Information goods

and online communities

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Abstract
Digitization and virtualisation of information goods gradually moves the value of these goods from their physical layer towards the social process which generates and prepares a demand that suits them best. At the same time, ICTs (Information and Communication Technologies) are currently challenging the top-down model that channels information from producers to final consumers through the mass-media system and the retail network. On the Internet, new structures of interaction between consumers (virtual communities) are already shaping efficient ways to initiate and develop the demand for information products. This paper presents three types of virtual communities which jointly play a significant role in the emergence of a bottom-up model: (a) file-sharing communities (like Napster), that challenge the top-down editorial model; (b) experience-sharing communities (like Amazon.com), that help consumers to estimate ex ante experience goods characteristics; these communities trigger the value migration from information to meta-information; (c) knowledge sharing communities (like free software user lists), that help consumers to understand complex goods and customize them to their needs; these epistemic communities could lead information goods designers to better apprehend the consumers’ usage constraints. Virtual communities are original interaction structures: they are characterized by very weak ties or even no interpersonal relations; they centre around an information corpus, built and used by anybody for his or her own sake. The survival of these communities does not depend mainly on the altruism of the participants but rather on the structure of the corpus (the file-sharing utility, the reviews, the forum or the user list, etc.). As an institutional infrastructure for final markets, virtual communities could lead to a wider variety and a greater adaptability of final goods.

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Information goods and online communities

Summary

1 The role of ICTs in the current development of markets .................................................. 5
  1.1 Markets and information processing ............................................................................... 5
  1.2 Markets and meta-markets ............................................................................................ 6
  1.3 The development of information goods ........................................................................ 6

2 Experience goods and the limits of the mass media model ............................................. 7
  2.1 Experience goods and the exchange of advice .............................................................. 7
  2.2 The limits of the top-down information model .............................................................. 8
  2.3 The emergence of experience-sharing communities .................................................... 8
  2.4 The construction of a review corpus to enlighten consumption .................................... 9

3 Complex goods and the limits of technology push innovation ........................................ 10
  3.1 Complex goods and the dissemination of knowledge .................................................... 10
  3.2 The limits of the technology push innovation model .................................................... 10
  3.3 The emergence of epistemic communities .................................................................... 11
  3.4 Distributed knowledge and market pull innovation ...................................................... 11

4 Dematerialized goods and the limits of intellectual property .......................................... 12
  4.1 Dematerialized goods and productivity growth ............................................................ 12
  4.2 The limits of the editorial model ................................................................................... 13
  4.3 The emergence of peer-to-peer file-sharing communities ............................................ 14
  4.4 The construction of an efficient distribution system ..................................................... 15

5 Online communities: a new social interaction model? ..................................................... 15
  5.1 Instrumental intimacy or the rationalized social link .................................................... 15
  5.2 The solitary construction of a collective virtual corpus ................................................ 16
  5.3 A participation pattern less cooperative than proactive ................................................ 17
Information goods and online communities

Internet mass utilization developed during the years 1995 - 2000, especially via web and e-mail services. It was believed, perhaps a little too quickly, that information and communication technologies (ICTs) would improve markets’ operation. It was wrongly imagined that business and social models of the real world would easily extend into the virtual world. The collapse of the dotcoms showed that the transition was not so easy and that a simple transposition of commerce into e-commerce or of traditional media into a "multimedia" environment was doomed to failure. The Internet deeply transforms market dynamics and industrial organization. It is indeed a new economy which is slowly taking root, but not the one that was dreamt up: not an old economy using Internet but an online economy.

In the beginning it was thought that groups of surfers in "virtual communities" would follow the pattern of real communities and become the online extension of the latter. It was imagined that, at best, online communities would become almost\(^2\) as efficient as their real counterparts, that they would induce relationships almost as intimate and behavior almost as co-operative. According to the model of monopolistic competition, it was concluded that more extensive and more mobile communities would entail better segmentations of clients and more accurate differentiation of products at both the production and the distribution levels. As a sort of full-size clustering of consumers by affinity, online communities would advantageously replace market analysis: customer segments would no longer appear as the uncertain result of statistical adjustments but as a reality that can be observed and possibly influenced. People dreamt of community marketing\(^3\), and it was even thought that communities of consumers could issue grouped orders\(^4\), that would benefit from discounted prices.

Yet sites which invested on community marketing have collapsed. The virtual communities which have finally emerged are new social structures that differ from those usually referred to by the term "community". ICTs do not transform real processes into similar virtual processes. This had already been noted for e-commerce or online media: retail purchasing, for example, does not simply morph into virtual shopping on commercial web sites. ICTs transform information networks which serve to regulate markets and hierarchies and by the same token, they challenge production, distribution and consumption processes.

Original interaction structures are developing today on the Internet (referred to subsequently as "online communities"); they are already modifying the way consumer tastes evolve; perhaps in time they will close the loop between consumers and designers. In this article, we offer an analysis of this current development, based on actual examples of virtual communities that have recently been observed, i.e. communities hosted by vendor web sites (such as Amazon.com), communities which emerge from users’ forums (e.g. free software distribution sites and user mailing lists), and finally communities that share digital files (e.g. peer-to-peer networks).

The paper is organized as follows: after a short clarification of the concepts of information goods and informational infrastructure of markets (i.e. "meta-markets"), we characterize the economic role played by each type of virtual community, the type of information goods that it helps regulate, and the market shortcomings and failures it could overcome. Finally, in each case, the operating mode of the communities, their governance problems and the motivations of their participants will be examined.

An overview will be given of:

(i) experience-sharing communities (i.e. sites where people can exchange reviews and advices) that make consumer choice easier for experience goods and in particular, cultural goods;

\(^2\) Thus, in the pioneering Wellman - Gulia paper [1999], which forms part of a handbook on "real" social networks (neighbor networks, social networks among urban poor in a Latin American city, personal networks in France, network capital communist and postcommunist countries, personal community networks in Japan, etc.), the authors finally ask the question: how do Internet-based communities compare to real communities? Are they more specialized? Do they have weak ties and strong ties (in Granovetter’s sense [1973]), like real communities? Do intimate links exist in online communities? etc. Such an approach naturally leads the reader to conclude that virtual communities are nothing more than clumsy transposition of real communities, that may improve over time and eventually become some substitutes for them.

\(^3\) See the Hagel – Armstrong work [1997] on community marketing.

\(^4\) Thus, group-buying website, Koobuy, which became KoobuyCity, or Clust finally disappeared at the end of 2000.
over time these communities could substitute for the top-down information model (mass media model);

(ii) epistemic communities (i.e. knowledge sharing communities) which make it possible to disseminate the knowledge needed to use complex goods; in the future these communities may act as a communication channel between consumers who try to adapt complex goods to their particular needs and developers to design next generation products;

(iii) file-sharing communities, dealing with cultural goods or software; these communities make it possible to achieve the productivity gains promised by ICTs, based on low cost duplication, processing and storage of digital information; they challenge the editorial model of intellectual creation.

Lastly, we will point out what these three types of communities have in common: (i) an original sociality: instrumental intimacy, i.e. rationalization of the interpersonal link; (ii) a specific purpose that justifies their existence: the production and maintenance of a collective information corpus; (iii) a mode of participation that is less altruistic than proactive: participation in the community originates less from disinterested cooperation than from the wish to promote an opinion, a way of thinking or a model of society.

In this article, we are not trying to analyze the various services, protocols and software that enable communities to develop and work technically. Apart from multi-player games (MUD) and chat rooms, these services5 offer asynchronous contacts on the basis of various protocols: e.g. email-based discussion lists, forums (Bulletin Board Systems), discussion groups (e.g. Usenet6 newsgroups), software made available by vendor on web sites (such as Amazon) or by distributors of free software (such as Debian), etc. The distinction between these various services is not always very clear and commercial sites can take advantage of services offered free on the Internet (as Amazon takes advantage of the IMDB Internet Movie Data Base). Such services can also be used as a support for the online transposition of real communities: clubs or associations that develop a website, support groups, etc. The analysis presented here is centered on the way online communities operate and on their economic role, whatever the precise type of on-line services used, as the same type of community can develop using various interaction applications7 (e.g. an experience community can use newsgroups, forums, discussion lists, personal pages or specific software offered by an online vendor, etc.).

Finally, as we focus on the new regulations that the online communities can induce in the final market, we limit our scope to communities on the Internet without referring to working groups that companies can set up via their intranets. No mention is made here of the transformation of production processes resulting from a possible use of online communities inside companies (intranet), or between different companies (extranets, B to B platforms, etc.).

1 The role of ICTs in the current development of markets

1.1 Markets and information processing

Markets were first understood as exchange mechanisms which allow efficient allocation of resources without requesting a centralized understanding of each person’s preferences. In this framework, production functions and consumers’ utility functions are assumed to be exogenous. From a dynamic viewpoint, markets are considered as processes of reciprocal learning: demand progressively learns the constraints of the production function while the producers learn the features of the consumers’ utility functions. The free market described by classical economists8 is a means of inventing new forms: new products, new usages.

5 For a precise description of newsgroup services on the Internet, see the article by Kollock & Smith “Communities in Cyberspace” which is as an introduction to Kollock & Smith [1999].

6 In particular see the description of these newsgroups in Smith [1999]: “Invisible Crowds in Cyberspace: Measuring and Mapping the Social Structure of USENET”.

7 Procedures and software are nonetheless crucial to shaping communities; some minimum changes in procedures can occasionally lead to significant consequences; in particular the role of the interface has been studied in the case of chat rooms: see the analysis of alternative chat interfaces (chronological presentation, conversation threads,..) in Smith, Cadiz & Burkhalter [2000].

8 See, for example, Hayek [1978] or Kirzner [1985].
So, it may be surprising that market models do not explicitly take into account information exchange and the various institutions that allow the collective knowledge processing. As far as allocation of resources is concerned, the efficiency of a market obviously depends on the regulatory constraints that can weigh on physical exchanges, on the tax system, on the confidence in means of payment and in the security of transactions, etc; whereas the efficiency of a market that invents new forms tends to depend mainly on information networks: if the latter yield lower search and learning costs, qualitative matching between supply and demand will be improved.

Information and communication technologies (ICTs) act at two levels: on the one hand, at the level of physical exchange mechanisms, by simplifying some transactions and by reducing the logistics costs for purchases (virtual shops), payment (electronic payment), delivery (management of delivery rounds); and on the other hand, at the level of information exchange mechanisms, which facilitate demand awareness and acculturation as well as innovation and product design.

1.2 Markets and meta-markets
From a static viewpoint, for ordinary products, (i.e., standardized, easy to use and well known ex ante by consumers, when there is no fashion or imitation effects, etc.), the performances of markets do not heavily depend on information exchange between potential consumers and early adopters. All the goods are well known by all the consumers, even if these goods are not equally accessible due to transportation costs (these costs can be interpreted as information search costs: search goods).

From a dynamic viewpoint, when products are complex, when they change very rapidly, when their utility is uncertain ex ante, consumers must be helped to search and collect data disseminated in the final market. Internet and ICTs then allow for powerful information gathering and collective processing. User networks could be more or less spontaneous or controlled by producers and/or vendors. These user networks form new informational infrastructure that can improve the way retail markets operate. They will be subsequently called “meta-markets”. They are not real markets as some economists presumed during the dotcom frenzy, when it was supposed that information on the primary market could form the staple product of a genuine secondary market and that gatekeepers could broker meta-information directly. Thus, the knowledge of a price, and the search for a better price would have its price in turn. Nevertheless, even if such information brokers only managed to survive according to a standard media model (e.g. banner advertising on sites offering price comparison or shopbots), it remains true that some networks or communities of consumers resemble markets: self-regulation mechanisms must develop to ensure fluidity of exchanges, permanence of the system (resistance to free-riders) and harmonious distribution of quasi-costs (e.g. the necessary balance between access time and writing time).

In the case of information communities, it would be simplistic to reason in terms of altruistic contributors and free riders (lurkers) and undoubtedly naive to think that meta-information could simply be sold and bought as a product. Here, we focus on the mechanisms that allow these communities to function and on their role in regulating the associated final market.

1.3 The development of information goods
Meta-markets, i.e. the sophisticated information exchange systems needed for markets to operate are all the more useful as the underlying primary markets relate to information goods.

Here, "information goods", refers to the goods (or services) that incorporate information and/or that need information to be chosen and consumed. Of course, these two criteria are different: there are goods which contain information and that require little meta-information to be produced and consumed; just as there are goods, in particular those involving radical innovation, that require lengthy acculturation on the part of consumers, without however containing much information. Nevertheless, in practice, these two criteria often overlap: it is precisely information-rich goods (e.g. cultural goods or software) that also require exchanges of information either prior to purchase, to inform demand of the usefulness of their content, or after sale, to help utilization.

Information and communication technologies change the nature of information goods: on the one hand information becomes "free" information, i.e. it is no longer rigidly tied to the physical layer, while on the other hand, costs of handling meta-information fall, which facilitates the development of the latter and increases its efficiency. These two trends are not independent. On the one hand, capturing the value of information goods cannot be efficiently based on the information they contain, because this free

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See the Baye – Morgan article [2001].
information becomes a collective product that is optimally priced at its marginal cost of reproduction (the no-charge economy). On the other hand, the value of information goods might be extracted from the mechanisms they specifically need to meet the appropriate demand (attention and knowledge economy). In this sense, meta-information is the key to the value of information goods, even if it is not directly marketable.

Information goods will subsequently be broken down according to the type of market infrastructure (meta-market) which can serve to regulate them:
- In the case of experience goods, quality is not known ex ante by consumers. It could happen in a context of vertical or horizontal differentiation. In the case of vertical quality, all buyers agree on which of two different grades is the more desirable (e.g. the reliability of a transaction on a web site like eBay: everyone prefers a high degree of reliability). In the case of horizontal quality, products are not ordered in the same way by all the consumers (e.g. the quality of a cultural product, such as a DVD on a web site like Amazon.com, depends on each individual’s tastes). In both cases, potential consumers must turn to early adopters for direction: in the case of vertical quality, they must trust them (e.g. the sellers’ ranking system on eBay), while in the case of horizontal quality, they must be able to estimate the closeness between their tastes and those of the reviewers (e.g. customer reviews on Amazon.com).
- In the case of complex goods, the way of using the product and of adapting it to personal needs is not known ex post. After the purchase, consumption demands acculturation and learning; instructions for use supplied with the products and after-sales services are not sufficient; training sessions are both costly for producers or retailers to set up and, in many cases, off-putting for future consumers.
- In the case of dematerialized goods, information is freed from its physical layer: this information is either engraved on a CD or a DVD from which it can be extracted, or in files downloaded through Internet. A bit stream is a collective product, with a very low or zero marginal cost of reproduction but with a very high initial fixed cost of production. Regulations must simultaneously allow widespread distribution, the financing of fixed costs and, above all, orientation of creation (which is no longer simply oriented through market reactions).

2 Experience goods and the limits of the mass media model

In the case of experience goods, ICTs, and in particular web services, have upgraded the markets’ information setting by allowing consumers who have bought and appreciated a product to share their experience with potential customers who wonder about the quality and usefulness that they could derive from its consumption. In the past, customer information had to be disseminated10 by a centralized review and advice system (mass media system). The transformation of this top-down informational infrastructure into a bottom-up one is likely to bear multiple consequences upon the dynamics of the primary market.

2.1 Experience goods and the exchange of advice

When the quality of the experience good is objective11 (vertical differentiation of quality), providing advice raises few difficulties, at least when compared with the case of horizontal differentiation. For example, setting up a reputation reporting system demands to ensure12 that there is no cheating (e.g. dishonest vendors arranging to appear reliable through buyers who connive with them) and to allow a comparison of subjective scales: this involves, for example, correcting the excessively favorable advices generated by over-tolerant critics.

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10 Here the “top-down information model” refers to the overall mass media system (advertising, radio, television, newspapers, etc.) that makes it possible to inform the consumer today. Messages not only come from producers and distributors but also possibly from independent reviewers, critics and experts. Analysis of this system show that to be really efficient the broadcast messages have to be relayed by intermediaries (opinion leaders): see, for example, the “two-step-flow” model by Katz & Lazarsfeld [1955]. As a result, the top-down information model and the community model described here differ less in their final orientation of creation (which is no longer simply oriented through market reactions).

11 More precisely we speak of vertical differentiation of quality when, in the absence of any price differentials, all potential buyers would adopt the same classification of goods.


Information goods and online communities - Michel Gensollen
In contrast, in the case of cultural goods (e.g. a book or a film), when tastes and opinions are scattered (horizontal differentiation of quality), a review can only be interpreted when sufficient information is supplied about its author. It is then necessary to provide potential buyers with a large quantity of information, i.e. not only opinions on the goods themselves but also a description of the different reviewers.

In the case of rapidly renewed products, such a model of collective review will substitute completely for the top-down information model (i.e. the mass-media model) only if it can play a double role: both (i) draw attention to the goods recently issued on the market and (ii) disseminate various estimations of their quality. Online communities seem more efficient today as regards the second dimension and distributors’ sites have had to implement specific non-community procedures to focus consumers’ attention: generally, statistical estimates of product’s proximity that can provide potential customers with short lists of new products (e.g. “Customers who bought this DVD also bought:…”). Nonetheless, there are attempts to enable communities to attract attention to products; thus, on the sites of some vendors\(^\text{13}\), the contributors can post lists of goods which, in their opinion, resemble each other and are quality products (e.g. in the form of a hit-list: the ten best science-fiction films etc.).

### 2.2 The limits of the top-down information model

Before the Internet, awareness and knowledge needed for consumption were mainly provided by the mass media top-down model. Such a procedure could be efficient if products are not changing too rapidly and if quality differentiation is vertical rather than horizontal (i.e. when consumers’ tastes are close to each others). When products and services differ and try to adapt very precisely to each customer segment, then the costs of a centralized meta-information model become heavier. In the case of information goods, such as books or movies, a customization splitting the market into many cultural sub-markets can only be undertaken in the framework of a decentralized review system.

The top-down information model rests mainly on three elements: branding, advertising and professional reviewing. These elements are used differently depending on whether the experience goods are vertically or horizontally differentiated.

In the case of vertically differentiated quality (congruence of tastes), the producer is generally aware of and in control of the quality produced. Consumers’ choices can be simply channeled by brand names and the advertising campaigns needed to make them known. For some goods, specialized publications give access to experts’ opinions and the results of tests carried out by consumer associations. Some distributors, when they can make their objectivity credible, can also participate efficiently in informing potential clients (for example, this is often the case with electrical home appliances). For this type of products, online communities make little contribution and actually have a minor presence on the Internet.

In the case of horizontally differentiated quality (different tastes), the producers have difficulty in controlling the quality produced and the brand system becomes largely irrelevant. The top-down information model could then only be based on multiple reputation factors, with each one reducing the uncertainty concerning the quality, at least for certain segments of the customer base. Thus, one can try to assess the quality of a movie from the actors playing in it, the director, the producer, or even the theaters where it is programmed. When tastes are widely differentiated such a model is inefficient. That is why, in the case of cultural goods, producers try to focus consumers’ attention on a very small number of easily identifiable goods. Thus, online communities could allow a wider variety of products and over time, less homogenization of tastes.

### 2.3 The emergence of experience-sharing communities

The Internet was initially considered as an information infrastructure which could be used in the framework of the top-down information model; i.e. as a classic centralized mass media system characterized by advertising (e.g. advertising banners). During the anarchic growth of dotcoms, attempts were made to adapt the concepts of the top-down information model to the Internet and, for example, to argue in terms of website audience or exposure of specific targets to advertising messages. However the web does not provide clear advantages over newspapers, radio or television when it is used as a traditional media. Here again, the Internet is more useful in inventing new services than in simply adapting existing ones.

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\(^{13}\) On the Amazon.com website and also on other sites, such as the BD Paradisio (http://www.bdparadisio.com/) website, which advertises and sells comic books.

*Information goods and online communities* - Michel Gensollen
“Experience-sharing communities” are specific search communities where early adopters provide valuable information on the quality of experience goods. These communities did not appear on media information sites (although this would have been logical) but in spontaneous discussion and opinion-exchange forums\(^\text{14}\) or on cultural product vendor sites (in particular on the Amazon.com site, which has progressively refined its consumer interaction software).

The main difficulty that these sites had to face came from the need to provide information that should be both precise enough to foreshadow the usages of the products and synthetic enough to limit the consumers’ search time. A whole range of procedures and software has been designed, building on the interaction structures developed spontaneously on the Internet (Usenet Newsgroups, Bulletin Board Systems, discussion list by e-mail, personal webpages, etc.). The latter have been tested and gradually selected by the distributors’ sites in order to permit ephemeral, intimate and efficient relationships between potential consumers and experts. In particular, those who issue reviews can often describe themselves in a specific space (e.g. a personal webpage on the site). The reviews are in turn reviewed according to their usefulness and the reviewers are ranked according to the number and quality of their contributions, which can be considered as a form of symbolic remuneration.

Still, star-products (i.e. products on which the mass media system has focused attention) have too many redundant reviews; this is inefficient and slows down searches, while the products that should benefit most from a decentralized review system usually get too few reviews. It is not certain that online communities have already created a greater differentiation of cultural products: the answer may depend on the type of goods considered (books, CD, DVD, etc.).

Moreover, in order for such a decentralized review system to be really useful, the potential customers must find sufficient advice about the products they are interested in: the community must therefore be very diverse. The distribution sites that offer such review services enjoy a scale related competitive advantage: because of its size, Amazon.com has a dominant position on cultural products in the United States. But the vendors that edit reviews must also be able to link this service to actual buying or, at least, to offer prices and levels of service similar to the best market offers, in order to make the customers stick to their site.

### 2.4 The construction of a review corpus to enlighten consumption

Experience-sharing communities are characterized by the corpus they create and use. For a participant, the usefulness of the community depends on the quality of the corpus: relevant reviews, easy-to-access comments, meta-review system, efficient forum software, etc. Every product must have a sufficient number of reviews so that everyone can be efficiently guided while star-products must not have too many reviews which are time-consuming to skim through (or in this case, the reviews should be edited and presented according to their quality, which is itself estimated by a feedback from readers). For reviewers, the incentives to contribute depend also on the nature of the corpus and on the quality of the audience, i.e., in fine, on the impact that publishing an opinion can have.

A “good” corpus of reviews minimizes the writing and reading times for a given level of quality; as there are much more readers than contributors, the greatest constraint comes from the reading process. So, reviews must be qualified by several comments and reviewers must be ranked according to the usefulness of their contributions.

Thus, for a virtual community, it is not possible to consider the contributors as being only altruistic and the readers as only taking advantage of the corpus as free-riders. On the contrary, the reviewers seek to promote their opinions and tastes and they are prepared to spend a considerable amount of time to do so\(^\text{15}\). Those who read the reviews undertake the complex and time-consuming task of selecting reviews which appear useful to them and seeking information about the issuers’ personal characteristics in order to fully understand their reviews. There is no altruism among reviewers: they try to increase the effective customer base for products that please them, so that these products multiply and gain quality. Readers do not exploit reviewers; on the contrary, the more numerous they are, the more the reviewers can promote their opinions.

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\(^\text{14}\) For a description of such forums, see Smith [1999] and for a tentative modeling see Curien et al. [2000].

\(^\text{15}\) For example, on Amazon.com, even if extreme cases are not considered (the first contributor wrote more than 4,500 reviews), the 50\(^\text{th}\) expert wrote around 500 reviews and the 500\(^\text{th}\) expert wrote more than 150 (classifying reviewers according to the number of reviews).

*Information goods and online communities* - Michel Gensollen
The corpus of reviews created by an experience community therefore plays the same role as the "word of mouth" informal interaction system. But these virtual conversations are rationalized: long term personal relationships turn to ephemeral, narrow and mediated social links.

Experience-sharing communities are fragile to the extent that the information corpus is under the control of an agent (the webmaster), who can edit the information (by withdrawing some texts or adding others) and who is supposed to do so because of his editorial responsibility. The webmaster's capacity to credibly commit himself to objectivity of the editing is then crucial for the survival of the community.

3 Complex goods and the limits of technology push innovation

In the case of complex goods, the Internet provides markets with information processing social systems that contribute to the training of novice consumers: in epistemic communities, a newbie can benefit from the advice of experts or early adopters. As in the case of experience goods, this is a sort of mutual help among consumers; but epistemic communities are very different from experience-sharing communities because the tasks to be performed are much more complex: it is no longer a question of comparing tastes but of sharing new representations.

3.1 Complex goods and the dissemination of knowledge

Here a product will be called complex if, not only its use is difficult to learn and, for example, requests reading a long set of instructions but also, more specifically, if:

- the potential consumers have not already formed the cognitive representations they would need to efficiently use the product; written instructions are not sufficient and prior training is essential;
- the product is not ready to use: it must be customized insofar as it is less expensive to produce a sort of "framework product" that will then be adapted by each consumer for his specific needs; this product fine tuning is not always easy, precisely because all of the possible adaptations could not have been tested during the production phase; this is generally the case with software.  

Complex goods could develop only because, at the production level, interface standardization improved (e.g. the case of video recorder, television, mobile telephone, etc.) and, at consumption level, users could benefit from training, generally at work; thus they can configure complex goods when these are identical for residential and professional usages (e.g. computers and basic interfaces such as Windows).

3.2 The limits of the technology push innovation model

When innovation is only driven by technical progress, a new product is often designed without sufficiently taking into account the difficulties that the customers could encounter figuring out how to use it. Ergonomics and human factors recently came at the forefront of the discussions on the digital economy because of the growing awareness of both the scale of adaptation costs between supply and demand and the difficulties involved in financing them. It is now acknowledged that it is far more efficient to take into account the constraints imposed by final demand in terms of representations and user competence as soon as possible during the product design process. With the speed of technical progress and the development of complex goods, the technology-push innovation model comes to a crisis.

Communities offering mutual support for consumers of complex goods are original and very different from the experience-sharing communities insofar as they can play a double role: helping to train potential customers, but also allowing developers and designers to better understand customers' needs and representations in order to take them into account when designing products. Such a feedback would also be conceivable in the case of cultural goods: today it only plays a limited role and sometimes comes up against the opinion that in cultural matters, taking account of demand at

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\[16\] This is the argument of James Bessen [2001] who wrote: "With complex software, standard products cannot address all consumer needs and proprietary custom solutions are not always offered. Open source allows consumers to create their own customizations. When such user-customizations are then shared, open source products grow in quality and features."

\[17\] Examples of such cooperation can be cited, for example on the previously described comic book distribution site, BD Paradisio.
design level is not always judicious (independence of artistic creation, the mass audience’s bad taste as illustrated by commercial television, etc.).

3.3 The emergence of epistemic communities

Proprietary software editors have been trying to replace instruction manuals by electronic documentation, which can be available as local support or as online interactive service. For simple stable software, in a standardized context, such a procedure is consistent with mass consumption, when users have been trained in their workplace in the rudiments of information technologies (IT).

In the case of free software, the effort has tended to focus on providing user mailing lists and discussion forums, where users exchange clues and guiding information on installing and using the products and report bugs or documentation errors. Thus, in the case of Debian\(^{18}\), an operating system and application software based on the Linux core, more than 8,000 "packages" (i.e. 8,000 software components) are available. These packages can be in a stable form but they can also be released while being developed: "testing distribution" or even "unstable distribution". To enable users to install and test programs, detailed documentation is available on line (made up of manuals, many HOWTO guides, and frequently updated FAQs\(^{19}\)) on the one hand and, on the other, discussion lists are opened where everyone can register to ask or answer questions and possibly to suggest corrections and improvements.

The common information corpus is thus composed of a rich documentation written by experts and of interactions between those seeking to solve practical problems, those who have already solved similar problems, and experts who can analyze these problems and recognize that some questions reveal bugs or limits in software applications (real bugs, documentation imprecision, poor interface design, etc.).

Thus, "epistemic communities" are specific consumer communities where early adopters can interact on the one hand with developers and designers to help them correct and improve complex products and in the other hand with beginners who cannot make do with the directions for use and the FAQ. For such "epistemic communities", where knowledge is unevenly distributed, the main problem comes from the heterogeneity of skills. The trade-off between contributors’ and readers’ times, already pointed out in the case of experience-sharing communities, becomes crucially important here: novices must have read all the relevant documentation so that they do not ask obvious questions that clutter up the list and waste experts’ time. Indeed, most of the contributors’ time is not devoted to writing answers but to sorting out questions in order to identify those that are useful to deal with\(^{20}\). This issue is all the more important as the number of contributors is much lower than the number of questioners.

In user mailing lists, the difficulties involved in finding an efficient allocation between the questioners’ working time (time to prepare the question) and the experts’ time to find the relevant questions in the list, lead to numerous calls to order and even conflicting exchanges (flaming). These dysfunctions could even result in the splitting of the list into sub-lists according to the level of competence: for example, novices, beginners and some seasoned users on a low level list and seasoned users, experts and software designers on a developer list. Such a segmentation may appear sensible; nonetheless, it breaks the loop between designers and customers, which is the main asset of epistemic communities.

3.4 Distributed knowledge and market pull innovation

In mailing lists, if one sets aside simple precise questions which, by omission, have not been included in the FAQs, a large number of exchanges aim to dialectically clarify complex representations. Hence the importance of discussion threads: the first formulation of a question is generally not meaningful enough and this first draft must be interactively worked upon.

Beginners do not know what they do not know (to quote Hayek’s formula on central planners): ignorance is not a lack of information but a lack of conceptualization. Someone who does not know how to run an application on his computer often does not know either how to explain what is happening and his questions can be enigmatic or even unintelligible for an expert.

\(^{18}\) http://www.debian.org/

Manuals and documents are completed by online help: FAQs, Frequently Asked Questions.

\(^{20}\) Thus Eric von Hippel reports (see Lakhani and Hippel [2000]) that, in the user-list for Apache software (a list where most participants are software developers) 25% of the questions do not receive any answer, that there are relatively few contributors and that these spend a greater part of their time reading and filtering the relevant questions than answering them (to reply takes only from one to five minutes).
A heterogeneous epistemic community on the Internet (e.g. user mailing lists) is characterized by an unequal distribution of knowledge among the various participants. In contrast to a community of experts with complementary skills\(^{21}\), the communities referred to here mix experts of very different natures: those who know the products and their operating logic and those who know how they want to use these products. The fact that the "demand experts", in some ways "the experts in incomprehension", are considered as ignorant does not simplify the relationships between participants in discussion lists.

Thus, it is understandable why segmentation of user lists by levels of competence leads to loose an essential advantage: orientation of innovation by the reporting of implementation difficulties. The most naive questions are occasionally the most useful for developers to ponder; the most badly formulated questions are precisely those that indicate a gap in representations between designers and users. But these questions are immersed under an ocean of naive questions, coming from beginners who save on reading documentation.

Ensuring smooth operation of heterogeneous epistemic communities is an essential condition for developing better free software. Open source applications that developers enjoy designing are rapidly written whereas some applications that users need are never developed. Thus, closing the gap between experts and consumers is crucial for the very success of open source over proprietary software.

### 4 Dematerialized goods and the limits of intellectual property

In the case of dematerialized information goods, ICTs, and in particular peer-to-peer networks, have made efficient pricing possible: as the marginal cost of copying and transmitting a file is almost zero, a zero price ensures an optimum situation once the good is produced. Two problems must be solved: the financing of the fixed cost of production and the co-evolution of supply and demand.

The information available in digital form (bit streams) can be distributed by telecommunications networks at very low costs but the final customer must be equipped with several electronic terminals (computers, games consoles, MP3 players, etc.). There is thus a current conflict of interest between editors and ICT industries; there is also a conflict of interest between editors and consumers, the latter experiencing a drastic reduction of their digital fair use rights; finally there is a conflict of interest between telecommunications operators and editors, the latter wishing to keep a permanent link between information and its physical layer (CD, DVD, ...).

Digitization is therefore happening very slowly not for technical but for economic reasons and online file exchange communities (i.e. peer-to-peer networks) have developed in a particular context of fighting against obsolete legislation (copyright and patent).

#### 4.1 Dematerialized goods and productivity growth

Information and communication technologies transform conditions of producing and consuming information goods. At the production level, better ICT equipment results in significant gains in quality (e.g. through digital processing) and major cost reductions: text and photo processing, digital cameras, camcorders, music recording equipment, etc. of professional quality are now readily affordable by individuals. At the consumption level, recording equipment, processing software and low-cost storage allow individuals to reuse digital products to create new ones by reassembling them.

"Open source" in the cultural domain is technically possible. Once a bit stream is made (text, music, movie, etc.), its duplication, compression, transmission and transformation by consumers over networks occur at almost zero costs: dematerialized information goods are collective goods.

The value of information products can be partially captured through various business models that can be characterized as follows:

- The “physical model” consists in rejecting digitization altogether (i.e. by ensuring that bit streams are permanently tied to their physical carrier). There is no information economy as such but an economy of physical objects or locked files\(^{22}\). Rejecting duplication means

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\(^{21}\) The epistemic communities studied by Emmanuel Lazega [2001] in the case of a law firm or by Edwin Hutchins [1995] in the case of a ship’s crew provide examples of communities of experts.

\(^{22}\) It will be noted that the link between information and the physical carrier (CD, DVD, ...) can not only be obtained by encryption and anti-copying protection processes but also, straightforwardly, by increasing the quantity of information for the same service (supposedly of better quality); thus the very inefficient DVD video encoding, which does not offer better quality than DivX encoding designed by hackers (and used on peer-to-peer networks)
rejecting the gains in productivity and welfare permitted by digitization. It also naturally leads to confrontations between producers-publishers and consumers and, to a certain degree, authors. Finally it places the consumption of cultural goods in an environment of suspicion, prosecutions and penalization which is at odds with the hedonism and creativity that are inherent to this type of consumption.

− The “servicization model” consists in shifting the value of cultural goods towards physical by-products or services. A movie can already draw a significant portion of its revenue today from (i) the sale of characters or images, just like brands (e.g. Mickey) and (ii) the transfer of its characters or script to other types of products, such as video games or texts (novelization). Such a strategy often requires the extension of copyright rules.

− The “customization model” consists in directly reducing the collective nature of information goods: when a product can be customized for a small number of consumers, its duplication becomes a lesser threat for publishers. An adapted information product does not need the same protections as a mass market product. However, in this case, the fixed costs have to be amortized over a small customer base: this limits this solution to luxury goods. This leads to separating production into two phases: the creation of a general pattern which can be amortized over large customer bases and an adaptation of these patterns to various customer segments, a phase in which the market value can be captured.

− The “matching and acculturation model” consists in placing the value less on information and more on meta-information: i.e. less on information content and more on software and services that can be used by customers for identifying goods that suit them. The shift of value from information to meta-information is a particular way of reducing the collective nature of information goods, as the relevant meta-information is specific to each individual. Thus, even if a work can be copied freely, it will finally take its value from the procedures that can attract the consumers who would like it. Today, a service like Musicmatch23 provides this type of service: for each customer it designs successive bundles which are increasingly adapted to his/her specific tastes.

Thus, online communities play together an essential role in the development of information goods: peer-to-peer communities are forcing editors to change their business models, experience-sharing communities are developing meta-information and are shifting the value of goods towards matching procedures and, finally, epistemic communities make it possible to adapt innovation to consumer uses and representations.

4.2 The limits of the editorial model

Business models of editors and publishers are based on intellectual property rights whether these rights specifically protect an expression (copyright) or a process (patents). When they were enacted, these regulations took great care not to harm innovation and the dissemination of knowledge: for patents, they set up protection length consistent with the then rather slow pace of technical progress and they stipulated very broad exceptions to copyright (fair use, private copy, right to quote, public libraries, etc.).

The speed of technical progress should have been reflected in a reduction in length and scope of patents. The low-cost transmission and transformation of bit streams should have led to reduced authors’ rights and copyright protection. In contrast, we are witnessing a counter-productive reinforcement of these constraints: copyright length has been considerably extended24, fair use is being more narrowly defined and home copying will soon be forbidden or made impossible25. Software, whether protected by copyright or patents, cannot be freely enhanced and customized; applications cannot evolve and adapt to new needs because the source is not open to scrutiny.

23 http://www.musicmatch.com/
24 The US Congress recently extended the copyright period by twenty years via the Sonny Bono Copyright Term Extension Act; in its ruling Eldred v. Ashcroft of January 2003; the Supreme Court confirmed that Congress did indeed have the right to prolong the length of copyright under the Constitution.
25 See, for example, the analyses by Lessig [2001] and Samuelson - Davis [2000] on the challenge to fair use in the United States.
The editorial model, based on intellectual property rights, is linked to the top-down informational infrastructure (mass media); it is being challenged by the development of online communities. The model which will be induced by a bottom-up market infrastructure (virtual communities) is not perfectly clear yet. However some of its features are foreshadowed by the current challenging of notions inherited from the industrial era (which in the domain of information goods, starts with the invention of printing):

- The definition of a clearly identifiable work is no longer possible in a world where copying, reuse, and hybridization can be done efficiently. Thus webpages do copy, use and freely adapt the components of others, like storytellers in oral tradition imitated each other to create a collective corpus.
- Similarly, the concept of original author is waning. It is no longer possible to consider an author as a demiurge, who is indefinitely the owner of his or her creation. Cultural works and scientific innovations are now created by teams rather than isolated individuals and these teams are well aware of what they owe to collective research and invention.
- Finally, in many cases, the traditional model of authorship is challenged: in this model the author is considered as a producer who has to be remunerated and the reader or viewer is seen as a customer who must pay the price to access the product. With many voluntary authors, each working mainly for his pleasure and addressing narrow audiences, it becomes less and less clear whether emitters or receptors should be remunerated, emitters for the works they conceive or receptors for the time and attention they agree to give.

4.3 The emergence of peer-to-peer file-sharing communities

Peer-to-peer networks (file exchange communities) have recently got better media coverage than meta-information processing communities (i.e. experience-sharing communities or epistemic communities). Even though all of these communities challenge the top-down information model, peer-to-peer networks appear to harm publishers more directly by offering free substitutes (MP3 or DivX files) to expensive products (CD, DVD). The RIAA (Recording Industry Association of America) played a driving role in the process that led to the prohibition of exchange sites like Napster and their replacement by file-sharing software, less easy to attack. Publishers were unable to fully understand the advantage they could derive from the Internet and when they bought file exchange platforms they used them as supplementary radio stations. In contrast, equipment manufacturers were more innovative in finding new markets for their products (CD copiers, MP3 players, etc.).

File-sharing communities have become more efficient if less visible: they are based on community software that build a "commons" of files on the participants' hard disks; this is only efficient if there is a means of identifying the files currently available (with information on the bandwidth). It would be only natural over time for this technical meta-information to be extended to content-related meta-information, which could lead to a convergence of file-sharing communities and experience-sharing ones.

With the development of broadband, file exchange communities will soon extend to movies and threaten the movie industry's value chain. These communities will accelerate the value transfer from the primary market towards the meta-market, a transfer that will gradually occur for all goods but which is more advanced for information goods. If all movies or musical works are accessible free of charge via software like Gnutella or Kazaa, it becomes clear that the value is no longer based on the

26 Authors are marginal in the information economy and at best only gain 5% to 15% of revenues (for texts and music; in the movie industry, it depends on the definition of "authors" and can reach 40%). When publishers hide behind authors to explain the price of information products, they are neglecting the fact that most costs are associated with publishing tasks and not creation itself. ICTs profoundly alter the publisher's work and have little effect on the process of creation.

27 See the site: http://www.riaa.org/.

28 The Net Act (16 December 1997) criminalizes the supply of files with copyright protected content, even when supply is not done for profit (see the text at http://www.usdoj.gov/criminal/cybercrime/p.html). On its site (http://www.riaa.org/Music-Rules-2.cfm) RIAA states: "The No Electronic Theft law (the Net Act) sets forth that sound recording infringements (including by digital means) can be criminally prosecuted even when no monetary profit or commercial gain is derived from the infringing activity. Punishment in such instances includes up to 3 years in prison and/or $250,000 fines. The NET Act also extends the criminal statute of limitations for copyright infringement from 3 to 5 years." Recently, RIAA tried to force Verizon to reveal the names of customers suspected of illegally downloading music from file-sharing networks.

29 See, for example, the development of mp3.com after its purchase by a publisher (http://www.mp3.com).

30 Today, Apple is becoming involved in distributing music (iTunes Music Store) and a software copying publisher, Roxio (which developed Easy CD Creator) and owns the "Napster" name, has just bought Pressplay, the platform that holds the rights of the Sony and Universal publishers.
information itself but on the services and software that help the supply / demand matching procedures and the acculturation process.

4.4 The construction of an efficient distribution system

Like the above described epistemic or experience-sharing communities, peer-to-peer networks are characterized by a common information corpus: anybody may contribute to it and anybody can use it. In the case of file-sharing communities, all the files in the public directories at a given moment form the community corpus.

The cost of participation is very low: it involves placing a file in his/her public directory. In the case of a rare file that will interest a lot of people, this cost can include the upload cost that the IAP (Internet access provider) may charge (pricing or ceiling on upload volume). This constraint is all the more severe as the network has the structure of a physical broadcast network: cable networks are very quickly cluttered by upload flows whereas DSL networks are more resilient.

The motivations for participating actively (i.e. to offer files) are more altruistic than in the previous cases: the desire to promote works or to collect information do not really play a role. So, in the case of peer-to-peer networks, some procedures exist to detect free-riders: e.g. some participants check that those who are copying files have given access to interesting files in their own directory; if this is not so, the connection may be cut. This does not involve a negotiation between individuals but "altruistic punishment": some participants check that the behavior of other participants does comply with a standard that ensures the survival of the overall system.

Up to now, the operation of exchange communities has been jeopardized less by free-riders than by the legal harassment of the publishing industry. As long as the editors, publishers and producers have not adapted their business model to new technical constraints, the communities will have to organize themselves to resist lawsuits and technical sabotage. This is currently an aspect that cements this type of communities and helps to enforce behavioral standards that ensure their survival.

Peer-to-peer networks, especially if they merge with experience-sharing communities, could result in a sort of reverse value chain and undoubtedly a more rational organization. In the case of music or movies, the communities could serve to initiate the audiences through free supply and collective meta-information; the “best” works, directly selected by the customers, would then be played in theaters (for movies) or would be promoted through major commercial campaigns (for CDs or DVDs).

5 Online communities: a new social interaction model?

The various online communities, which have just been described, although apparently very different, share one common factor: they challenge the top-down information model by developing databases ("commons") that help to close the gap between innovation and customers' needs. They form original interaction patterns which differ from real communities. We will now try to highlight some aspects of this common feature.

5.1 Instrumental intimacy or the rationalized social link

The transition from real communities to online communities is very similar to the rationalization process that can be exemplified by the transition from charismatic leadership to hierarchical and bureaucratic organization, or by the transition from informal bargaining to anonymous markets. In online communities, social links between individuals are similarly replaced by anonymous and asynchronous relationships.

Even if virtual communities are based on Internet services (e-mail, forums, newsgroups, webpages, etc.) there are no direct and lasting relations between individuals: contributors and users work on a common information corpus which they want to shape to their liking and to which they feel attachment and loyalty. An absence of inter-individual relationships is all the more surprising as, at least in the case of epistemic and experience-sharing communities, intimate knowledge is necessary at some stage of the process. This sort of "instrumental intimacy" is regulated by various procedures:

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31 In the sense which Max Weber gives to this term: pre-eminence of the formal rule over the ethical value, of efficiency over justice etc. which leads to disenchantment if not alienation.

32 Such an "instrumental intimacy" resembles the anonymous intimacy identified in chats, e.g. in Velkovska [2002].
asynchronicity\textsuperscript{33}, the public nature of exchanges, anonymity\textsuperscript{34}, protected by pseudonyms, the rule of limiting exchanges to a precise subject, hosting of interactions by a third party, etc. In such a context, interaction protocols that would induce sustained relations between participants, far from adding to the integrity of the community, would rather tend to endanger its survival by making it less efficient and more time-consuming.

The rationalization of individual relationships in online communities does not occur without disenchantment. Just as managers speak of human relations and team spirit to counterbalance the inhumanity of rational relations induced by office work, and just as anonymous markets are described in terms of customer relationship management and customization, similarly online communities are very often described and studied as real communities, i.e. close groups of people in lasting intimate relationships.

Some real communities (clubs, associations, etc.) might also use Internet services (email, web, instant mail services, etc.); but the resulting online communities do not have the specific structure or dynamics of real virtual communities, at least at the beginning. It would be interesting to analyze whether community software could transform real communities into virtual communities and whether in some specific cases, online communities can give rise to real sub-communities. The clubs which appear among certain MMORPG\textsuperscript{35} (Massively Multiplayer Online Role Playing Game) players thus provide an example of real sub-communities emerging from repeated anonymous interactions (or which might exist prior to these interactions).

5.2 The solitary construction of a collective virtual corpus

Unlike real communities characterized by clusters of interacting individuals, online communities are centered on a virtual meeting space, procedures, formal rules and a behavioral code tacitly accepted by everyone. This virtual space can be a website (e.g. a site of a vendor of cultural products) but it can also be reduced to a simple software package, with all the data needed for interactions being distributed across participants’ computers (e.g. as happens with peer-to-peer networks like Kazaa).

In virtual space, some participants build an information corpus and others come to use it. The efficiency of the community depends on the quality of this corpus: on its diversity, its relevance, its more or less frequent updating and, possibly, on its resilience to hijack or sabotage. Each contributor tries to modify the common corpus so that it serves a social goal; each user tries to optimize his consumption on the basis of information drawn from the information corpus. There is little altruism on anyone’s part but some degree of coordination is nonetheless necessary, so that writing and reading tasks are efficiently distributed.

Indeed, the entire web meets this definition of online communities: not-for-profit personal webpages (i.e. most\textsuperscript{36} webpages) constitute an example of a common information corpus. So it is understandable why attempts to identify communities of surfers based on the structure of hyperlinks between URLs have not been successful. It is the entire range of sites and the structure of the links between them that form the “commons” of the large community of Internet users. The web is a collectively built corpus with few commercial sites. Portals and search engines are essential to complement the links between sites and to help web surfers find their way towards what they seek.

The fact that the web is a community corpus but not a community of sites or URLs is illustrated by empirical studies\textsuperscript{37} on Internet connectivity and the structure of hyperlinks: these do not form a “social graph” (i.e. a highly clustered graph with a very low average path length: small world\textsuperscript{38}) but in contrast a fractal graph (scale free network), where it is possible to encounter very large hubs.

\textsuperscript{33} It should be noted that the majority of Internet services are asynchronous. Chat rooms and instant messaging, which are synchronous, primarily play a phatic role (clearly revealed by an analysis of their content): they build a sort of community illusion and thrive on it.

\textsuperscript{34} On teleidentity, anonymity, multiple identities, pseudonyms, see the article by Judith Donath [1999].

\textsuperscript{35} See Chapter 5 (Multi-User Dungeons and Alternate Identities) by Rheingold [1993] for example.

\textsuperscript{36} The Internet was only used by universities and research centers for a long time. Even today, over three quarters of the pages are not profit oriented. The surfers form a scientific community rather than a customer base or an audience. See Flichy [1999]: Internet ou la communauté scientifique idéale.

\textsuperscript{37} See the study by Michalis, Petros and Christos Faloutsos on the Internet topology: Faloutsos [1999].

\textsuperscript{38} We have known since Milgram (1967) and Granovetter (1973) that social graphs are of the small world type (even if a formalization like this was not used in these first analysis), i.e. that they have an abnormally small diameter given their very high level of clustering. In contrast, scale-free or fractal networks (the probability for a node to have k links is of the form k\textsuperscript{-p}), are graphs arising from a growth process with each new node randomly connecting with highly connected nodes (preferential attachment). The diameter of a graph is the average number of edges that separate two nodes. A clustered graph is characterized by the fact that two neighboring nodes of a same node have a greater chance on average of being connected.

Information goods and online communities - Michel Gensollen
Similarly, attempts to help the construction of online communities based on hyperlinks or webpages organized as topic clusters have not given birth to very lively and thriving communities; "rings", that were supposed to constitute sub-graphs of sites that were closed in terms of content, or "virtual cities" introduced through free hosting by Geocity, did not succeed in designing virtual communities that imitated real communities. These companies were bought by Yahoo, which terminated such experiments.

5.3 A participation pattern less cooperative than proactive

To explain why opportunist and selfish agents (homo economicus) may nevertheless engage in spontaneous co-operation and disinterested participation to the constitution of a collective good, economic literature offers three types of model:

- The observed cooperation is only apparent. Through peer recognition, the providers-contributors (e.g. developers of free software) are only trying to signal their talent and competence to possible employers in a domain where performances vary widely and are very difficult to estimate ex ante. Such a mechanism, that may occasionally play a role in the case of software, can hardly be invoked for experience-sharing communities or peer-to-peer networks.
- Cooperation can be deemed rational in the framework of repeated games between the same individuals. When participants can recognize whether they are paired with a cooperator or a defector, it is clear that a stable community can emerge. This type of mechanism is not suited to online communities, where lasting interpersonal relationships do not play a significant role.
- Apparent cooperation can also emerge when certain individuals are unconditional cooperators because they have internalized cooperative behavior standards. These norms can be transmitted, either through socialization institutions (oblique transmission), or by imitation within peer groups (horizontal transmission). Under certain conditions, the population of cooperators does not disappear and can stabilize. In this type of model, altruist punishment (strong reciprocity) plays an important role. A formalization of this type seems to apply to online communities and could make it possible to characterize the conditions under which the latter can survive and develop.

As seen above, in the case of virtual communities, decisions to contribute are essentially explained by the willingness of contributors to set up an information corpus which, by its very existence, will lead to desirable consequences for them. For example, in experience-sharing communities, beyond the altruistic desire to provide relevant information on the quality of cultural goods, reviewers try to promote their consumption structure, which is a rational strategy because information goods are subject to direct externalities (creation of sub-cultures, groups of fans, specialist sites) and indirect externalities (due to fixed production costs). Thus, to paraphrase Adam Smith, "it is not from the benevolence of the contributors that the user expects his information, but from their regard to their own interest".

Symmetrically, users are not free riders and passive beneficiaries of the information corpus, the shape and content of which is affected by their demand. Their very presence on the community site is a

Information goods and online communities - Michel Gensollen
means of pressure; they have often the possibility of reviewing the contributions (which makes them second-degree contributors).

Finally, it has been noted that contributors and users often wish to promote an alternative model of production (epistemic communities), distribution (peer-to-peer networks) or consumption (experience-sharing communities). This sort of activism has facilitated cooperative practices, at least in the initial phase of the community. Free software epistemic communities struggle for open-source and against proprietary code, which handicaps scientific progress. Peer-to-peer networks and file-sharing communities try to create a direct link between artists and consumers. Experience-sharing communities are very proactive: they promote opinions and advice that oppose uniformity and conformism and very often challenge editorial reviews.

The “assertive” aspect of online communities makes them fragile: any editing by the site webmaster is suspected of censorship; it discourages participation. Moreover, challenging the dominant production / consumption model rapidly becomes political: the authorities are discovering, like at the time of the telegraph, that direct relations between individuals can be threatening if not riotous. Control of interaction platforms and software then becomes a political as well as an economic issue.

Finally it is not obvious that the information corpus built by virtual communities resembles the commons of rural communities to which they are very often compared. The empirical rules identified by historians and sociologists who analyzed such real communities seem very different from those followed by virtual communities on the Internet: the borders of virtual communities are not clearly defined, their participants cannot easily modify the interaction protocols, there is no graduated sanction system nor procedures for resolving conflicts, etc. It seems that the collective information corpus which online communities gradually constitute raises fewer appropriation and free-riding problems than the classically studied commons (common grazing, fishing reserves, irrigation systems, etc.).

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In this article, we described interactive social structures which are currently developing on the Internet. No specific reference was made to communities on intranets and online working groups. It was not in the scope of this paper to analyze whether ICTs could change coordination patterns at work and industrial relations between companies.

On the Internet, exchanges of information between consumers deeply change the way final markets operate; they also challenge the current business models for information goods and the technology push innovation process.

The points emphasized more particularly in the text are as follows:

- To take full advantage of digitization (i.e. dematerialization of information goods) in terms of consumption dynamics, customer information cannot only occur via a top-down model, from producers to customers, via mass media channels.
- Meta-markets (i.e. exchanges of information between customers and producers) are migrating from mass media to virtual communities; this could lead to greater variety and better adaptability of products and services.
- Direct relationships between consumers are developing through the Internet; these links, complemented by relations between consumers and developers or product designers, could possibly implement a more demand-pull innovation.

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44 For example, Elinor Ostrom (see Ostrom [1990]) has studied real communities that manage "commons" (maintenance of common forest and grazing grounds in Swiss and Japanese villages, fisheries in Canada and Sri Lanka, irrigation systems in Spain and the Philippines, etc.) and has set forth several rules which appear to be necessary for such communities to sustain. For example, we find rules as those: "Group boundaries are clearly defined ; Most individuals affected by the rules of the community can participate in modifying these rules ; The rights of community members to devise their own rules is respected by external authorities ; A system for monitoring member's behavior exists; the community members themselves undertake this monitoring ; A graduated system of sanctions is used ; Community members have access to low-cost conflict resolution mechanisms."
• Virtual communities are original social structures; they are very different from real communities. There are no direct interpersonal links between participants who construct and use a common information corpus.

• The survival of virtual communities does not mainly depend on the altruism of the participants, but on the shape of the corpus and its mode of continuous elaboration. It is essential to ensure: (a) an efficient time allocation between contributors’ and users' efforts, (b) the possibility of intimate but very focused interactions between participants (instrumental intimacy), (c) the objectivity of the corpus editor or moderator (participants must trust him).

References


*Information goods and online communities - Michel Gensollen*


