



Digital Goods: An Economic Perspective

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GLOSSARY

copyright One of several legal constructs introduced to ensure that inventors of intellectual property receive compensation for the use of their creations. Copyrights include the right to make and distribute copies; copyright owners have the right to control public display or performance and to protect their work from alteration.

digital goods Goods that can be fully expressed in bits so that the complete commercial business cycle can be executed based on an electronic infrastructure such as the Internet.

on-line delivered content (ODC) Data, information, and knowledge tradable on the Internet or through other on-line means. Examples include digital on-line periodicals, magazines, music, education, searchable databases, advice, and expertise. ODC can be offered without a link to physical media. ODC explicitly excludes executable software.

watermarking Hiding of data within digital content. A technique for adding data that can be used to identify the owners of various rights, to record permissions granted, and to note which rights may be attached to a particular copy or transmission of a work.

can be executed based on an electronic infrastructure such as the Internet. This article first positions digital goods at the core of the digital economy. It points to the main economic characteristics of digital goods as well as to criteria for differentiating among different kinds of digital goods. In more detail, the article then covers five specific areas relevant to digital goods: (1) legal and technical protection, (2) pricing, (3) bundling and unbundling, (4) peculiarities of on-line delivered content, and (5) economics of digital content provision on the Web.

II. DIGITAL GOODS: CORE OF THE DIGITAL ECONOMY

A major characteristic of the digital economy is its shift to the intangible. Terms with similar connotation include *intangible economy*, *internet economy*, *virtual economy*, or *information society*.

The creation and manipulation of dematerialized content has become a major source of economic value affecting many sectors and activities. It profoundly transforms economic relationships and interactions, the way firms and markets are organized and how transactions are carried out. The digital economy is not limited to the Internet. Analog technologies such as radio and TV are also to be considered integral parts of the digital economy because these technologies are getting used to an increasing degree, and further media integration is foreseeable in the near future.

I. INTRODUCTION: CONCISE SUBJECT DEFINITION

Digital goods are goods that can be fully expressed in bits so that the complete commercial business cycle

To some extent, the digital economy runs squarely against the conventional logic of economics. Digital goods are not limited by physical constraints and are not limited to traditional economic characteristics, such as “durable,” “lumpy,” “unique,” and “scarce.” Instead, digital goods can simultaneously be durable and ephemeral, lumpy and infinitely divisible, unique and ubiquitous, scarce and abundant. The business of purely digital goods is different from conventional electronic business areas, which focus on trading or preparing to trade physical goods or hybrids between physical and digital goods. Trading of digital goods demands new business models and processes.

Classical economic theory does not usually address the issue of digital goods as tradable goods. The value of digital goods, especially information, is traditionally seen as derived exclusively from reducing uncertainty. In the digital economy, however, digital goods—information/content—are simultaneously production assets and goods. This article focuses primarily on digital goods in their capacity as goods to be sold.

From a supplier’s perspective, the growing importance of digital goods as intangible assets and the resulting complexity can be seen in the differences between book value and stock market values. These differences can partly be explained by the crucial role attributed to brands, content, publishing rights, and intellectual capital, which may emerge via, be embedded in, or be stimulated by digital goods.

Increasing discussions about information markets—mainly driven by information sciences—are targeting the peculiar case of markets for specialized digital goods such as knowledge or specialized information. Research on information brokers, structuring, retrieval, pricing of on-line databases, etc. represents an important point of reference. Despite all the work during the past 50 years, the problem of classifying, storing, and retrieving digital goods remains a

major problem regardless of media type. Multimedia searching by document content is a technology that has reached the initial demonstration phase, but is still in its infancy. There is, essentially, no mature method of storage for retrieval of text, images, and sounds (including speech and music) other than through the use of words, normally in the keyword format. The challenge is to obtain the essential digital content rapidly and attractively. The implied challenge is to modernize the style of presentation to make the key digital goods accessible with as little effort and time as possible. Major efforts are required to establish the right mix of media to convey a particular type of digital good.

III. DEFINITION, PROPERTIES, AND DIFFERENTIATION CRITERIA

Simply speaking, digital goods are goods that can be expressed in bits and bytes. Table I shows selected kinds of digital goods with some illustrations. Due the variety of terms used, some comments are necessary. A commonly quoted analysis provided by Shapiro and Varian focuses on information that the authors define as everything that is digitalized, i.e. can be shown as a sequence of bits. As an example, for information goods they mention books, magazines, films, music, stock market prices, sporting events, and web sites. Hence, the term *information* as applied by Shapiro and Varian covers basically the same concepts as our term *digital goods* stated above. In addition to such a variety of information goods, we also include software and interactive services such as chat rooms under the term *digital goods*.

In the following, we first take a broader perspective to help us understand and characterize the phenomenon of digital goods, including content and soft-

Table I Kinds of Digital Goods

Kinds of digital goods	Illustrations
Searchable databases	▷ Restaurant guides, phone books
Dynamic information	▷ Financial quotes, news
On-line magazines and newspapers	▷ International, national, regional; general and special interest publications
Reports and documents	▷ Easy multiplication and indexing
Multimedia objects	▷ Music, video files, texts, and photos
Information services	▷ Offerings by travel agencies, ticket agencies, stock brokerages
Software	▷ Off-the-shelf products, customized products
Interactive services	▷ On-line forums, chat rooms, telephone calls, games

ware. We offer a discussion of special properties of digital goods in this broad sense. After that we offer some criteria for further differentiation among the different kinds of digital goods. We then focus on the equally common, even if narrower concepts, of digital content in general and on-line delivered content more specifically.

In the legal literature, the concept of *digital assets* is more common than that of digital goods. This concept then tends to embrace everything that has value and is available in digital form, or could be valuable if it were changed into its digital form. The term *digital goods* is often used interchangeably with the term *intangible goods*. However, in the literature the term *intangibility* refers to two rather different concepts. Levitt suggests that the terms *goods* and *services* be replaced by *tangibles* and *intangibles* and hence observes that intangible products are highly people intensive in their production and delivery mode. This does not really match with a more recent interpretation of *intangibility*, which is suitable also for digital goods, aiming at immaterial goods (not services), often expressible in bits and bytes.

Digital goods are affected by electronic business from their inception all the way to their use by an end user, facilitating extensive transformations and product innovations. They take advantage of the digitization of the market and of distribution mechanisms. Hence, they are particularly suited for electronic markets. The whole set of business processes can be handled digitally, thus minimizing not only transaction costs, but also order fulfillment cycle time. However, as Shapiro and Varian state “. . . the so-called new economy is still subject to the old laws of economics.”

A. Economic Properties of Digital Goods

Digital goods possess some basic properties that differentiate them from physical goods. Digital goods are *indestructible* or *nonsubtractive*, meaning that they are not subject to wearing out from usage, which can often occur in the case of physical products. They are easily *transmutable*; manipulation of digital products is easier than that of physical products. Last, digital goods are easily and cheaply *reproducible*.

Digital goods are characterized by high fixed costs (first copy costs), dominated by sunk costs, and by low variable and marginal costs. This constellation typically leads to vast economies of scale. In practice, digital goods can be copied at almost no cost and can be transmitted with minimum delay to almost everywhere. This copying of digital products at almost no

marginal costs, the ease of transformation in the production process, and the interactivity of the products are reforming the production of digital goods compared to the production economics of physical goods.

Costs for content creation (programming) for high-end multimedia digital titles are often high. As a consequence, companies that create digital goods have an interest in reusing the same content as many times as possible and in as many media as possible without having to pay “first copy” costs again. We speak about a systematic disconnection of production and usage, which naturally has an impact on distribution. It leads to the idea of *windowing*: Pay for content creation once, then reuse it for free. To secure profitability, the producer of digital goods must be able to recoup at least its costs at the first showing of the product.

While a free exchange of information (digital goods) is a crucial prerequisite for innovation, the incentives for innovation and investments are diminished by the difficulties of claiming property rights for digital products. The digitization of content creates a considerable degree of freedom for the provision and the transformation of content.

Consumers are partly involved in the production of information, i.e. the choice of content, mode of display, transformation, etc., and therefore evolve into *prosumers*. For some authors the role of *prosumer* is restricted to the simultaneity of production and consumption, and the nonstorability of services, extended by processes of simple self-service.

The disconnection of production and usage leads to the so-called “value paradox”: Only when products are well known and highly in demand are they attributed a high value and the possibility of generating revenues. That is why comparatively unknown providers of digital goods distribute their products to the widest possible public for free (e.g., artists or free-ware coders). At the same time, customers are only willing to pay for “scarce” products. Different from physical products, scarcity in digital goods does not come naturally. Instead it has to be reinforced by limited editions and individualization of the copies (e.g., through watermarking) or other restrictive measures.

A frequently applied distinction of products is that made between *search goods* and *experience goods*. This distinction is built on customers' chances to judge the value of a product. The quality of search goods can be determined without actually using them. With experience goods, knowledge about quality is learned from experiencing the product, i.e. from using the good. Search features of a product can be evaluated prior to its usage (e.g., price), but experience features can be evaluated only after usage (e.g., taste). There

is also the additional category of “credence goods” where, even after usage, consumers cannot judge the value properly, because they are lacking some necessary skills (e.g., clinical diagnostics). These three terms offer a continuum of judgment, starting from search products—which can be assessed easily—to experience products and finally credence products.

In many cases, digital goods tend to be experience goods or even credence goods. To overcome the implied difficulties for advertising and sales (why should one buy information that one has already experienced or tried?), many digital goods are sold based on strong brands or teasers. For instance, without having experienced an article in a newspaper, the brand of the newspaper leads to the expected sales. Further, teasers such as abstracts or chapters serve as triggers for book and magazine sales.

Digital goods, especially information and content products, are often classified as *public goods*. Public goods share two main characteristics: nonrivalry and nonexclusiveness in usage. Nonrivalry is a product feature normally given in the case of digital goods due to the low costs and ease of reproduction. Nonexclusiveness is a feature of the legal system. In legal systems emphasizing private property, technical and legal means are in place to prevent unwanted joint usage. An automobile is protected by a lock (technical solution) or the threat of police punishment (legal solution) to prevent its use by unauthorized persons. In the digital world, copyrights grant creators of digital products certain rights, which—at least supposedly—can be enforced via technical or legal means. Therefore, digital products cannot be generally termed public goods, even when it is technically difficult to prevent unauthorized persons from using digital products. In addition, the basic laws and constitutions of most countries grant citizens access to “relevant news.” So such news in digital form offered, for example, on the Internet could be characterized as public goods. The specific article written about the news, however, could be copyright protected and hence not be a public good.

B. Criteria Used to Differentiate among Digital Goods

Digital goods represent a variety of economic goods, which require different business processes and economic models. To distinguish within the group of digital goods, we use the following criteria: transfer mode, timeliness, usage frequency, usage mode, external effects, and customizability. With them we are partially

following the discussion offered by Choi, Stahl, and Whinston.

Concerning the *transfer mode*, we distinguish between delivered and interactive goods. Delivered goods are transferred to the user as a whole or in pieces, i.e. by daily updates, etc. Interactive goods or services require a synchronous interaction with the user. Examples are remote diagnostics, videoconferences, and interactive computer games. Some careful observation is necessary: Many services on the Internet today are called “interactive,” although in reality they are “supply on demand.” For instance, when watching “interactive” television, the user merely downloads pieces over time. Neither is a search engine fully interactive, because searches are only orders for personalized delivery. Most digital goods are based on delivery as the transfer mode. Only a real-time application with the need for consecutive questions and answers implies interactivity. Interactive goods are by definition tailored to the specific user, making problems of resale and copyright irrelevant.

The criterion of *timeliness* covers the constancy and dependence of the value of digital goods over time. Products like news, weather forecasts, or stock prices normally lose value as time goes by. The timeliness of any product correlates with the intended usage. For instance, when planning an excursion, weather data are only valuable ahead of time. On the other hand, for scientists studying the accuracy of weather, forecasts deliver value only after the predicted day.

The third criterion is *usage frequency*. Some goods are intended for single use. They lose their customer value after or through use. For instance, the query on a search engine has no recurring value. Other products are designed for multiple uses; examples include software and games. The perceived total value of digital goods designed for multiple uses may well accumulate with the number of uses. One can observe different patterns of marginal utility functions over time. Computer games tend to become boring after a while, leading to negative marginal utility. Software applications on the other hand often render learning effects, leading to increasing marginal utility.

Regarding the *usage mode*, we can distinguish between fixed and executable goods. Fixed documents allow handling and manipulation in different ways and by different means than executable goods. With executable goods such as software, suppliers define the form by which the good can be used. Furthermore, the transformation of fixed documents into executable software increases the possibilities of control by the supplier. For example, suppliers could distinguish among read-only access, sort-and-print access, and a

deluxe package that allows the user to make changes to the data pool and to define any possible data queries. Thus, differentiated products to be sold at varying prices can be created out of a common data pool.

Another differentiation criterion within digital goods is the *external effects* associated with products. Products with positive external effects raise the value for customers with increasing numbers of users. For instance, the more participants who agree on a common standard, the more potential partners for exchange exist. In the same way, multi-user Dungeons computer games deliver more opportunities through a larger number of participants. But with restricted capacities, too many participants can cause traffic jams or obstructions, turning positive effects into negative ones. Negative external effects imply a higher value for users resulting from a lower number or restricted number of other participants. This is especially applicable for exclusive information providing competitive advantages, such as internal corporate information used as the basis for speculation on the stock exchange.

Customizability reflects the extent to which goods can be customized to specific customer needs. An electronic newspaper has a high degree of customizability in that an average customer is able to design a personal version through combinations of articles. But the articles themselves—being equal for all customers—show low customizability. Consequently, the level of analysis has to be specified (the entire, personalized newspaper or the standard article) in order to be able to judge the customizability of digital goods.

IV. ISSUES OF LEGAL AND TECHNICAL PROTECTION

Legal questions, usually interpreted in the sense of legal protection of the value of digital products, are of high interest. The development and the application of legal rules have to take into account the properties of digital products and the corresponding technical possibilities and constraints.

Content creators and owners need to protect their property. Traditional content media (such as paper documents, analog recordings, celluloid film, canvas paintings, and marble sculpture) yield degraded content when copied or require expensive and specialized equipment to produce high-quality copies. The technical burden on traditional content creators (such as book authors) for protecting their material has been small. For digital goods, there is no obvious limit to the value that can be added by creating and providing ac-

cess to digital content. High-quality copies (in fact, identical copies) of digital content are easy to produce.

In this context, legal issues are partially dealt with by application of already existing legal institutions (civic law, criminal law, and international law) and partially covered by rather new legal constructs (concerning contracts or media).

A. Copyrights

Copyrights are one of several legal constructs relevant to any business producing digital goods. However, they are not new in the world of digital goods. They have been introduced to ensure that inventors of intellectual property receive compensation for the use of their creations. In the international context, copyrights are granted on the basis of the Treaty of Bern, the Treaty of Rome, and the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement. Copyrights have different components. The most notable component is the right to make and distribute copies. In addition, copyright owners have the right to control public display or performance and to protect their work from alteration. Further, content owners hold the rights over derivative works, that is, the creation of modified versions of the original.

As a means to protect intellectual capital, copyrights have gained special importance in the context of digital goods. Because digital goods are easy and cheap to duplicate, copyright protection is essential for ensuring the above-mentioned compensation for product inventors and creators. If creators cannot get paid, what would ensure the continued creation of digital goods? Therefore not only the creators but also digital intermediaries and distributors have high economic incentives to see to it that copyrights are respected and remunerated. However, traditional copyright laws have not been designed for handling digitized goods. Nationally and internationally updated rule sets are under development.

B. Watermarking

Watermarking represents a technical solution fostering the implementation of the above-mentioned copyrights. Digital watermarks are designed to add value to legitimate users of the protected content and to prevent piracy. In addition, digital watermarks can be utilized for market research.

Following Acken, digital watermarking can be defined as the hiding of data within the digital content.

It provides a technological way to add data that can be used to identify the owners of various rights, to record permissions granted, and to note which rights may be attached to a particular copy or transmission of a work. Digital watermarks are invisible when the content is viewed. They indicate an original, but do not control somebody's access to it. This means that—similar to an original signature—watermarks do not prevent photocopying, which might be needed for fair use.

Digital watermarks can add value for different legitimate uses while increasing barriers to pirates. The benefits depend on the particular digital good and the associated and differentiated needs, burdens, and benefits for their creators, distributors, and recipients. For many business applications, there is great value in being able to reconstruct relevant events. In accounting, the resulting timeline is called an audit trail. For digital content, digital watermarks can be used to indicate recipients or modifiers without the administrative burden of keeping the associated information and links separate from the digital content itself.

Digital watermarking needs to support scalability to be able to match the different value requirements of digital good. Some digital goods, for example, a film classic like *High Noon*, carry high, long-term value. Other digital goods, such as yesterday's stock quotes, have only limited value. The longer lasting the value of digital goods is, the more time pirates have to break the protection methods. Therefore, a scalable system is required that renews itself over time.

V. SELECTED PRICING ISSUES

Production costs cannot be used as a guideline for pricing because there is no link between input and output. Mass consumption does not require mass production. Economies of scale are determined by consumption, not by production. Economies of scale in digital goods production are limited; economies of scale in digital goods distribution can be significant due to a combination of the high fixed costs of creating the necessary infrastructure and the low variable costs of using it. Economies of scale in distribution are accentuated by consumption characteristics: Consumers tend to use the supplier with the largest variety although they only take advantage of less than 5% of the choices available.

Due to the issues that derive from the above-mentioned characteristics of digital goods, neither cost-based pricing nor competition-based pricing are

reasonable pricing strategies. Marginal costs are zero or near zero. So by applying cost-based or competition-based pricing mechanisms, sales prices would tend to zero or near zero. But prices near zero make it impossible for producers to get back their high fixed cost. So the only reasonable strategy for pricing information goods is to set the price according to the value the customer places on it. Because consumer valuations are different, it is also important to differentiate prices. Different approaches can be used as the basis for price differentiation. Probably, the two most popular ones are grouping and versioning.

Grouping refers to the distinction of prices among different customer groups for the same product. Typical examples from the nondigital world are reduced prices for students or elderly people. The problem for grouping when selling digital goods over the Internet lies in the difficulty of proving people's identity and "characteristics." How do we check, for example, whether a student number from an unknown university is correct, how do we find out where the potential customer is actually located. Technical verification procedures are on the market, but rarely applicable at reasonable effort and cost.

Versioning refers to price differentiation based on slightly different product characteristics. Different product versions are sold at different prices. Versioning is already familiar to us from nondigital information goods; consider the pricing of hardcover versus paperback books. For digital goods, Shapiro and Varian suggest numerous ways to create different versions (see Table II).

A consumer's willingness to pay is often influenced by the consumption or nonconsumption of others. Accordingly, it is not an adequate approach for assessing the value of digital goods, given the ease of replication/sharing and associated externalities. Furthermore, the pricing of digital goods raises the fundamental issue of inherent volatility of valuation when the value of digital goods is highly time sensitive. For instance, stock market information may be worth millions in the morning and have little value in the afternoon.

Finally, offering digital goods over an extended period of time may lead to the establishment of *electronic communities*. Electronic communities are likely to create value in five different ways: usage fees, content fees, transactions (commissions), advertising, and synergies with other parts of the business. Translating these income opportunities to the more narrowly defined area of digital goods, *usage fees* could be in the form of fixed subscriptions, paying per page, or paying per time period independent of the quality of the

Table II Approaches to Versioning of Digital Goods

Basis for versions of digital goods	Illustrations
Delay	⊃ Books, FedEx
User interface	⊃ Search capability
Convenience	⊃ More or less restricted time or place of service availability
Image resolution	⊃ Higher resolution depending on storage format, etc.
Feature and functions	⊃ Quicken vs. Quicken Deluxe, which includes a mortgage calculator.
Flexibility of use	⊃ Allowing users to store, duplicate, or print information
Speed of operation	⊃ Time to download or to execute programs
Capability	⊃ Number of words for dictionary/voice recognition

content. *Content fees* would most likely be based on fixed amounts per page, but should tackle the issue of valuing the content (quality/relevance). *Commissions and advertising income* are triggered by attractive digital goods on display. Strictly speaking, however, the subsequent income would not stem from the digital goods, but from attracting customers to a page regardless of its content or from offering some empty space for third-party advertising in addition to the actual digital goods offered.

The range of pricing schemes for digital goods is becoming broader and more sophisticated. Pricing models may imply giving actual goods away for free and then charging for complementary services, updates, etc. They are developed for bundles of digital products as well as for single units. Economists are developing theoretical solutions to these problem areas. However, some of the mechanisms developed demand an enormous amount of data, thus questioning the trade-off between allocation efficiency and operational cost-effectiveness.

VI. UNBUNDLING AND BUNDLING

We see at least two different trends in the digital age: (1) the trend toward unbundling and disintermediation because of the absence of former economies of scale in printing and distribution of content, and (2) the trend toward bundling as a tool to shift consumer rents to the producers.

Traditionally, many digital goods have been bundled solely to save on these costs:

- *Transaction and distribution costs*: the cost of distributing a bundle of goods and administering the related transactions, such as arranging for payment

- *Binding costs*: the cost of binding the component goods together for distribution as a bundle, such as formatting changes necessary to include news stories from wire services in a newspaper bundle
- *Menu costs*: the cost of administering multiple prices. If a mixed bundling strategy is pursued, where the available components are offered in different combinations, then a set of n goods may require as many as 2^n prices (one for each subset of one or more goods).

Yet these costs are much lower on the Internet than they used to be for physical goods. Thus software and other types of content may be increasingly disaggregated and metered, as on-demand software applets or as individual news stories and stock quotes. Such a phenomenon is described as *unbundling*.

Unbundling also goes along with the separation of digital goods from the delivery media. Traditionally the pricing of content has been based on the delivery medium—mostly measured in convenience—rather than on actual quality. For instance, the price of a book depends heavily on its printing quality and the number of pages, while the price for an excellent book is almost the same as for a poor one. Electronic trading in digital goods technically allows unbundling. The Internet is precipitating a dramatic reduction in the marginal costs of production and distribution for digital goods, while micropayment technologies are reducing the transaction costs for their commercial exchange. Content can be priced separately from the medium allowing for price differentiation based on the estimated value of the content. Unbundling, however, also raises problems as administration becomes more complex.

On the other hand, the low marginal costs as well as the low transaction costs of digital goods also lead to other ways for the packaging of digital goods

through strategies such as site licensing, subscriptions, rentals. These aggregation schemes can be thought of as *bundling* of digital goods along some dimension. For instance, aggregation can take place across products, as when software programs are bundled for sale in a software suite or when access to various content of an on-line service is provided for a fixed fee. Aggregation can also take place across consumers, as with the provision of a site license to multiple users for a fixed fee, or over time, as with subscriptions.

Following Bakos and Brynjolfsson, aggregation or bundling is a powerful strategy to improve profits when marginal production costs are low and consumers are homogeneous because of the changing shape of the demand curve. The economic logic of bundling is based on different consumers' valuations for bundled and unbundled goods.

The larger the number of goods bundled, the greater the typical reduction in the variance. Because uncertainty about consumer valuations hinders effective pricing and efficient transactions, this predictive value of bundling can be valuable. For example, consumer valuations for an on-line sports scoreboard, a news service or a daily horoscope will vary. A monopolist selling these goods separately will typically maximize profits by charging a price for each good that excludes some consumers with low valuations for that good and forgoes significant revenues from some consumers with high valuation. Alternatively, the seller could offer all the information goods as a bundle. Under a very general set of conditions, the law of large numbers guarantees that the distribution of valuations for the bundle has proportionately fewer extreme values. Such a reduction in buyer diversity typically helps sellers extract higher profits from all consumers.

The law of large numbers makes it much easier to predict consumers' valuations for a bundle of goods than their valuations for the individual goods when sold separately. Thus, the bundling strategy takes advantage of the law of large numbers to average out unusually high and low valuations, and can therefore result in a demand curve that is more elastic near the mean valuation of the population and more inelastic away from the mean.

When different market segments of consumers differ systematically in their valuations for goods, simple bundling will no longer be optimal. However, by offering a menu of different bundles aimed at each market segment, bundling makes traditional price discrimination strategies more powerful by reducing the role of unpredictable idiosyncratic components of valuations.

In summary, bundled goods typically have a probability distribution with a lower variance per good compared to the separated goods. Hence, bundling can help to improve seller's profits. One can show that bundling could improve seller's profits when consumer preferences are negatively correlated.

VII. ON-LINE DELIVERED CONTENT (ODC)

Loebbecke introduces the concept of on-line delivered content as a special kind of digital goods. ODC deserves further attention because the concept includes mainly those forms of digital goods that have gained attention in the Internet age.

A. Concept, Examples, and Characteristics

On-line delivered content is data, information, and knowledge that can be traded on the Internet or through other on-line means. Examples include digital on-line periodicals, magazines, music, education, searchable databases, advice, and expertise. The decisive characteristic of ODC is its ability to be offered independently of physical media by selling it through a communication network. Whether ODC is then transferred to a computer memory (e.g., with a print-out or by burning a CD) or not is irrelevant for the classification of the ODC. Streaming content like a digital video transfer and the transfer of data that can be looked at later off-line are both equally valid ODC forms. ODC focuses on the content of digital products. For that reason, software products including computer games are not covered by the ODC concept. Different from common concepts of digital goods, the term ODC, as defined and applied here, is limited to stand-alone products consisting solely of content/information. Hence, the term ODC implies that *only* the content is the object of a transaction; no physical product is shifted among suppliers, customers, or other players. When trading ODC, the complete commercial cycle—offer, negotiation, order, delivery, payment—is conducted via a network such as the Internet. Figure 1 illustrates this definition of ODC.

The ODC concept can be illustrated by three examples:

1. *Music.* ODC refers to music that can be downloaded from the Web. Afterwards, if desired, it can be stored on a CD-ROM. ODC does *not* include the ordering of a CD-ROM to be

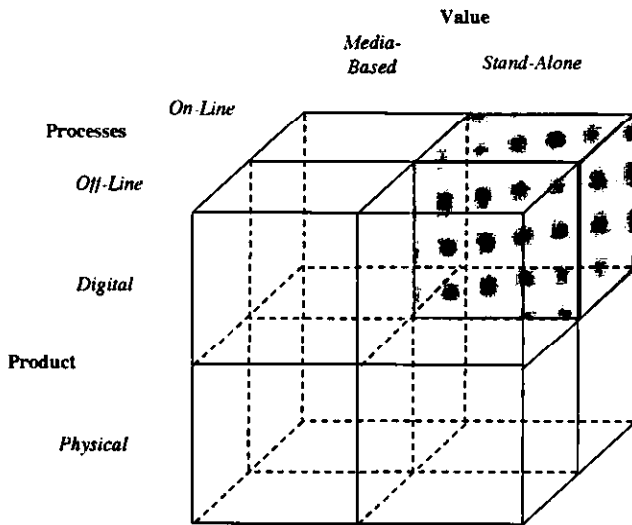


Figure 1 Conceptualization of ODC. [Adapted from Choi, S., Stahl, D., and Whinston, A. (1997). *The economics of electronic commerce*. Indianapolis, IN: Macmillan Technical Publishing.]

delivered to one's home, since ODC—by definition—refers *only* to the content and excludes the need for any physical medium.

2. **Databases.** Databases are offered by on-line bookstores and various kinds of content are offered on web pages maintained by TV stations. The information/content contained in those web sites is a form of ODC, even if it is usually not traded separately. Possibilities for commercializing such content could be pay per view, pay per page, or pay per time concepts. By trying to sell such content (instead of offering it for free and counting on positive impact on other product lines such as books or TV programs) suppliers would rely on the actual value that potential customers associate with it.
3. **Tickets.** Tickets on planes, trains, or to concerts actually represent a counterexample. Certainly, all paper-based products, like posters, calendars, and all sorts of tickets, could be converted into or replaced by digital counterparts. Further, one can imagine ordering and receiving tickets for trains, planes, or concerts on-line. In the near future, technology will allow individuals to print tickets (administered wherever) just as travel agencies or event agencies do today. However, for consumers this is not the full delivery cycle. They do not pay for the piece of paper called a ticket, they pay for being moved from point A to point B or for attending a concert/stage performance. Those services of “being moved” or “concert

performance” are the actual values bought, and they will never be delivered via any technical infrastructure (at least not within the limits of current imagination). Therefore, a ticket, even if bought and—with regard to the piece of paper—delivered over the Web does not represent unbundled, stand-alone value of content. It does not belong to ODC as understood in this article. (For simplicity reasons, this illustration leaves out the possibility of reselling a ticket and thus giving it a monetary function.)

In addition to the issues inherent in trading physical goods on the Web, trading ODC on the Internet raises concerns such as version control, authentication of the product, control over intellectual property rights (IPRs), and the development of profitable intra- and interorganizational business models.

Most forms of ODC belong to the group of experience goods (see above), for which the quality of the content is learned only from using/consuming the good. However, treating ODC as an experience good, i.e. letting potential clients “experience” ODC implies giving the actual content away for free (i.e., not trading it) and, in all likelihood, counting on receiving revenue via some synergy mechanisms. Once potential customers have experienced ODC, they have no more reason to buy it. ODC suppliers will try to solve this dilemma by shifting ODC as much as possible into the category of search goods. Possible steps for this are establishing strong brand reputation for Web sites or publishers or offering abstracts, sample chapters, or reviews as triggers to buy the whole product.

As a consequence of the characteristics of digital goods such as indestructibility, transmutability, and reproducibility, the exclusivity of ODC may be difficult to durably maintain. Sharing may be simultaneous or sequential; in any case it affects the allocation of property rights. While a seller of a physical good loses his or her property right, a seller of ODC may continue to hold it. Even illegally sharing ODC often causes positive network externalities, which may even exceed the cost of sharing if caught. Once ODC has positive network externalities, control over reproduction and sharing is the primary objective of copyright protection.

Related to the issue of externalities is the issue of value generation. Often there is no direct link between a transaction and the generation of value. Furthermore, ODC value can hardly be measured in monetary terms only. For instance, the appreciation of free TV could be measured in time budgets allocated; and appreciation of academic papers (increasingly

often provided as ODC) may be measured in number of quotes. Indirect value creation and the related problem of ODC value measurement lead to the problem of adequately pricing ODC, as discussed later in this chapter.

While the conventional logic of economics is concerned with scarcity, the dematerialization logic inherent in ODC is concerned with abundance. Abundance and resulting ODC overload (the huge variety of ODC available to almost everybody) confront consumers with a dilemma. They want to take advantage of the increased choice of ODC, and at the same time, they seek to minimize the costs of searching. To respond to the first objective, new modes of consumption have emerged: zapping, browsing, or surfing. These are characterized by short attention span, latency, high frequency of switching, and capriciousness. The distinction between consumption and non-consumption becomes difficult, rendering pricing problems even more intractable. The expanded choice of content makes consumer choice more difficult, thus continuously raising the cost of acquiring information about the content. To minimize these costs, the choice is increasingly determined by criteria other than product characteristics, e.g. brand familiarity or fashion. Low transaction costs lead to excessive volume of transactions that generate noise rather than useful content. Abundance of products and services stimulates the development of activities whose purpose is to monitor, evaluate, and explain their characteristics and performance.

B. Trading in ODC

While the offering of free ODC has become extremely popular in the Internet area, only a few companies have started trading. To trade in ODC, several roles have to be fulfilled. The value chain depicted in Fig. 2 has been outlined by the European Commission for the electronic publishing business. It differentiates between two layers. The content-related layer addresses content creation, content packaging, and market making. The infrastructure-related layer comprises transportation, delivery support, and end-user interfaces.

The framework suggests the following strategic roles to be played (Fig. 3). Online Networks manage a full electronic marketplace, Community Organizers focus on interest-centered target groups, Interactive Studios create content with new levels of functionality, Content Rights Agencies manage rights and match content to market needs, and, finally, Platform Providers create end-to-end, easy-to-use technical platforms for authors, publishers, and end users. Rather

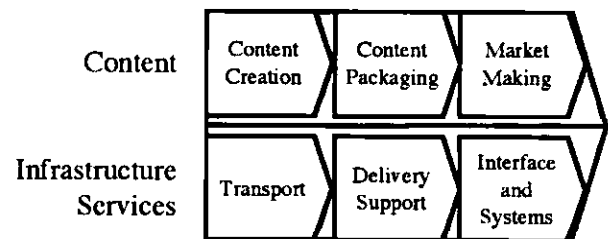


Figure 2 Electronic publishing value chain. [From European Commission (1996). *Electronic publishing—Strategic developments for the European publishing industry towards the year 2000*. Brussels.]

recent concepts suggest that such activities be organized as value networks instead of value chains. The strategic roles to be fulfilled do not significantly change, regardless of conceptualization in a chain or in a web.

Syndication is also of particular interest as a business model in the context of ODC trading. Syndication involves the sale of the same good to many intermediaries, who then integrate the good with others and redistribute the whole. First, syndication can only work with information goods since they can be duplicated and consumed by infinite numbers of people without becoming exhausted. Second, syndication requires stand-alone, modular products that may function well as a part of a whole. Third, syndication requires multiple points of distribution. The millions of existing web sites theoretically offer many different points of distribution.

In such an environment, trading in ODC can be used to supply innovative content, especially differently packaged, more targeted information. It combines communication with content, leading to higher quality and thus added value to customers. Further-

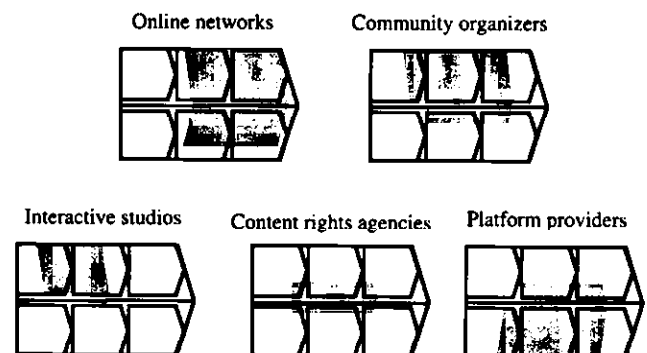


Figure 3 Strategic roles in electronic publishing. [From European Commission (1996). *Electronic publishing—Strategic developments for the European publishing industry towards the year 2000*. Brussels.]

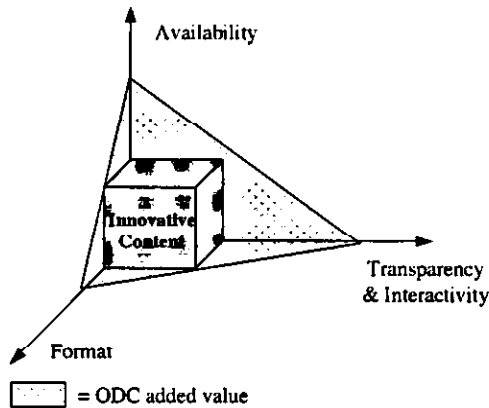


Figure 4 Dimensions of ODC added value.

more, ODC customers are more in control of how much and what kind of content they want to obtain. When substituting print products by ODC, customers will request additional value such as availability (newest information, access to data from any location), format (multimedia such as video clips and sound), transparency and interactivity (user-friendly downloading, search functions, etc.), and innovative content (Fig. 4).

In summary, ODC refers to digital goods that are manufactured, delivered, supported, and consumed via the Internet or similar networks. Typical examples of ODC are music, information, and expert knowledge. For these types of goods, as for almost all kinds of digital goods, traditional economic models based on scarcity and uniqueness leading to a market based on demand and supply do not apply. Once created, ODC is extremely easy and cheap to replicate, distribution costs are almost zero, and most other transaction costs except perhaps marketing and sales barely exist.

VIII. ECONOMICS OF DIGITAL CONTENT PROVISION ON THE WEB

We distinguish four possibilities for profiting from providing digital content on the Web: (1) increasing the number of units sold, (2) increasing the margin per unit sold, (3) selling digital content as stand-alone product, and (4) generating advertising income from web pages. In the first two cases, the digital good is a free enhancement of the main, nondigitizable product offered (cars, coffee, computers), which cannot be delivered via the Internet. In the third setting, the product offered consists of information and thus can be transmitted digitally via the Internet (magazines, music, etc.). For such a good, the term on-line delivered content was introduced in the previous section.

In the fourth setting, the focus is not on the actual goods, but on the space for sale around the content on the Web.

1. *Increased number of units sold.* Internet-based marketing and public relations aim at increasing awareness about a company and its product and service range. As with traditional marketing, this is costless for consumers; profit is made when the marketing costs are compensated by additional sales. Currently the largest potential in Internet-based marketing is seen in attracting new customers worldwide and in establishing distant, long-term customer relationships. In most instances it is difficult to discover how many additional units are sold because of a web presence. Further, some of these may be substitutes for traditional sales (internal channel cannibalization).

As long as overall worldwide or regional sales do not increase, but almost every bookstore, computer dealer, etc. is present on the Web (with rather different offers), it is not obvious how they all could increase their total turnover. It seems to be more like a football league: Every team gathers strength during the summer but by the end of the following season there are few winners, and there will always be some losers.

There is no doubt, however, that Internet-based turnover is predicted to grow during the next few years. But with more efficient business processes and price transparency leading to decreasing margins there is not too much reason to foresee an increase in total (traditional and Internet-based) turnover and especially profits.

2. *Increased margin per unit sold.* Larger margins per unit could theoretically be achieved by lower costs (efficiency) or by charging higher prices per unit. Lower costs may be achieved by using the Web for various processes such as internal communications, receiving orders and payments, or providing customer service (process/business reengineering). Customers could, for instance, download information from the company's web site and special requests could be answered via (automatic) e-mail. From a more in-depth perspective, most efficiency gains will result from decreased working capital achieved by introducing electronic commerce, e.g. Internet-based activities. Higher prices charged per unit need to be based on value added for customers. This means that a particular book, computer, or type of coffee that is advertised and sold via the Internet is more expensive than if it were sold via

traditional marketing media and sales channels. This notion is the reverse of the more popular idea of selling cheaper via the Internet due to economies of scale, improved transparency, and fewer players in the value chain. If, however, the Internet sale of a digital good provides no added value, then competition may well squeeze prices down to the level of the marginal cost of the goods.

3. *Digital content sold as stand-alone product.* This is the ODC situation, which was discussed at length in the previous section.
4. *Advertising income generated from web pages.* The market for advertising space on the web is booming. Only those companies whose contents attract a certain number of site visitors can sell additional space to others who then place their ads. While this opportunity for profit is gaining importance, it is mainly suitable for those large companies whose sites are well known and visited, e.g. TV stations, newspapers, and magazines, etc. It does not appear to be a feasible source of income for the millions of small and medium sized enterprises (SMEs) that also offer content on the Web.

Large company infrastructures to market specific products are no longer required either for content provision on the Web or for the actual sale of digital goods. This causes an enormous growth of digital products and service offerings. However, small content providers still mainly count on positive, but indirect contributions of their Internet activities to their overall cost-benefit structure. For SMEs to continuously provide digital content on the Web, shifts in financial flows along intercorporate value chains are required. Table III outlines two scenarios regarding potential sources of income for digital content providers and the related shifts in intercorporate value chains. To clarify the terminology of Table III, Inter-

net providers "transport" content from content providers to customers. They are comparable to common carriers expecting payment for this intermediary service. If they manage to enhance their service line beyond transmission, e.g., with value-added services, this should allow them to charge consumers for more than just the transmission fee.

Scenario 1: Digital content providers receive payment for their content directly from the consumers who not only have to pay the Internet providers but also the content providers for the information they access. Competition for customers among content providers would begin to develop; hence, the quality of information is likely to improve. The situation for Internet providers would mostly stay the same, unless—due to the higher Internet consumption price for users—the overall Internet traffic would decrease drastically.

Scenario 2: Digital content providers receive payment from Internet providers who forward part of their income to the content providers. Internet providers can only win in this scenario if the low price of content and service in comparison to the previous scenario would lead to a drastic increase in overall Internet traffic. The situation for consumers would remain mainly the same.

In summary, electronic media enable organizations to deliver products and services more cost-effectively and efficiently. In cases where the Internet is supposed to support the traditional business (e.g., book sales), the increasingly sophisticated services offered go beyond pure marketing efforts. They provide additional value to customers. While these services constitute extra costs, they barely generate additional profits. Potential clients take advantage of these services (e.g., search the bookstore database) without necessarily becoming customers. Involvement in Web-based activi-

Table III Shifts in Financial Flows along Intercorporate Value Chains

	Content provider	Internet provider	Consumer
Currently	Receives no payment for content provided	Receives payment on time/volume basis	Content mostly free, pays for time and volume
Scenario 1	Receives payment based on content directly from the consumer	Receives payment on time/volume basis	Pays for content, time, and volume
Scenario 2	Receives a predefined share from the Internet provider	Receives payment on time/volume/content basis and shares with content provider	Pays for time/volume

ties and increasingly also content provision on the Web seems to have become compulsory in many industry sectors. If eventually all companies achieve significantly lower cost for customized product and service delivery, the result cannot be a competitive advantage, but lower margins for the average player in the sector. Offering content on the Web has to be attractive for the providers in one of two ways: (1) strengthening a company's competitive position with respect to its traditional products (e.g., higher turnover as a consequence of Web activities, or (2) expanding toward additional, profitable product lines (e.g., selling information/content-based products and services).

SEE ALSO THE FOLLOWING ARTICLES

Advertising and Marketing in Electronic Commerce • Business-to-Business Electronic Commerce • Copyright Laws • Desktop Publishing • Digital Divide, The • Economic Impacts of Information Technology • Electronic Commerce, Infrastructure for • Electronic Data Interchange • Marketing

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