contribute to. To avoid any biases it could be helpful to increase the number of groups exposed to the Disclosing approach or repeat the experiment, using different brands of the same product: controlling for brand importance, product portfolio and different types of product/industry.

- customers' attitude towards the Web (i.e. customers' web site surfing ability

APPENDIX V - Web-Based Approach Design

The experiment is designed to find the Web design conditions that give rise to maximum or minimum customers' contribution to new product development trough virtual mechanisms.

Propositions should be properly formulated, because having clearly defined objectives is of paramount importance to appropriate design selection.

Two different experiments have to be defined: EXPERIMENT 1 and EXPERIMENT 2.

EXPERIMENT 1

Within subjects Experiment

A group is subjected to different treatments: to address customers' propensity to collaborate as tools positioning changes within the firm Web site or inside the Web page, different possible website designs are defined *a priori* and customers' contribution is measured according to each different designs (i.e. tools[51] positioning).

Specific web sites and tools will be designed for the purposes of the experiments.

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[51] Tool has to be selected according to advantages and limitations associated to each of them (see table 3 at chapter 2)

Subjects

Users already familiar with web-based mechanisms (no less than 25 individuals); in order to avoid any possible distortion related to individuals' limitations in the identification and use of the different tools.

The number of individuals in the group will be big enough for addressing the variety individuals can show in term of different level of creativity°.

Variables

Independent Variable

Position of a specific tool in the Web site

Dependent Variable

Customers' contribution in term of quantity: counting number of times the tool is used, independently from the effectiveness of the contribution.

EXPERIMENT 2

Within subjects Experiment

A group is subjected to different treatments to understand which characteristics should be included in the tools in order to enhance customers' contribution to new product development, several tools characteristics are examined and included independently one at

time (and then simultaneously) in the tools. Customers' contribution is measured time by time.

Specific web sites and tools will be designed for the purposes of the experiments.

Subjects

Users already familiar with web-based mechanisms (no less than 25 individuals); in order to avoid any possible distortion related to individuals' limitations in the identification and use of the different tools.

The number of individuals in the group will be big enough for addressing the variety individuals can show in term of different level of creativity°.

Variables

Independent Variable

Tool characteristics (i.e. presence versus absence of product presentation; presence versus absence of incentive; use of games *versus* use of explicit market research tools)

Dependent Variable

Customers' contribution in term of both quality (i.e. level of creativity or competences, according to the tool goal) and quantity (counting number of outcomes associated to the tool)

In both case we should control for:

- web site layout

- customers' attitude towards the Web (i.e. customers' web site surfing ability)

- customers' attitude toward creative activities

- time individuals have for generating ideas

- general conditions (situational and individual factors)

In analyzing the results, researchers should be aware of the fatigue effect the within-subject approach could produce.

APPENDIX VI - Security Trading On Idea Generation

The experiment is designed in order to find the impact of an incentive system on customers' contribution to the ideation process. The experiment goal is to relate the value of a security to the customer's contribution to idea generation.

> P3: The presence of an incentive system positively impacts on customers' contribution to idea generation.
>
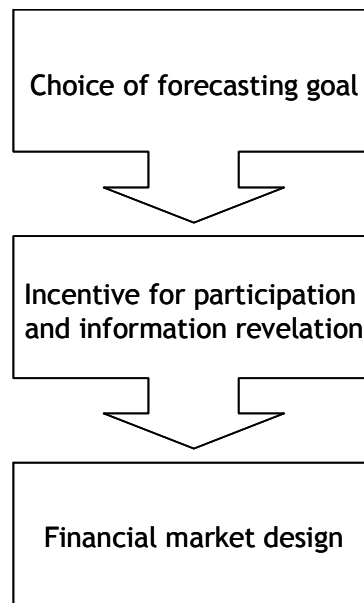> P4: The presence of an incentive system positively impacts on customers' level of creativity.

Between-subjects Experiment

Two groups – (A) one "play" the stock market mechanism and (B) one "plays" with Web-based tools for idea generation, lacking in the presence of incentive systems (control group).

A game is generated on purpose, according to the steps for designing a Virtual Stock Market as suggested by Spann and Skiera (2003) and reported in the Figure A. A multi-period situation (T1, T2, etc.) is proposed. During the first period (T1), customers are exposed to a problem and provided with an initial portfolio of mother-ideas and cash; during this first period customers are demanded to generate new mother-ideas that can be added to their initial portfolio and then traded on the market during the following period.

In the second period (T2) a trading market game is run; customers are required to trade in order to maximize the value of their own portfolio - that is, selling the ideas they don't like (on which they don't want to build on) and retaining those they trust in. At the end of this period, another creative stage takes place; during the third period (T3) customers start to build on the idea they have in their portfolio in order to generate new ideas - both mother and daughter ideas – that can be put on the market, in period four. The fourth and last period (T4) replicates the second one and, at the end of the game, it shows through the securities prices which ideas have been considered as more constructive - each idea should reflect the judgment that the other traders have about its level of creativity.

Figure A. Steps for Designing a Virtual Stock Market

```
┌──────────────────────────────┐
│                              │
│   Choice of forecasting goal │
│                              │
└──────────────────────────────┘
           │
           ▼
┌──────────────────────────────┐
│  Incentive for participation │
│  and information revelation  │
│                              │
└──────────────────────────────┘
           │
           ▼
┌──────────────────────────────┐
│                              │
│    Financial market design   │
│                              │
└──────────────────────────────┘
```

First, the forecasting goal of a VSM determines which future event or market state is to be predicted and is, subsequently, modelled as a specific stock to be traded. Idea generation contribution & creativity level

Second, participants need to have an incentive to reveal their true assessments. This requires the design of the initial portfolio and the final remuneration that together make up the incentive mechanism. Mother & daughter ideas; best idea + public acknowledgment

The third category represents the design of the actual trading on the VSM itself; that is, the selection of market and trading rules. Build on mother & daughter ideas; portfolio maximization = the higher the level of creativity included in the idea and the more numerous is your portfolio => the higher the final outcome

Subjects

Users already familiar with web-based and STOC mechanisms (no less than 20 individuals for group); in order to avoid any possible distortion related to individuals' limitations in the use of VSM.

The number of individuals in the group will be big enough for addressing the variety individuals can show in term of different level of creativity°.

Variables

Independent Variable

(A) Presence of incentive system (stock market mechanism)

(B) Absence of incentive system

Dependent Variable

Customers' contribution to idea generation in term of quantity (counting number of ideas generated at the end of the trade) and quality (i.e. level of creativity – counting number of mother ideas versus number of daughter ideas).

Researchers should control for:

- customers' attitude towards the Web (i.e. customers' web site surfing ability)

- customers' knowledge of the 'topic' they are called to create on

- time individuals have for generating ideas

- general conditions (situational and individual factors)

- customers' attitude toward creative activities

- Web-based tools for idea generation characteristics: it could be helpful to increase the number of control groups or repeat the experiment; the number of control groups should be great as the number of web based tools for idea generation, for eliminating possible biases associated to web tools characteristics.

APPENDIX VII - Customer Satisfaction

The experiment is designed in order to compare the relation existing between different levels of customer satisfaction and firms' level of adoption of new product development web based mechanisms for absorbing customers' knowledge.

P18: The higher the customer' satisfaction the higher the contribution they provide for supporting firms' innovation process through Web-based mechanisms.

Between-subjects Experiment

Three groups "play" with a firm Web-site. Each group is made of individuals showing different levels of satisfaction toward a specific firm or product.

With the term "play" we mean answering to requests included in one or more specific web based tool used by the firm for new product definition. Customers are called to play with the same tool when the unit of analysis is the quality of the contribution. When quantity is the measurement goal, customers are required to play with more tools.

Specific web sites will be designed by taking hints from the already existing ones.

Subjects

Actual company customers/users

The number of individuals per group (at least 20 subjects) will be big enough for addressing the variety individuals can show in term of different level of propensity to participate to market researches for innovation.

Independent Variable

Customers' level of satisfaction toward a specific firm or product: (A) high; (B) medium; (C) low[52].

Dependent Variable

Customers' product contribution to new product development through the Web; in term of quality - measuring the level of creativity or expertise; and, in term of quantity - counting the number of tools they decide to participate in and the degree of task completion.

In both case we should control for:

- customers' propensity to collaboration,
- customers' attitude towards the Web (i.e. customers' web site surfing ability)
- customers' level of creativity and expertise
- tools complexity

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[52] Levels are measured according to literature suggestion (Hill,1996)

The generalization of results should be aware of the fact that results of this experiment are based on evidences from a specific firm operating a specific market.

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