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Frank Linde, Wolfgang Stock

INFORMATION MARKETS

A STRATEGIC GUIDELINE FOR THE I-COMMERCE

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Knowledge and Information (K&I) is a peer-reviewed information science book series. The scope of information science comprehends representing, providing, searching and finding of relevant knowledge including all activities of information professionals (e.g., indexing and abstracting) and users (e.g., their information behavior). An important research area is information retrieval, the science of search engines and their users. Topics of knowledge representation include metadata as well as methods and tools of knowledge organization systems (folksonomies, nomenclatures, classification systems, thesauri, and ontologies). Informetrics is empirical information science and consists, among others, of the domain-specific metrics (e.g., scientometrics, webometrics), user and usage research, and evaluation of information systems. The sharing and the distribution of internal and external information in organizations are research topics of knowledge management. The information market can be defined as the exchange of digital information on networks, especially the World Wide Web. Further important research areas of information science are information ethics, information law, and information sociology.

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Preface

The markets for digital information–this means both software applications and all sorts of content (from blogs via images, films and games up to scientific articles and patents)–are different than markets for non-digital goods. When a non-digital good is purchased, it physically changes hands from the seller to the buyer. On the other hand, goods on information markets stay with the seller, buyers merely receiving a copy. Trade with digital information, which we call "I-Commerce" (in the sense of E-Commerce with information), mainly occurs with the aid of networks, particularly the internet. The products are thus characterizable as network goods. Here, too, there are particularities: network goods may have their basic value (for an operating system, this value might be, for instance, that it allows applications to run on a computer), but they receive an additional value via the number of their users (the more the better for the network) and via the number of complementary products (in our example: application programs that run on the operating system). A further particularity of these markets is the technically illegal "swapping" of digital information. To put it provocatively: there is theft on a scale that puts most other markets to shame. In light of the network effects (the more users the better), though, this does not have to be detrimental to the market in question–to the contrary, sometimes it can be useful.

Markets for digital information are the prototypical markets of the information and the knowledge societies or–following Manuel Castells (1996)–the network society. Many an author thinks we are on the threshold of an entirely new culture, the "multimedia culture" (Rauch, 1998). Such a transition to a new form of society or even culture goes hand in hand with a change in social values, a new sense of legal boundaries and a modified code of ethics. It is in front of this background that information markets develop the economic goods proper to them.

This book mainly deals with five research questions:

A. What particularities are displayed by pieces of digital information as economic goods?
B. In what environment (society, law, ethics) are information markets located?
C. What digital goods are traded on information markets?
D. What competitive strategies are pursued by providers on information markets?
E. Which role is played by piracy and the illegal information market?

The Spectrum of Digital Information Goods

In the early days of scientific endeavors toward the information market (from the nineteen-sixties onward), led by Peter F. Drucker (1959), Fritz Machlup (1962) and Marc Uri Porat (1977), among others, this concept is defined very broadly, encompassing all non-manual work. The delineation of the "knowledge worker" from all others was a rather arbitrary one (Webster, 1995). We consider to be more realistic. The approach of demarcating information markets works with two salient characteristics: on information markets, *digital* (or at the very least: generally digitizable) *information* is traded via the usage of *networks* (such as the internet).

Information markets are embedded in societal structures. This is why it is necessary to consider the conceptions and manifestations of the information, knowledge or network society. We will also lead an intensive expedition through the territories of information law. Considering the importance to information markets of free access to knowledge, of privacy and of dealing with intellectual property, it is unavoidable to take a look at information ethics.

Our book extensively analyzes the products and submarkets of I-Commerce. We look at products, the steps taken toward their production, their buyers as well as their providers' business strategies. An initial overview exemplifies the multitude of digital products:

- Business, market and press information,
- Legal information: norms, cases, annotations, citation services,
- STM information (scientific, technical and medical information): STM literature, bibliographical information services, facts,
- Search engines and content aggregators,
- Web 2.0 Services: sharing services, social bookmarking, knowledge bases, social networks,
- Commercial online music services,
- Internet TV,
- Digital games: "classical games", gambling, videos games, Massively Multiplayer Online Role Playing Games (MMORPGs), social games, games with a purpose,
- Software: products: system software, middleware, application software (each either as individual or as standard software), services: consulting and implementation services, software as a service.

Many goods–such as search engines and Web 2.0 services–are offered for free. The providers generate revenue by selling their customers' attention to advertisers. This is why internet advertising is an important subject to us. We are dealing with banner advertising, target-group-specific and personalized advertising, in-game advertising, permission-based marketing, context-specific advertising (such as "sponsored links" in search engines) and viral marketing.

I-Commerce: Mechanisms, Value Net, Strategic Variables

Competitive advantages are of great importance for information providers who want to be successful on information markets, in "I-Commerce", just as they are important to all providers on all markets. It is, however, necessary to account for the special characteristics of information goods in order to represent information providers' strategic positioning and courses of action. Three aspects are of central importance:

- the economic particularities (mechanisms) that occur in relation to information goods,
- the value net (stakeholder configuration), as well as
- the specific strategic variables that information providers can apply to gain competitive advantages.

From an economic perspective, is there anything special to be detected in information goods? Four *mechanisms* play a central role:

- dominant fixed costs,
- distinct information asymmetries,
- pronounced network effects and
- the tendency toward mutating into a public good.

In information goods, the production of the *first copy* is extremely expensive, compared to the cost of its reproduction. If we consider the sums expended upon a music title or movie, we will soon arrive at sums of several tens of thousands, or even millions, of Dollars. Once the software, the album or the film are finished, however, they can be reproduced nigh-on perfectly for a few Cents only. Furthermore, the transmission costs are very low for digital information goods. If a fast internet connection on a flat-rate basis is a given, data can be sent and received with no additional cost. This relation between very high fixed costs to very low variable costs leads to a pronounced unit cost reduction. This means that average costs per unit decrease very quickly when production numbers rise–boosted by the rapidly decreasing average fixed costs.

It can often be observed in information goods that one side of the market is better informed about the quality of its products than the other. A software provider knows his product, whereas the layman cannot assess its quality prior to a purchase and only partially afterward. Even an information professional should run into problems rating the quality of a search engine's sorting algorithms to any degree of exactitude, since providers of such search tools (let's say: Google and Yahoo!) may disclose a lot about patent writs, while keeping the details of their practical application tightly wrapped. Such unbalanced distributions of quality information is what we call *information asymmetries*. The value of an information good, e.g. the blueprint of a new production method or a chemical formula, can only be judged for good once the information has been received and processed (experienced). Once the information is in one's possession, however, the question becomes how high one's willingness to pay still is. In contrast to a new pair of shoes, information cannot be fully inspected prior to a purchase. Every kind of closer inspection leads to a disclosure of (parts of) the information, which runs

counter to the provider's interests. Kenneth J. Arrow (1962, 615) has described this problem as an *information paradox*: "[…] there is a fundamental paradox in the determination of demand for information; its value for the purchaser is not known until he has the information, but then he has in effect acquired it without cost."

When buying an information good, it is often of great importance how many other users this good already has. If you want to buy a word processing or spreadsheet application, you will think long and hard about whether to buy the product of a small provider, which is not very widely used, or to whether to turn to the market standard. Before buying an operating system, it is important to know what application software it supports. Buying the program that is most prevalent offers distinct advantages, e.g. in the possibilities for swapping files or helping one another solve any problems that might arise. The case is similar for films, books or music. A provider like Amazon is successful because a lot of customers cooperate (partly without being aware of it), generating basic information for recommendations via their clicking and buying behavior or consciously submitting ratings and comments. Facebook is mainly used because many others also use it, and because the individual can maintain many friendships or other contacts in this way, even internationally. Perhaps one or the other user also uses Facebook because of its neat additional offers, such as the games. Hence, in information goods the decisive factors are how many users the product is able to bind (*direct network effect*) and how many related products are available on the market (*indirect network effect*).

Whether goods are to be classed as *private* or *public* is decided, according to standard economics textbooks, via the two criteria of user rivalry and the principle of exclusion. User rivalry or user competition is what we call when usage of a good deprives others of the option of using it as well. Information goods can be used by many people without being used up, or consumed. An information good does not decrease with usage. When a person acquires a certain knowledge via processing information, this does not decrease the odds of another person acquiring the same knowledge. As opposed to many other goods, one need only think of a pair of trousers or a chocolate bar, the same information can be used by a multitude of people at the same time. There is thus generally no user rivalry in the traditional sense. It is more appropriate for the characterization of information goods to focus on changes to the benefits enjoyed by user (in terms of software) and informed party (in terms of content), respectively, when an information good is widely distributed. These changes can be very aptly described via network effects. They can be positive when the existing network becomes more valuable due to its increased usership, i.e. when its participants are increasingly better off. This is the case, for example, when one is able to communicate with a growing number of people about certain events or in a certain language. The network effects can also be negative, however, when the growth is to the participants' detriment. An undesired communication of a private or business secret would be a fitting example for this scenario. The principle of exclusion is not applicable to public goods as it is to private ones. This means that people who are unwilling to pay for usage of a good cannot be excluded from using it anyway. This is a grave problem for information

providers in particular, since information goods are easily distributed without the provider being able to control it. This goes both for information that started out being known in a small circle (e.g. plans concerning a new research result in the R&D department) and, particularly, information that has already been widely released (e.g. in the company bulletin or even as a specialist publication via open access). The further usage of such information goods can hardly be controlled by the provider anymore. Information goods thus display the strong *tendency to become public goods.*

Each of the four economic mechanisms of information goods described bears a great potential for *market failure*. Market failure is what the economist talks about when the market results are less than ideal when compared to a reference model. Following microeconomic standard textbooks, we would even have to suppose that no market can be created for information goods at all. Several examples illustrate this problem.

What company will offer goods that cost large sums to produce but for which it is unclear whether they will ever reach the high unit sales required in order to recoup these costs? Big providers with a large market share have a distinct advantage in this scenario. What's more, the copy costs are not only very low for legal users, but also for all illegal ones, which means that one must always expect the distribution of pirated copies to impair legal sales.

What provider wants to be active on a market where he will have to disclose his product to the customer for processing prior to a sale? Potential customers want to be as certain as possible that they will like the music, film, book etc. or that the software will suit their purposes.

Who wants to enter a market as provider where the customers will tend to settle for a product that is widely used rather than a high-quality product? Established providers enjoy immense advantages.

Who is prepared to offer goods on a market where one cannot, only with great difficulty, make sure that the buyers will actually pay for their usage? And what customer pays for a product that he could also have for free?

The starting point to *Competitive Strategies of Information Providers* occurs via the introduction of the instrument of industry analysis. In order to systematically comprehend an industry, there is the so-called "Five Forces" model developed by Porter (1980). According to this model, there are five fundamental forces that, put together, make up the attractiveness of an industry. Individually, they are the rivalry between the competitors extant in the industry, the market power of suppliers and buyers as well as the threat posed by replacement products and potential competitors.

The Value Net model by Nalebuff and Brandenburger (1996) is much better suited to describe the stakeholders active on an information market, however. This model stresses that there are not only competitive but also cooperative relationships in a market, and that they are of great importance to business success. This combination of competition and cooperation–co-opetition–ends, in contrast to Porter's Five Forces model, in a slightly modified model of market analysis. Nalebuff and Brandenburger speak not only of forces that threaten profitability, but also of

a *Value Net*, in which different agents are able to create values collaboratively. Apart from the usual stakeholders, like customers, competitors and suppliers, which Porter also talks about, the Value Net explicitly makes allowances for co-operative relationships.

Complements play a hugely important role on information markets, since it is always necessary to have some form of end device in order to be able to use digital information goods. Music files cannot be used without a player, eBooks cannot be read without a reader and application software is useless without a computer. How then, taking into account the particularities of information goods, can value nets be designed in such a way that they can lead to competitive advantages? In every textbook, strategic considerations end with the question "What is the basis on which companies develop their competitive advantages?" Here, too, the doyen of strategy, Michael Porter, has wielded enormous influence. He shaped strategic management by stating that companies generally have two strategic alternatives for gaining competitive advantages: the differentiation strategy and the cost/price leadership strategy. Porter's fundamental thoughts on positioning are directed at traditional markets, however. Since information goods are clearly different from traditional goods, they also require different competitive strategies. Porter's strategy alternatives do not become obsolete, but they have to be used in new variants on information markets. In their fundamental work "Information Rules–A Strategic Guide to the Network Economy", Carl Shapiro and Hal R. Varian (1998) offer multifarious starting points that are of great importance for information providers' strategy development. Their work has strongly influenced the debate about strategy, particularly from the perspective of the software industry. We worked out a total of seven strategic variables that are of towering importance for information goods:

- Timing of Market Entry,
- Pricing,
- Compatibility Management (Standardization),
- Complement Management,
- Copy Protection Management,
- Signaling,
- Lock-In Management.

These seven aspects are *strategic variables* due to being "manageable", i.e. subject to entrepreneurial influence. Such decision variables, or action parameters, can be used by companies in such a way that certain goals can be reached, relating for instance to market share, brand recognition or revenue.

The three aspects introduced above (mechanisms of the information market, value net and strategic variables) are summarized in a model, complemented by the technological (e.g. provision of broadband connections) and the institutional environment (e.g. the configuration of copyright). With the help of this model (see p. 358), information markets can be analyzed and design recommendations deduced.

It is possible, for example, to use the strategic variable *timing of market entry* to influence the different stakeholder groupings. Thus the timing of the market entry

affects customers' willingness to pay, suppliers' readiness to collaborate, complementors' interest in creating complementary products as well as the competition's endeavors toward creating competing offers. The stakeholders' actions, in turn, influence the degree to which economic mechanisms take effect on information goods. If many customers decide to buy a new product, this will attract followers who also want to have the product. Such direct network effects can be observed quite clearly in the case of the recently released iPad. At the same time, expectations for a large number of customers affects the offer of complements. Indirect network effects arise, such as publishers' eBook offers for the iPad.

The mechanisms can also be addressed directly via some strategic variables, such as *copy protection management*. A software, for instance, which is brought on the market early in a beta version without copy protection–a fairly common practice, by the way, in release changes by Microsoft–can spread very quickly but also uncontrollably and is thus pretty much to be regarded as a public good. So here too, network effects begin to work. Direct network effects arise via exchange of data in new formats or early communication about the software, indirect ones via complementary product developments, as can be very nicely observed in the number of apps, which were developed with great speed at the time of the iPhone's release.

Another example for a direct influence on the mechanisms can be seen in *signaling*, which is when preannouncements are made concerning a product release, for example. This can be used to reduce information asymmetries by giving customers early information about a new product and its release date. At the same time, though, this can increase information asymmetries, if for example the competitors' hand is forced because they are unable to accurately estimate what features the new product will have.

Feedback may act from mechanisms to stakeholders. A broad offer of *complements* (e.g. movies in the HD format) boosts further sales of HD TVs. A greater demand in turn gives the provider pricing latitude. This serves as an example for the reaction of a stakeholder grouping to the strategic variables, in this case *pricing*.

There are also, however, direct reactions of mechanisms to strategic variables. Thus network effects play a crucial role for a successful *market entry*. The stronger they are, the harder it will be for a pioneer to survive, since neither customers nor complementors want to make an early commitment.

Piracy on Information Markets

Piracy occurs massively in information and knowledge societies. The production of illegal copies with no loss in quality challenges–thus the industry associations–many of the traditional business models for information goods. The music industry in particular complains of massive losses in revenue due to the multitude of illegal access paths to the information good music. Why do people bootleg? There is a variety of reasons, such as gender, age, income, technical know-how, availa-

ble bandwidth or legal alternative offers. To put it very simplistically, male students can be termed the core group of pirates.

The question as to what concrete damage piracy causes, however, must be deemed an open one from a scientific point of view. A large number of studies from the music industry have arrived at differing results. They run the gamut from extremely strong negative effects, where every illegal copy substitutes a purchase, to positive effects, where illegal downloads even boost legal sales. If we take into consideration the studies' quality, we can see that negative effects cannot yet be cleanly proven.

What are information providers' scopes for design in the face of piracy? Educational work is to be preferred to criminalization, and a further tightening of copyright appears counterproductive. The central factor is the offer of attractive (legal) commercial offers in connection with innovative pricing models and new, creative usage options of the information goods for sale.

Remarks on Citations

A short note on the literature cited: Since the chapters each represent a unit, the sources are listed at the end of a chapter. For reasons of space, there is no summary of all cited sources at the end of the book. Sources from the internet are always marked "online". Due to the length of many URLs, we decided not to state the exact Web address. The interested reader will locate such sources via his or her search engine of choice. These websites are up to date as of early 2011.

Some of our quotations are in their original version in German language. All those quotations were translated by us.

Target Groups

This book is the result of the cooperation between an economist and an information scientist. We thus aim to address fellow scholars and all students of both disciplines. *Information Markets* is a comprehensive overview of the state of the art of economic and information-scientific endeavors on the markets of digital information–software as well as content. We address the following groups in particular:

- Economists (economics and business administration),
- Library and Information Scientists,
- Computer Scientists,
- Students of these disciplines,
- Professionals on the markets for information.

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Part A

Propedeutics of Dealing with the Information Market

Chapter 1

History of Exploring the Information Market

1.1 Knowledge Workers in the Knowledge Economy

Information–understood as knowledge set in motion (as in a patent document, for instance)–and knowledge itself (e.g. the concrete content of the patented invention) first became the focus of economic studies around 1960. However, this does not mean that information had become an economic good all of a sudden. From the beginning of the modern era, especially pointedly in Francis Bacon's "knowledge is power" at the beginning of the 17th century (Stock, 2007, 26 et seq.), through Enlightenment and particularly in the course of the industrial revolution, the significance of information has been steadily on the rise (Ortner, 2006). Peter F. Drucker (1959) and Fritz Machlup (1962) in the U.S.A., as well as Tadao Umesao (1963) and Yujiro Hayashi (1969) in Japan (Duff et al., 1996) were the first to have pointed out this significance of knowledge for society and economics. In the period following, the terms

- Knowledge Industry / Information Industry,
- Knowledge Economy / Information Economy,
- Knowledge Society / Information Society

were coined, which are, respectively, viewed as more or less quasi-synonymous or as part-whole relations. Added to them were the terms

- Knowledge Worker / Information Worker.

With the advent of services and the foreseeable loss of jobs in the industry, Peter F. Drucker (1959, 91) "discovered" the "**knowledge workers**", who do little manual but a lot of intellectual work:

> Productive work, in today's society and economy, is work that applies vision, knowledge and concepts–work that is based on the mind rather than the hand.

This was accompanied with a new form of organizing enterprises (Drucker, 1959, 50 et seq.):

> The principles and concepts which automation applies to mechanical production-work have earlier been developed for non-mechanical work in the business enterprise. They are fast becoming the rule for the work of all those who are not 'workers' in the traditional usage of the word, but who work productively as technicians, professionals and managers.

Drucker was less concerned with knowledge itself than with the management of the companies that employ knowledge workers. Knowledge work is accomplished in teams, and knowledge workers are either (as a rule) directly integrated into the company or at the very least closely tied to it. Joseph (2005, 249) observes that

> knowledge is not treated explicitly and it is the organization that is in control. Knowledge workers do not have a real definition if they are not associated with an organization.

The publication "The Production and Distribution of Knowledge in the United States" (1962) by the Austrian-born Fritz Machlup was seminal for the economic exploration of the information market. Machlup was one of the first to formulate knowledge as static and information as dynamic. Knowledge is not transmitted; only information is subject to being sent and received (Stock, 2007, Ch. 3). Machlup (1962, 15) defines:

> to *inform* is an activity by which knowledge is conveyed; to *know* may be the result of having been informed. „Information" as the act of informing is designed to produce a state of knowing in someone's mind. „Information" as that which is being communicated becomes identical with „knowledge" in the sense of which is known. Thus, the difference lies not in the nouns when they refer to *what* one knows or is informed about; it lies in the nouns only when they are to refer to the *act* of informing and the *state* of knowing, respectively.

Knowledge–as in knowledge representation (Stock & Stock, 2008, 20 et seq.)–is defined very broadly, comprising "knowing how" and "knowing that", implicit and explicit, subjective and objective as well as scientific and every-day knowledge. Machlup (1962, 19) inclines to agree with Hayek (1945), who introduced knowledge in terms of a critique of Neoclassical Theory. While this theory (falsely, according to Hayek) assumes the prevalence of perfective information (consumers about prices, companies about production technologies etc.), Hayek stresses that information is never simply "a given" for an entire economy, but are

distributed entirely unevenly, depending on the economic agent. Benoît Godin (2008a, 9-10) emphasizes:

> In Hayek's hands, the concept of knowledge was used as a criticism of perfect information in economic theory. … In real life, no one has perfect information, but they have the capacity and skill to find information.

Machlup (1962, 21 et seq.) classifies knowledge into five types:

- practical knowledge,
  - professional knowledge,
  - business knowledge,
  - knowledge of the worker,
  - political knowledge,
  - knowledge in the household,
  - other practical knowledge,
- intellectual knowledge,
- small-talk knowledge,
- spiritual knowledge,
- unwanted, superfluous knowledge.

It is a matter of both the production of said knowledge and its distribution via information. Godin (2008a, 12) summarizes Machlup's conception of knowledge:

> Defining knowledge as composed of all kinds of knowledge … was the first aspect of Machlup's definition of knowledge. The second was defining knowledge as both its production and distribution. To Machlup, information is knowledge only if it is communicated and used.

Machlup also regards the labor market of knowledge producers (1962, 393), but centre stage is taken by the knowledge economy's contribution toward the total valuation of a national economy (Webster, 1995, 11). According to Machlup, the following industries come under Knowledge Economy in the total economic account:

- education (domestic education, schools, universities, job training, education in church and the military, libraries),
- research and development (basic research, applied research and development),
- communication media (print products, photography, stage and cinema, broadcast and television, advertising, telecommunication media such as telephony and mail),
- "information machines" (printing machines, music instruments, film projectors, telephones, signaling systems, measuring instruments, typewriters, electronic computers, other office machines and their parts),

- "information services" (professional services: law, engineering, accounts, medicine, financial services, wholesalers, other business services, government).

In data acquisition, Machlup uses diverse sources outside official statistics, such as figures by the National Science Foundation, and also makes informed estimates. Machlup presents figures for every single industry of the Knowledge Economy, as well as aggregates for the industry level, which at the very least come close to measuring its valuation. Godin (2008a, 20) regards this as the essentials of Machlup's approach:

> Machlup then arrived at his famous estimate: the knowledge economy was worth $136.4 million, or 29% of GNP in 1958, had grown at a rate of 8.8% per year over the period 1947-58, and occupied people representing 26.9% of the national income.

In summary, Machlup discusses the effects of the further development of the Knowledge Industry on the labor market. His result points into two directions: (1.) The labor market for knowledge workers is getting larger (Machlup, 1962, 396-397):

> (W)hile the ascendary of knowledge-producing occupations has been an uninterrupted process, there has been a succession of occupations leading this movement, first clerical, then administrative and managerial, and now professional and technical personnel. Thus, the changing employment pattern indicates a continuing movement from manual to mental, and from less to more highly trained labor.

The last sentence of this quote already hints at the second trend. (2.) The labor market for untrained labor shrinks (Machlup, 1962, 397):

> If employment opportunities continue to improve for high-level-knowledge-producing labor and to worsen for unskilled manual labor, the danger of increasing unemployment among the latter becomes more serious.

Roughly ten years after Machlup's "Knowledge Economy", Daniel Bell (1973) called the goal of this development the "postindustrial society" and, a further six years later, the "information society" (Bell, 1979). The characteristics of such a postindustrial society are the prevalence of services on the labor market, at which point we have to critically parenthesize that not all services are automatically information services (Webster, 1995, 40). Alvin Toffler's "Third Wave" (1980) also describes–after agriculture (first wave) and industry (second wave)–his third wave as a postindustrial society.

1.2 Information Economy as Fourth Sector

A nine-volume work by Marc Uri Porat, dating from 1977, refines Machlup's approach and provides detailed statistical data of the United States' Information Economy. He thus lays the foundation for regarding information as an independent fourth economic sector, and acknowledging that this sector dominates the economy as a whole. Porat (1977, 2) defines "information" very broadly:

> Information is not a homogeneous good or service such as milk or iron ore. It is a collection or a bundle of many heterogeneous goods and services that together comprise an *activity* in the U.S. economy. For example, the informational requirements of organizing a firm include such diverse activities as research and development, managerial decision making, writing letters, filing invoices, data processing, telephone communication, and producing a host of memos, forms, reports, and control mechanisms. …
>
> Information is data that have been organized and communicated. The information activity includes all the resources consumed in producing, processing and distributing information goods and services.

Mainly, there are two fundamental differences to Machlup's approach (Porat, 1977, 44). Porat draws data and definitions for economic branches from official statistics and divides the Information Economy into two areas, the primary and the secondary information market. The **primary information sector** summarizes all branches that produce information machines or sell information services on (established) markets (Porat, 1977, 15). Information services have two central aspects: they are sold on markets and their utilization installs knowledge in the buyer (Porat, 1977, 22).

> The end product of all information service markets is knowledge. An information market enables the consumer to know something that was not known beforehand.

The **secondary information sector** comprises all sorts of bureaucracy, company administration as well as government agencies (Porat, 1977, 15 et seq.):

> It includes the costs of organizing firms, maintaining markets, developing and transmitting prices, regulating markets, monitoring the firm's behavior and making and enforcing rules.

These services of the secondary information sector are not offered on the market but performed internally in companies or the apparatus of state.

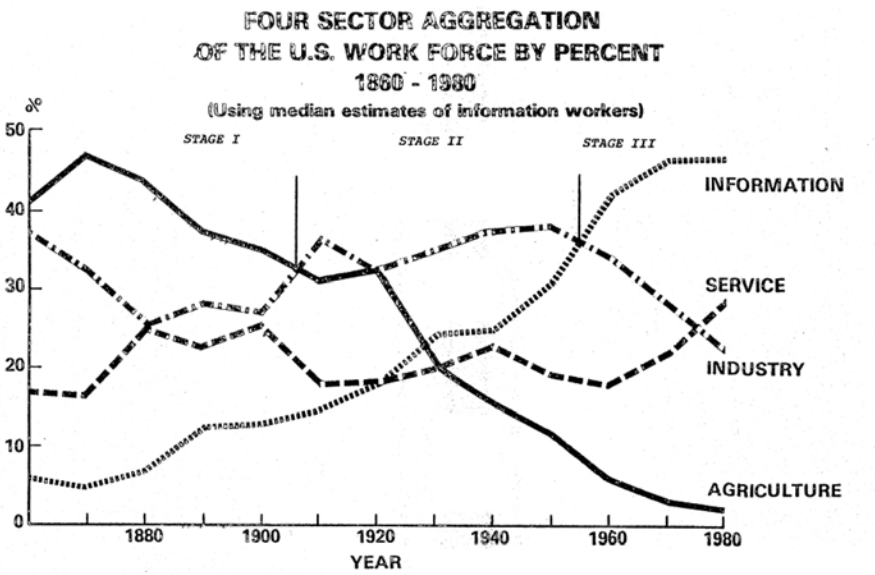

Figure 1.1: Development of the U.S. work force in the four sectors after Porat. Source: Porat, 1977, 121.

Porat, too, calculates figures that express the information market's contribution to the overall economy, but most influential were his estimates concerning the labor market. The "information workers" (Porat, 1977, 105) are employed in three areas (Porat, 1977, 107):

- in organizations that offer their products on information markets ("markets for information"); among them knowledge producers (scientists, lawyers, architects etc.) as well as knowledge distributors (mainly teachers and librarians),
- in organizations corresponding to the secondary information market ("information in markets"); among them accountants, insurance agents, salesmen as well as managers,
- in organizations that produce or operate information infrastructure, i.e. those that work with computers, telecommunication and non-electronic information machines (e.g. printing presses).

Porat translates the manpower into the sum of information workers' income and arrives at the following figures for the year 1967 (Porat, 1977, 107):

Markets for Information	
Knowledge Producers	$47m
Knowledge Distributers	$28m

Information in Markets	
Market Search & Coordination Specialists	$93m
Information Processors	$61m
Information Infrastructure	
Information Machine Workers	$13m

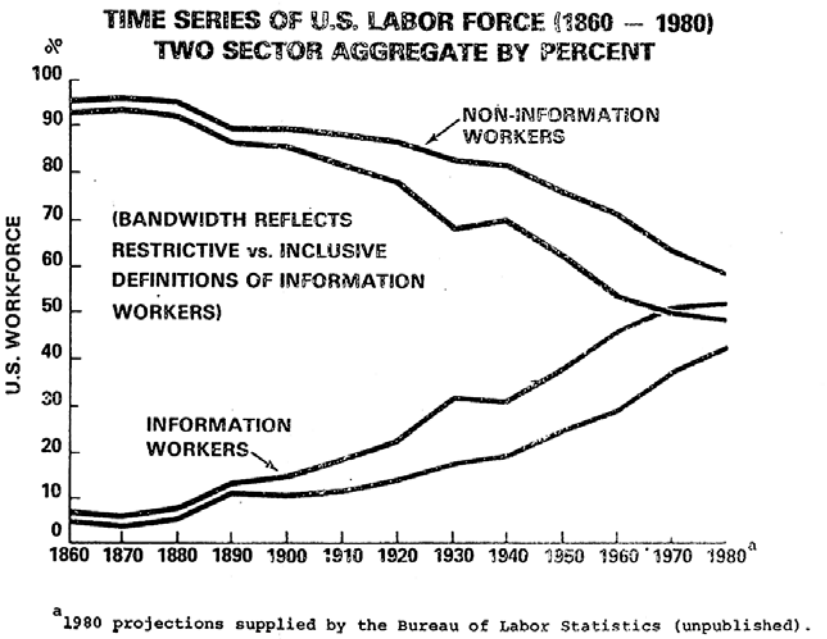

Figure 1.2: Development of the U.S. work force by information workers and non-information workers. Source: Porat, 1977, 120.

This corresponds to an overall volume of $242m for the information market, or 53.2% of the United States' entire earned income. The rest of the labor market is made up by agriculture, industry and other services (Porat, 1977, 117 et seq.). The first phase ("Stage I") is dominated by agriculture, whereas the labor market in Stage II belongs mainly to industry. Today, in Stage III, information work is dominant. In an aggregation of this data into only two sectors (information workers / others), we see a convergence, starting approx. in the middle of the 1960s, of both labor markets' volumes to around 50%. In the face of such a description, it seems natural to believe in the existence of an information society (at least in the U.S.A.). Frank Webster (1995, 12) comments on this:

> The quantification of the economic significance of information is an impressive achievement. It is not surprising that those convinced of the emergence of an 'information society' have routinely returned to Machlup and especially Porat as authoritative demonstrations of a rising curve of information activity, one set to lead the way to a new age.

However, diverse problems hide in Machlup's and Porat's deliberations (Robinson, 1986; Schement, 1990). Delimiting information activities from all others is highly arbitrary. Neither theory gives appropriate space to all the services not belonging to the information market. All people who do not obviously and exclusively work "with their hands", are information workers per definitionem. A clear distinction between "thinking" and "doing" is impossible, particularly for the secondary information sector, which means that all secretarial and accounting activities are not regarded as services but as information work. Webster (1995, 16) is very skeptical:

> Librarian, for example, can encompass someone spending much of the day issuing books for loan and reshelving, as well as someone routinely involved in advising academics on the best sources of information for progressing state-of-the-art research. Is it really sensible to lump together such diversity?

1.3 "Information Superhighways"

From the late 1970s through to the 1990s, the information society has become the subject of national and international political programs. The point is the *creation* of the information society–with a view also to strengthening national economies and labor markets via political measures, as there is a continuing discussion on the effects of technological progress on the job situation. One side holds that the rationalizing component of technological progress will lead to redundancies, and as a consequence, to underemployment and technological unemployment. The other side sees technological progress as the precondition for economic growth, with production growth, in turn, the precondition for employment (Stock, 1997).

With regard to the information society, there is a fundamental difference to the earlier discussion (Stock, 1997). There has always been technological progress locally, in the sense that it has led to innovations in a particular technology or economic sector. If there have been redundancies, in the end progress still led to new jobs being created elsewhere, and all in all the job situation more or less stayed the same. **Information-technical progress**, however, works on a global scale; it has consequences for all economic sectors and industries. This could lead to a loss of jobs in agriculture, industry and services. The opposite could also happen: the information society will manage, despite all rationalization effects, to achieve positive labor market aspects.

The negative scenario is invoked by Jeremy Rifkin (1995), for example, who sees us heading for "The End of Work". The positive scenario is mainly the product of the political programs for building the information society. Jobs in the information society are created by the providers of information (e.g. in the industry for computer manufacturing or entertainment electronics as well as by service providers in software and content production) as well as its users (e.g. in public administration or management). In the sense of a "Big Bang" (Pelton, 1994, 182), the new jobs of the information society clash, creating entirely new employment structures.

An early expert testimony on the government's role in creating the information society was submitted by Simon Nora and Alain Minc (1978). They coined the neologism "**telematics**", in the sense of a connection between telecommunication and informatics, thus endorsing the coalescence of both areas. Nora and Minc observe that the government cannot effect the change toward the information society by itself; however, it can so shape the underlying conditions that the hoped-for development is allowed to occur in the first place. The advancing computerization is proving to be one of the driving forces (Weygand, 2004).

The greatest influence on the development of the information society is wielded by the American programs for creating the information infrastructure, toward the implementation of which then-U.S. Vice President Al Gore contributed significantly. In one of the first programs (Information Infrastructure Task Force, 1993), relating exclusively to the **U.S.A.**, the **National Information Infrastructure** (NII) is sketched, which would later find its popular appellation in "Information Superhighways". The NII is

> a seamless web of communications' networks, computers, databases, and consumer electronics that will put vast amounts of information at users' fingertips.

The international expansion of the NII is the **Global Information Infrastructure** (GII) (Information Infrastructure Task Force, 1995). Al Gore (1996, 2) motivated the GII by stressing the international component, which is vital for the information society:

> We will not enjoy all of the benefits of the National Information Infrastructure („NII") unless it is linked to a global network of networks, a GII, linking every country, every town, every village, providing not just telephone service, but high-speed data and video as well. Such a global network would enable Americans to communicate across national boundaries and continental distances as easily as we communicate across state separations today. Time zones, not cost, will be the biggest barrier to keeping in touch with family, friends, and co-workers, no matter where they are.

According to Gore (1996, 3), five principles governed the construction of the NII and the GII: private investment, competition, universal service, free market access and flexible regulations.

Also at the beginning of the 1990s, the **European Union** discussed its path toward the information society (Stock, 1995; Stock, 1996a; Stock, 1996b). The fundamental planning paper is the "White Paper" from 1993, written under Jacques Delors' guidance, which introduces the information society as "the centrepiece of the twenty-first century's development model"–"Europe hinges upon it" (European Commission, 1993, 14). Expectations in the information society are very high (European Commission, 1993, 110):

> The community's policy for creating a common information area intensifies competition and increases Europe's competitiveness. It creates new jobs and should go hand in hand with special measures facilitating change in both economy and society, allowing every citizen to gain employment according to his or her qualifications.

The White Paper's statements are made more concrete by a working group led by Martin Bangemann (1994). As in the White Paper, the **Bangemann Group's report** puts the building blocks of the information society on top of each other, in a layer model. The bottom layer is made up of the networks and the technical facilities of data compression. The second layer contains the basic services (such as e-mail). In the last layer are the applications; paradigmatically, ten layers are worked out in which pioneer work is meant to be accomplished for the creation of the information society. Rather neglected in the White Paper as in the Bangemann Report, information contents are given due consideration in the European Commission's action plan "Europe's Way to the Information Society". The layer model is thus complemented by another layer and closed. For the EU Commission, there are two large groups of content; firstly audiovisual programs (films, TV productions and other multimedia applications), and secondly "high-quality information resources" (European Commission, 1994, 18). In the program "Info 2000" (European Commission, 1995), information contents take center stage. Here the market for content is split into three segments: print publications (newspapers, books, magazines etc.), electronic publications (online databases, teletext services etc.) as well as audiovisual content (television, video, radio, audio and cinema).

The programs for creating Information Superhighways prove successful, as long as the underlying technological infrastructure of the information market is being tackled. Around the same time (early 1990s), the World Wide Web appeared as the basic internet service; first search engines like Yahoo! and AltaVista counteract the chaos of the non-trawlable mass of digital content.

1.4 "New Economy"

With the advent and quick success of the WWW, several authors asked themselves whether the new "internet age" would also give rise to a "new economy", formed in such a way that it would override the previously known economic regularities and replace them with new ones. Looking back, we have to state, for business formations–and, particularly, the valuations of these businesses–that the history of the "New Economy" is the story of an error.

Picot and Scheuble (2000, 22) use the term "intellectual capital" to denote the knowledge of a company, and they (negatively) define this term as follows:

> Highly simplified, and abstracting from valuation problems as well as from market psychology, intellectual capital in listed companies corresponds to the difference between the market and the book value of an enterprise.

The market value is calculated via the product, consisting of market rate and number of shares, and the book value is noted in the balance sheet, representing the company's assets. In New Economy enterprises, this difference between market and book value proved to be gigantic. Following Picot and Scheuble, these companies thus had to have a fortune in intellectual capital. However, as investors had to find out when the New Economy collapsed, the difference turned out not to be "intellectual capital" but merely a bubble of "hot air", caused by feelings of euphoria; they were thus not the expression of new economic regularities, but instead of market-psychological circumstances (from which our authors abstracted–falsely, as we know today). Such market-psychological effects, observed in the New Economy, are in no way a new phenomenon. Such behaviors could already be seen during the Netherlands' "tulip mania" of 1636/37 (Baddeley & McCombie, 2001). The price for tulip bulbs rose sky-high (one single bulb commanded prices that rose to several times the annual income of a craftsman), only to take a drastic fall shortly after, alighting on a more realistic price range. This cost some tulip dealers their livelihood; the flowers themselves, however, are still blooming in Holland.

What, then, is the realistic economic core of this economy, previously deemed new by some? Kevin Kelly (1997; 1998) goes the furthest; he is actually convinced that the New Economy has features not even hinted at until today. Far more cautious are J. Bradford DeLong and A. Michael Froomkin with their "Next Economics" (2000), as well as probably the New Economy's most influential theoreticians, Carl Shapiro and Hal R. Varian (1998; 2003) with their conception of the "Network Economy", or "Information Economy", respectively. The authors agree that the information market displays all features of a **Network Economy**. Networks have, in fact, always existed (we need only think of railways or electricity grids), yet they command a dominant position in the information society in two respects: real networks are the information society's central infrastructures. The

(information) goods traded on information markets may themselves represent networks, of the virtual kind. Such networks display so-called **network effects**, meaning that their value increases the more participants they have (direct network effect) and the larger the offer of complementary products is (indirect network effects). The consequence of this "the-bigger-the-better" phenomenon is that standards often take shape which dominate a market. Users–end customers and companies both–are "trapped" within a standard, as the costs of switching (from one office software to another within a company, for example) may get very high; no network is possible without standards, and if a standard has reached critical mass, positive feedback will create a situation where the "winning" standard generally asserts itself. This last aspect quickly clashes with conventional antitrust legislation (Shapiro & Varian, 2003, 61). These laws protect the market by requiring several competing companies within any one industry, whereas network economy prognosticates the market dominance of a single standard (which may even be coupled with a single company). The second particularity of the information market is in the **business good of "digital information"** (Shapiro & Varian, 2003, 49 et seq.). Such goods are costly to produce but extremely cheap to reproduce; the legal protection of these goods is very difficult to survey and implement, so that some providers distribute certain information products for free ("follow the free!"; Kelly, 1997), generating their profits elsewhere. Commercially distributed information is never a search good, as its quality can under no circumstances be adequately assessed prior to purchasing them; lastly, information markets (as ad-financed television did before) use attention as their currency, which also generates profit. Hence, the "core" of the New Economy turns out to be the meeting of networks and digital content, where economic particularities can definitely be encountered.

1.5 Digital Information Services

What kinds of information are offered digitally, via networks? Whereas the "broad" approach of the information market, originating from Machlup and Porat, declares all non-bodily activities to be information work, the "narrow" approach starts with digital information goods. Some early market surveys were published by the **"Information Market Observatory"** (IMO) of the European Union's Commission. The IMO analyses the submarkets of online databases (IMO, 1989a), CD-ROM (IMO, 1991), teletext services (IMO, 1989c) and audiotext services (IMO, 1991). Even summarizing studies–e.g. on the European market (Casey, 1991; Schwuchow & Stroetmann, 1991; Bredemeier & Stock, 2000) hardly go beyond this small area of focus. Commercially distributed content is at the center of attention (Bredemeier & Stock, 2000, 228):

> We define "electronic information services" as electronic products that are distributed either online, via specific data nets (such as X.25 or the internet, or via teletext), or offline (as CD-ROM or Floppy Disks), and

> in which the information content (knowledge) takes center stage; in other words, they are the totality of products offered by the information economy's industry… on the market, with commercial purposes.

With the success of the internet and of the information offered for free on the World Wide Web, the IMO broadened its observation radius to include the internet (IMO, 1994). The restricted perspective on priced content is opened up, and content is now understood to comprise all sorts of knowledge (IMO, 1995, 9 et seq.):

> Originally, the IMO… concentrated on the relatively restricted area of electronic information services–the co-called traditional online ASCII database services, teletext and CD-ROM services as well as audiotext and fax-based services. In 1993/94, the perspective was broadened with regard to the now more extensive environment of the information service industry. This is meant to accommodate the phenomenon of convergence, which can be observed in a whole series of information-based sectors. The hardware and software industry, the telecommunication industry, the cable and satellite industry, all areas dealing with information content, such as film, television, music and print media, and of course the area of electronic information services display a tendency to converge in their striving toward markets and their technological development.

Relating to content, two approaches exist side by side. The goal of the "narrow" information market is to sell content, the goal of the New Economy's broad information market is to distribute information contents for free and charging customers' attention. For Rainer Kuhlen (1995), there is an additional third market, which is strictly non-profit-oriented and which he calls the "information forum". Here, predominantly scientific information is exchanged.

The **OECD** has developed a "guide" for recording indicators for the information society (OECD, 2005; Godin, 2008b, 54-61). As in the IMO (1995), here too the overall focus is on information and communication technology *and* information contents. Information contents become the subject of the information society in their digital online form exclusively (OECD, 2005, 58):

> According to this definition, digitised products include both:
>
> Products (such as reports, movies, music and software) which can be delivered over the Internet in digitised form and have a physical analogue (such as CD or DVD). For those products, the analogy with the physically delivered product is direct (*e.g.* a downloaded movie file and a DVD of that movie, an MP3 file and a CD); and other digitised products where the analogy with a physical product is less direct, for in-

> stance, new kinds of Web-based products which are accessed on line. They include online news, information or financial services and online games (…).

Why does the OECD thus place digital online content at the center of its considerations (OECD, 2005, 60)?

> It is clear that digital content–and digital delivery of content–are increasing in significance, driven by enhanced technological capabilities, a rapid uptake of broadband technologies and improved performance of hardware and software.

In the North American industry classification **NAICS** (2002), the information industry is at the first hierarchy level of the system–i.e. on the same level as, for instance, wholesaling, education or industry (Stock & Stock, 2008, 218). Sector 51 (Information) is classified into seven groups:

511 Publishing industries (except Internet), containing 5112: Software publishers,
512 Motion picture and sound recording industries,
515 Broadcasting (except Internet),
516 Internet publishing and broadcasting,
517 Telecommunications,
518 Internet service providers, Web search portals, and data processing services,
519 Other information services.

Manuel **Castells** (1996) devises a layer model of the internet industry, which is provider-oriented and considers four layers:

- Layer 1: Companies providing internet infrastructures (telecommunication companies, internet providers, manufacturers of network supplies etc.),
- Layer 2: Companies providing applications for internet infrastructures (particularly internet software and related consulting services),
- Layer 3: Companies providing free internet services and generating their income via advertising or commissions (content providers such as news portals, search engines, auction sites and the like),
- Layer 4: Companies transacting their business (exclusively or in addition to more common distribution paths) on a Web basis (E-Commerce).

1.6 M-Commerce

A new line of research comes about via the connection of the online world with mobile telephony: "mobile trade", or M-Commerce. Not the entire spectrum of M-Commerce (which, after all, additionally comprises the distribution of physical goods or electronic payment options) is relevant for our context, but exclusively the M-Commerce of digital information goods. M-Commerce is distinguished by the fact that at least one of the participants is not location-bound in his actions, being mobile. Balasubramanian, Peterson and Jarvenpaa (2002, 353) distinguish between three scenarios:

- Applications are dependent on location,
- Applications are dependent on time,
- Applications are dependent on the technology being used (by the sender or the receiver, e.g. when using a cell phone).

The precondition for this sector of the information market is broad usage of internet-capable mobile telephones or small computers with corresponding software for the operating system on the customer side. Another central concern should be the offer of application software and content tailored to the needs of M-Commerce (so-called "Apps"). On the one hand, we can observe application scenarios that are already known–so far, in respectively different contexts (telephony, SMS, e-mail, search engines, playback of music or navigation)–and can now be accessed mobilely from a single device, and on the other hand new services are created that presuppose a genuinely mobile application. Information to be requested mobilely by the receiver are, for instance, location-dependent navigation questions ("How do I get from here to X?"), time-dependent aspects for the observation of stock portfolios ("How are my shares currently doing?") or location and time-dependent requests such as information on traffic jams or delay messages for public transportation. Messages to be registered mobilely by the provider are, for example, location and time-critical problem reports by customers and their forwarding (the message "Car by Manufacturer X is stuck at location L" is sent to the nearest possible service point run by X), the offer of mobilely compiled (e.g. via satellite) data (e.g. for use in agriculture) or a service allowing the virtual participation in an auction (in which the provider acts via a mobile end device) (all examples taken from Balasubramanian et al., 2002). A sweeping success of M-Commerce is yet to make itself be felt (Godoe & Hansen, 2009).

1.7 Information Market–Today: Digital Online Information *and* Network Economy

At this point, the information market's demarcation as posited in this book has been located. Our subject matter concerns the digital information goods from NAICS 51, which are distributed via networks (chiefly the internet) and thus display significant network effects. It should be emphasized that the entire internet economy (Layers 2 through 4 in Castells) belongs to the information market, but

only insofar as information (in Machlup's broad sense) is offered there, either for sale or for free. Formulated negatively: we are not dealing with the E-Commerce of non-digital goods, but exclusively with I-Commerce, i.e. trade with information itself. M-Commerce with information goods is subsumed within this definition.

	Information	**Network**
Machlup, Porat	broad definition: "no manual labor"	---
IMO	digital information	---
Information Superhighways	not specified further	build-up of infrastructure
New Economy	digital information (misleading: "intellectual capital")	Network Ecomony
OECD	digital online information	Internet
NAICS	digital information	Internet
Information Market	digital online information	Network Ecomony (Internet)

Table 1.1: Approaches to Capturing the Information Market (I-Commerce).

In Table 1.1, the development toward the information market as we find it in today's scientific debate (and delimit it in this book) is sketched in a very simplified manner.

1.8 Conclusion

- Early economic discussions of the information market in Drucker, Machlup and Porat "discover" knowledge as an industry (or sector) of a national economy, in which "knowledge workers" are employed.
- Fritz Machlup (1962) "defines" knowledge very broadly, including in it all activities that are not accomplished manually. According to him, the United States' information market generates 29% of the Gross National Product and employs 27% of all manpower (both estimates applying to the year 1958).
- Marc Uri Porat (1977) distinguishes a primary information sector, in which companies offer information (again in Machlup's very broad sense) on markets, and a secondary information sector comprising all sorts of information processing activities by institutions. Both information sectors put together yield a volume of more than 50% of the U.S. labor market (for the year 1967).

- For many governments, the information society represents the salvation of ailing national economies and labor markets. The new jobs are hoped to provide decisive impulses for positive labor market developments.
- Programs from the early 1990s, like the National Information Infrastructure (NII) and the Global Information Infrastructure (GII) in the U.S.A. as well as the European programs for encouraging the Information Society (White Paper of 1993, Bangemann Report and actions by the European Commussion) provide the stimulus for building and expanding the information infrastructure, respectively.
- In the New Economy, the networks (particularly the internet), now well-developed, coincide with the economic good "digital information". In the economy, it is recognized (particularly by Shapiro and Varian) that remarkable particularities, but no new economic "laws", dominate. Valuations of New Economy enterprises show vast overestimations, which are not–as had falsely been assumed–due to mere "intellectual capital", but particularly to market-psychological effects.
- Apart from information and communication technology, information contents prove crucial for information markets. Early studies on content, e.g. by the Information Market Observatory, restrict themselves to online databases, CD-ROMs and video/audiotext services.
- The North American industry classification NAICS (2002) expands the perspective to all information; the OECD indicators for the information society (2005) exclusively consider such digital information as is distributed via the internet.
- On the information market in the sense of I-Commerce–as we understand it today–digital online information is exchanged, where all particularities of the information and network economies are to be taken into consideration.

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Chapter 2
Information as Economic Good

2.1 Economic Goods

What are goods? According to established definitions, goods are material or immaterial means suited for satisfying human needs (Gabler, 2011; Hopf, 1983, 68 et seq.). In other words, goods serve people. Now, not all goods are also economic goods. Economic actions are only registered when there is an insufficient amount of goods in relation to human requirements. A good such as air, which satisfies the human requirement to breathe, is normally available in sufficient amounts. Such goods, immediately available to everyone, are called **free goods**. At first glance, one might be tempted to describe water as such. However, it soon becomes clear that if one means fresh, drinkable water, it will not be necessary to imagine life in the desert in order to recognize that water is not freely available. In no country are there unlimited amounts of drinking water. Opposed to free goods are thus **scarce goods**.

The scarcity of goods coerces man into acting economically. He must decide how best to use his means of acquiring goods for satisfying his needs. Insofar, it can be assumed that there is a positive willingness to pay for scarce goods, i.e. people are prepared to pay for the value they represent. The acquisition of goods for money is usually conducted on markets. Suppliers and demanders of goods meet there and swap goods for money. The precondition for an exchange of goods coordinated via markets is the goods' marketability. To get back to the example of water: water is–today–a marketable good. Via its connection to the water supply, a household can use measurable quantities of water that will later be brought to account. The case is somewhat different for air–here, marketability has not been a given so far. Only recently have companies started to be required to buy so-called emission certificates if they want to use air as an emission carrier in Europe (Endres et al., 2004). For private individuals, air still remains a free good. In the following, we will focus exclusively on economic goods.

2.2 Information Goods

Let us turn to the specific form of the information good. What do we mean by it? A very broad definition is provided by Shapiro and Varian (2003, 49), who define an information good as everything that can be digitized. We can thus include sports results, books, films, music, stock prices or even conversations. As plausible as this definition may appear initially, it still has its flaws, as one might–at first glance–hold physical objects, say a banana or a tennis racquet, to be subject to digitization. According to this definition, they, too, are information goods. Apparently, Shapiro and Varian do not mean the object that can be digitized but the product of the digitization, the digital copy. In the case of physical objects, logically, information goods can only ever be their digitized reproductions. Expressed a little more precisely, the definition is thus:

> An information good is everything that is or can be available in digital form, and which is regarded as useful by economic agents.

In order to stress that we are talking about a good, we additionally emphasize the aspect of usefulness assumed by the potential consumer. It is doubly significant: the receiver hopes that he will be cognitively capable of processing the information, and that, furthermore, the information will be useful for satisfying his demands. If, for instance, someone were to buy enterprise data about a Chinese company, only to find out that he cannot process them because they are written in the local language, and also to find out–after a translation has been provided–that he had actually previously received the same data from another source, the assumption of usefulness would be disappointed twice.

A "bad" in this sense would be unwanted TV advertisements, for example. It can be digitized, but it does not serve the receiver, it merely annoys him. Another viewer might see it differently and actively enjoy the ads. What we can glean from this is that information goods have different values for different consumers. From a positive valuation, we can derive a willingness to pay.

The chosen definition for information goods is admittedly extremely pragmatic, but it will do for our purposes. A more detailed information-scientific discussion of the information concept can be found in Stock, 2007, 17 et seq.

The business with information goods is full of preconditions. It is not self-evident at all that the supply and demand of information goods will come together and create information markets. In order to be marketable, information must be not only useful, definable and available to an economic agent, but also transmittable (Bode, 1993, 61). The offer, i.e. the transmission of information goods, is always media-specific. These can be, according to Pross (1972, 127 et seq.), **primary** (carrier) **media**, which facilitate direct interpersonal contact via language, facial expressions or gestures, **secondary media** (e.g. devices such as flags, smoke signals or also letterpress printing), which are necessary for producing information, **tertiary media**, which require technology not only for production but

also transmission and reception (e.g. telephone, CD-ROMs, DVDs) as well as **quaternary media** (Faßler, 2002, 147), such as the internet or video-conferencing systems, which are information-technology-based means of telecommunication.

When information is saved, this occurs via storage media such as central servers, CDs or printed books or magazines. Such data carriers are copies of an information good containing the good's entire content in encoded and decodable form. The same good can–if with different degrees of effort–be reproduced in any number. Usage of a saved information good generally occurs via the decoding of a copy by the user himself (e.g. reading an e-mail) or via the participation of a third party in the decoding of a copy that is not in his possession (e.g. video night) (Pethig, 1997, 2 et seq.).

Information goods thus always have a dual character, since they are always a combination of **content** (e.g. a sports bulletin) and **carrier medium** (Schumann & Hess, 2006, 34). They are then offered as articles in a magazine, radio segments or a sports show on TV. Digitization allows for a simpler separation of content and medium than was possible in the past. Content can now be offered multiple times via different media with no great effort. Electronic information goods always require, next to the carrier medium, an **end device** (e.g. DVD-player, MP3-player) in order to be played. In the following, we will see how important this aspect is, particularly when dealing with network effects. A fourth aspect with regard to information goods is the **law** that applies to them. Ownership of an information good always resides with the original owner or creator, who in selling copies only grants the buyer certain usage or processing rights (Wetzel, 2004, 101). This aspect, in turn, has a great significance for the passing on and usage of information goods, and we will deal with it when discussing bootleg copies.

Apart from the criteria mentioned above, information is further to be regarded as a (marketable) economic good only if it is relatively scarce (Bode, 1993, 62). Scarcity in information goods, however, can assume an entirely different form than the one hitherto accepted. For relative scarcity, it is generally assumed that (unlimited) human needs are facing a limited amount of goods to satisfy them. Now, information is generally available in abundance, so that scarcity occurs elsewhere, namely in the recipient's subjective processing options. Searching for a particular information good, one is simply unable to look at or listen to everything on offer, because the human capacity for processing information is limited. Hence scarcity can be the result, for instance, of the restricting factor of concentration (Franck, 2007).

Economically speaking, the concept of goods encompasses both **products** and **services**. Analogously, we can distinguish between information products and information services (Kuhlen, 1996, 83 et seq.). The constitutive feature for this distinction is the use of an external factor, such as a company's disclosures for the benefit of the auditor (Bode, 1997, 462 et seq.). If an external factor is involved, one would thus have to speak of an information service. This, however, is not wholly correct, insofar as any information service process always results in an information product, e.g. the finished audit report. Thus an online database can be regarded as an information product

> that emerged from out of other knowledge or information products as the result of various forms of information work, e.g. referencing, indexing and the database-appropriate structuring of publications (Kuhlen, 1996, 84).

Information services, on the other hand, we would have to call researching in a database, for example. The results of those services which would then be compiled into an information product for a client. A live concert, which at first glance one would regard as a pure information service, becomes an information product in the end, i.e. something digitizable.

It soon becomes clear that the distinction of products and services, so clear in economics, becomes blurred when considering information goods. When discussing information goods in the following, we will do so aware of the fact that there may be pure information products, but no pure information services. A service is always being rendered if an external factor applies to the creation of an information product. Under this viewpoint, information goods and information services may be regarded as virtually identical.

More important for or further deliberations are two other distinctions between different kinds of goods common in economics. Depending on the position in the value chain in which they are used, there is a distinction between consumer goods and investment goods, and the method of their application allows us to distinguish between durables and consumables. **Consumer goods** are used by (end) consumers. **Durable goods**, on the other hand, are used by non-consumers (enterprises, administrations etc.) in order to create services. **Durables** provide a lasting, or at least long-term value, whereas **consumables** are used up either immediately or have a very limited scope of action (e.g. Olfert & Rahn, 2008, 736). If we combine these two distinctions, we get the following matrix:

Value chain / Kind of Usage	Production (durable goods)	Consumption (consumer goods)
Durables	Technological potentials, which can become productive in combination with other goods and/or manpower (e.g. facilities, machines, office equipment)	Have a longer lifespan and, generally, various uses (e.g. clothes, furniture)
Consumables	Go into other products or contribute to the process (e.g. fuels, lubricants)	Have only one or very few uses (e.g. food, articles of hygiene)

Figure 2.1: Classification of Goods.

Let us now turn to information goods. At first glance, it appears obvious that they can be used by both consumers and enterprises etc. The same information, e.g. concerning the price of a good, can serve as an important decision input for a consumer as well as a company. When discussing information content, information tendentially has the status of a **consumable**. Strictly speaking, information cannot be consumed, yet there are many information goods that are used only once or in a limited scope; thus a newspaper, for instance, is bought in order to read the articles once only. The information relevant to the reader is processed, after which the newspaper is usually discarded. Company, market and press information is generally to be regarded as a consumable. It is subject to high rates of change (e.g. due to fluctuating exchange rates, quotes, consumer preferences, product offers) and thus has to be produced permanently and consumed anew, respectively (Ernst & Köberlein, 1994, 6). Sjurts (2002, 11) speaks of "time elasticity" as a fluent distinguishing characteristic. Time-elastic (consumable) goods lose a significant part of their value after being consumed, whereas durables do not, or much more slowly. Among consumables are thus also music, films or literature, if they are subject to strong falls in value and are only consumed once or very few times. If this form of content is used repeatedly, however–which may very well be the case for a favorite piece of music, which one listens to again and again over a long period of time–it will come closer to having the characteristics of a durable. However–and this is in opposition to market information–use or consumption are not coupled with the primary goal of increasing the consumer's knowledge. The main value is in the actual consumption itself. Apart from the purely cognitive aspect of information reception, the consumption of such goods is mainly motivated by affective (aesthetic, emotional etc.) aspects.

Information goods can also be **durables**. Software is such a kind of information good, being installed once and used repeatedly. This is the case for simple office communication software right up to complex enterprise-resource-planning (ERP) applications. Content is created or processed with the help of software, and is then sold or used for other, e.g. in-house, purposes. The case is analogous for software used for telephony or video conferences, for example. These, too, are durables, as they facilitate communication and cooperation with others (Messerschmitt, 1999, 163).

In the following, we will separate information goods into software and content (Messerschmitt, 1999, 139 et seq., 159), primarily regarding the former as durables and the latter as consumables.

Value chain / Kind of Usage	Production (durable goods)	Consumption (consumer goods)
Durables (software)	• Operating systems • Software applications (e.g. for office communication, enterprise resource planning, management information, databases)	• Operating systems • Software applications (e.g. for office communication, audio/video playback, databases, games)
Consumables (content)	• Business information (e.g. acquisition costs, market rates, market and communication analyses)	• Technological information, e.g. about production methods • Business information (e.g. market prices, market rates, product tests) • News • Music, images, videos, literature

Figure 2.2: Classification of Information Goods.

2.3 Digital Information on the Information Market

We will separate the totality of digital information goods in two: software (applications, mainly used as durables) and content (information content, used primarily as consumables). Software can be roughly subdivided into either standard or individual software. For content, we will draw a somewhat blurred line between e-content (serving mainly entertainment purposes) and p-content (tailoring to professional needs) (Spinner, 2000, 179; see also Stock & Stock, 2008, 28 et seq.). In e-content, we find digital versions of images, pieces of music and videos, and online games. The Web 2.0 services are also filed into this category. P-content comprises business and market information and news, legal information as well as scientific, technical and medical information (STM information).

Apart from products with content (such as a piece of music on iTunes or a research article in a professional journal on Elsevier), there are services that help locate such products in the first place: online search engines. Search tools either provide a broad coverage with no depth of content (like the search engine Google) or a technically restricted coverage that aims at depth (such as the information services STN, LexisNexis or DIALOG). The latter are almost exclusively situated on p -content markets and offer their services for a fee, while online search engines are free of charge for information seekers, recovering their investment via

online advertising instead, effectively selling publicity. Figure 2.3 will provide a quick representation of our little classification of digital goods on the information market.

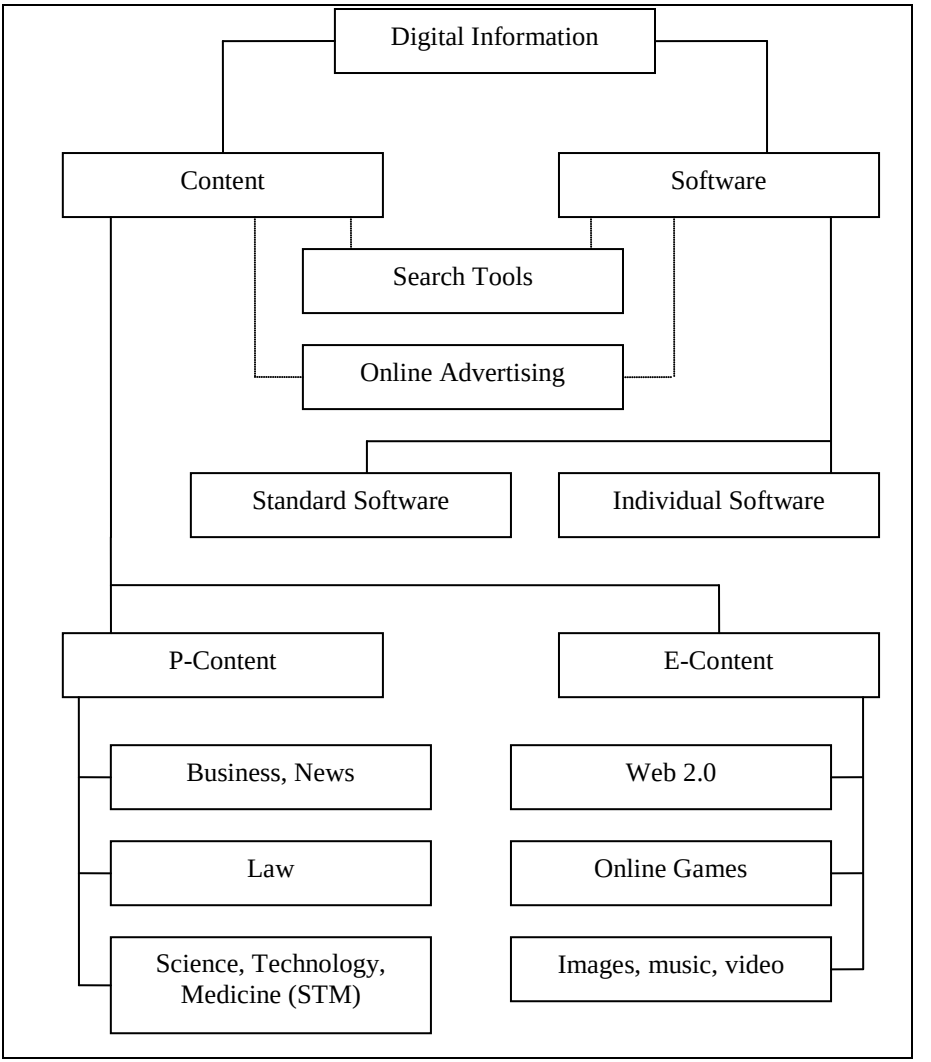

Figure 2.3: Rough Classification of Digital Goods on the Information Market.

In Chapters 7 through 15, we will take a closer look at the information goods addressed above. Here we can describe a select few typical products exemplarily,

one at a time; we do not aim to comprehensively represent all product groups or products, as there are thousands of relevant offers on the World Wide Web and particularly the Deep Web, but restrict our focus on a more analytically oriented overview.

2.4 The Economic Significance of the Information Market

The significance of the information markets, of its products and services, must be considered under two aspects. On the one hand, there is its direct significance, expressed in numbers of employees or sales figures. On the other hand–and this may even be the more important aspect–we will regard its indirect significance.

The **indirect economic significance** of the information market is expressed in the customers of this market having made economically significant decisions, or optimized business processes, on the basis of information products acquired. Thus for example a scientific article (acquired for around €25) can inspire an R&D staffer to come up with an idea that results in a completely new production method, netting the company several million Euros. Or a company dossier produced by the in-house information service was at the basis of the decision to acquire that company, allowing the buyer to achieve high profits. In the reverse case, a failure to perform research can lead to notable losses, even leading up to insolvency, e.g. if one misses technological developments about to happen (information which could have been acquired from content aggregators for a few hundred Euros), or if one is thrown into dire straits oneself via the insolvency of a supplier or client, only because one has neglected to acquire documentation regarding the former business partner's solvency. A further example: if a company makes insufficient use of software, this can very well lead to competitive disadvantages. The disadvantage of this indirect economic significance of information is that it cannot be expressed quantitatively.

This is–at least principally–different for the **direct economic significance**, as estimates regarding the market volume are available in this case. Lacking global statistics, we will here present our own informed estimate, compiled on the basis of diverse sources from market research institutes. The following values apply for the totality of digital goods (worldwide, 2009):

Software	€164bn
P-Content	€15bn
E-Content	€6bn
Online Advertising	€50bn
Total Market	*€235bn*.

For software, a huge portion of the entire market volume is a single company's (Microsoft; €43bn in the business year 2008/2009); the situation for online advertising is similar (Google; €17.5bn in 2009). The market for p-content is dominated by the submarket of STM information. For e-content, online games in particular generate significant profits; other submarkets such as Web 2.0 services or Web-

TV do not show any sizeable profits at the time. Web 2.0 services e.g. Facebook, make money with online advertising.

2.5 Conclusion

- Goods are material or immaterial means that provide use. Their scarcity– in relation to requirements–coerces man into acting economically.
- Information goods are (potential) digital copies with a presumed usage value.
- Scarcity in information goods may result from a limited offer as well as from the demanders' limited capacity for processing information.
- In order to be marketable economic goods, information must be not only useful, definable and available to an economic agent, but also transmittable and–relatively speaking–scarce.
- Scarcity in information goods can result from excessive demand and insufficient means of satisfying needs, or from oversupply combined with insufficient processing capacities.
- By and large, information products and services can be regarded as identical.
- The fundamental manifestations of information goods are content and software. The former generally serves to be consumed, the latter to be used.
- The direct significance of the information market, expressed quantitatively, is €235bn (total market, worldwide).
- The indirect significance is qualitative in nature and is expressed in the informational improvement of entrepreneurial decisions as well as productivity gains.

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Chapter 3

Economic Particularities of Information Goods

3.1 Market Failure for Information Goods

Information goods are goods that display particular economic characteristics, which can easily lead to market failure. Market failure occurs when

> the result of marketary coordination deviates from the economically ideal allocation of goods and resources in the model of complete competition (Gabler 2010a).

If we followed the micro-economic standard textbooks, we would even have to assume that no market for information goods could develop at all. Some examples to make this problem clearer:

For information goods, the creation of the first copy is extremely expensive when compared to its reproduction. If we consider the production costs for a piece of music or a film, we will quickly run up several hundreds of thousands, even millions, of Euros. Once the album or the films are finished, however, more or less perfect copies can be made for a few cents each. Furthermore, the transmission costs of digital information goods are extremely low. If there is a fast internet connection, run on a flat rate, files can be received and sent with no additional cost, no matter what their size is.

- From this sort of cost structure, problems arise for the working of information markets: which company is going to offer goods that require large sums in order to be produced, but for which it is unclear whether enough units will eventually be sold in order to recoup those costs? Big providers with a large market share are clearly in advantage here. What makes things worse is that the copying costs are low not only for the legal, but also for the illegal user, and that one must always account for the dissemination of bootlegs hurting one's legal business.

The value of an information good, e.g. of the blueprint for a new production method or of a chemical formula, can only be conclusively assessed after the information has been received and processed (learned). If one then possesses the information, it remains to be seen how high one's willingness to pay still is. Unlike a pair of shoes, information cannot be inspected in their entirety prior to purchase. Each kind of precise inspection means a divulgence of (parts of) the information, and this is frequently against the provider's interests.

- This again leads to problems for a functioning information market: which provider wants to be active on a market where you have to surrender your product to be processed by the receiver prior to purchasing? On the other hand, which customer wants to buy a product without being able to see it, and thus precisely assess its value?

It is often of great importance in buying an information good to note how many other users the good already has. Whoever wants to buy a text processing or spreadsheet application will consider carefully whether he settles on the product of a small provider, which is not very prevalent, or on the market standard. To buy the most widely used program has clear advantages for file-sharing and provides options for mutual assistance in case of any problems in operating it. The case for films, books or music is similar, i.e. many buyers settle on content known by many others in order to have a say.

- Problems that arise for a functioning information market here are: what provider wants to enter a new market in which customers, in case of doubt, will rather buy a highly popular than a high-quality product? Established providers have significant advantages.

Information goods can be used by many people without being used up, i.e. consumed. An information good is not reduced by usage. If a person acquires a certain knowledge by processing information, this will not reduce another person's chances of acquiring the same knowledge. In contrast to many other goods, say a pair of shoes or a chocolate bar, the same information can be used by a multitude of people at the same time. Wear-out effects only occur for information that derives its value from not everybody having it. The insider's tip for the small Caribbean island quickly loses its value if everyone knows about it. For many pieces of information, however, there is no competition in terms of their usage, from the provider's perspective: for him, it makes no difference whether 6,000 or 600,000 people read a magazine or watch a TV show, e.g. the Academy Awards ceremony.

However, restrictions can be imposed via the information's packaging: a book can only be read by one reader at a time as a matter of principle, and the number of viewers of a TV show in one household is limited. However–compared to traditional goods–it is disproportionately harder to exclude customers who are not prepared to pay for the information from its usage: a book can be borrowed at little to no expense from a friend or the library, a TV show can be seen at someone else's house or recorded by a friend for later playback.

- For lack of exclusion options, the following problems apply for a functioning information market: who is prepared to offer goods on a market where it can be ascertained only with difficulty, if at all, that the buyers

actually pay for their usage? And what customer will pay for a product that he could also have practically for free?

Economically speaking, the following particularities apply for information goods (Varian, 1998; Hutter, 2000; Gerpott, 2006, 318 et seq., Linde, 2008, 14 et seq., similarly Klodt, 2003, 111 or Buxmann & Pohl, 2004, 507.):

- Information goods have strongly **decreasing average unit costs** (First-Copy-Cost effect), because the attributable costs of production dominate the variable costs of reproduction.
- Information goods have few pronounced search qualities, but the more heavily pronounced **experience and credence qualities**, respectively.
- Information goods have the characteristics of **network effect goods**.
- Information goods have a strong tendency toward so-called **public goods**. Consumer rivalry, per definitionem, is absent and the principle of exclusion can be applied only with difficulty, if at all.

Information goods thus display characteristics that make the occurrence of a market difficult, or at least lead to the market results being suboptimal. The economist here speaks of market failure. What this means in particular–analyzed economically–will be discussed in the following sections in more detail.

3.2 First-Copy-Cost Effect

For many traditional goods, particularly industrially manufactured ones, there are both fixed and notable variable costs (e.g. Meffert, 2005, 508). As opposed to the costs for production and facilities, those are, in the example of the manufacturing of a new laptop computer, all costs that occur in direct relation to the manufacturing of a single product: e.g. drive, chassis, processors. For information goods, on the other hand, there is a strong shift to fixed costs. In publishing houses, the costs of producing the first copy (incl. author's fee, cover design, typeface etc.) eclipse the costs for the following copies (incl. paper, printing, binding etc.) by a large margin. The use of different data carriers during reproduction also results in different costs. Thus for Microsoft's Encarta, the reproduction and distribution costs for the book version were $250, as opposed to $1.50 for the CD-ROM version (Downes & Mui, 1998, 51). Another example: where the production of a music CD can easily cost tens of thousands of Dollars, the variable costs of making copies are entirely negligible. The traditional distribution of music, via audio CDs, presents the music industry with variable costs of around €0.50 per copy (Buxmann & Pohl, 2004, 507; Wetzel, 2004, 205). In comparison, digital goods may even be offered more cheaply than that, particularly when the receiver shoulders the costs for distribution, or downloading, himself. The difference between the costs for the first and the last unit depends on how immaterial the product is (Stewart, 1998, 170). The first copy of Netscape Navigator, for instance, generated around $30m in development costs. The variable costs of the second copy, on the other hand, were only around $1 (Kelly, 2001, 85).

This relation between very high fixed costs and very low variable costs leads to a pronounced fixed cost degression. This means that the fixed costs per unit sink very fast as production numbers increase. On the example of Netscape, the development costs of $30m for the first copy, spread out over all units produced, would already be halved into $15m apiece for two copies. For four copies, they would only be $7.5m, and for 100,000 copies only $300 apiece. This extremely pronounced degression effect is called the First-Copy-Cost effect (FCCE) in media economics (Grau & Hess 2007, 26 et seq.; (Beck, 2006, 2224; Kiefer, 2005, 169).

There is no notable fixed cost degression for information goods with high development costs that cannot be reduced via high production numbers. This is the case for individual software, for example.

Usually, any consideration of the costs includes not only fixed but also variable costs. If fixed and variable costs are related to a produced unit, we speak of average costs.

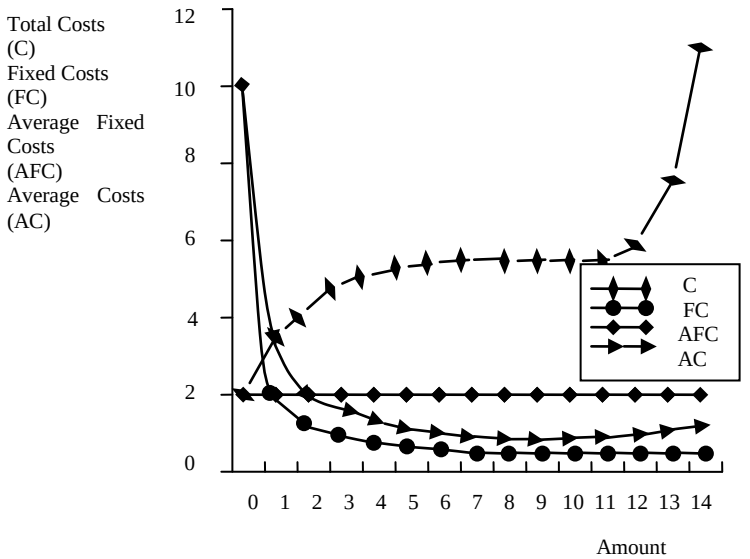

Figure 3.1: Typical Cost Behavior Pattern for Standard Goods.

As a rule, it is assumed for standard goods that average costs show a more or less pronounced u-pattern for companies with increasing levels of output (cf. fundamentally Mankiw et al., 2008, 297 et seq., with empirical data on cost behavior patterns in companies cf. Diller, 2008, 87 et seq., Kiefer, 2005, 173 et seq. and Simon, 1998, 14 et seq.). The total (fixed and variable) costs of production are divided by the amount produced, which results in said average costs. For the fixed

costs, the degression effect described above applies, as they are spread over more and more units. The decreasing average fixed costs result in a relatively fast decrease in total average costs. If the variable costs of every additionally produced unit are constant, or even decreasing, this will work in the same direction as decreasing average costs. If variable costs increase over the course of production, which is sooner or later to be expected for standard goods the degression effect of the fixed costs will be overcompensated for from a certain point on and average costs will rise.

The more strongly the average variable costs fade into the background behind fixed costs, the closer the course of the (total) average costs will come to that of the average fixed costs. In the extreme case scenario of $0 of variable costs, both curves will even be coextensive.

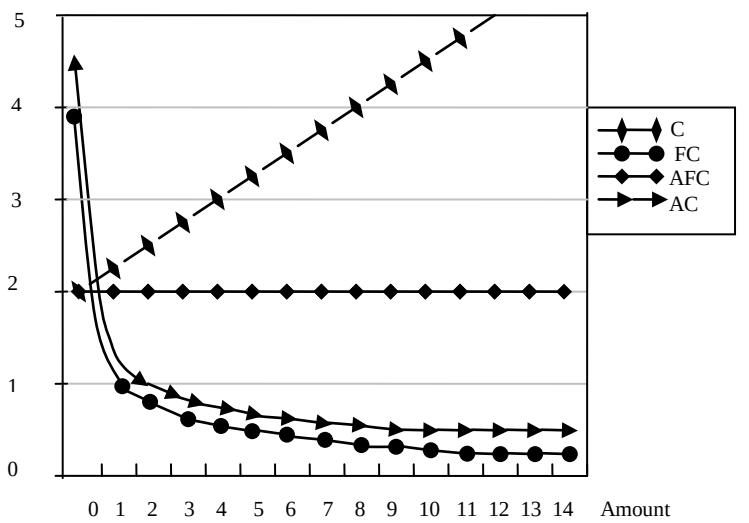

Figure 3.2: Cost Behavior Pattern for Information Goods with Constant Variable Costs.

If average costs decrease continually even as production numbers increase, this is called, in economics, (increasing) economies of scale. Economies of scale (e.g. Woll, 2008, 690) refer to changes in the output (production yield) due to proportional variations to all factor inputs for a given production technology. If the production amount increases proportionally/disproportionally/subproportionally to the additional factor input, we speak of constant/increasing/decreasing economies of scale. The causes for increasing/decreasing economies of scale are decreasing/increasing marginal products. In this case, it is desirable for the individual provider to expand his production amount as far as possible. Precisely these econ-

omies of scale occur for information goods, due to the high fixed costs for the first copy and the very low variable costs for all subsequent ones (Kulenkampff, 2000, 60). The very pronounced cost degression is reinforced significantly by the new information technologies. Transmission costs in particular decrease dramatically, as the provisioning and downloading of an .mp3 file, for example, are much cheaper for the provider than the production and distribution of a CD. Very little changes in the development and production costs, though (Klodt & Buch, 2003, 79 et seq.). These two cost aspects–provisioning costs and transmission costs–which are near zero, also represent the basis for the existence of online filesharing sites (Buxmann & Pohl, 2004, 507, 514 et seq.).

3.3 Information Asymmetries

In a traditional transaction of goods, e.g. of clothes, food or electronic devices, the customer has the option of inspecting the object in question. He will observe it, take it into his hands and perhaps even try it, or test its functions. All of this is difficult for information goods. In order to really be able to estimate their full value, one must first process the information. If we draw an analogy to a visit to a restaurant, one would first have to eat the food and then announce one's willingness to pay, i.e. one would determine oneself how much the already eaten food was worth. It is obvious that this can always be misunderstood as an invitation to a free, or at least very cheap, meal. The providers of information goods face a similar problem: if they surrender the information they offer, there will be insecurity as to the value their recipient will ascribe to it, and how his willingness to pay for the already consumed good will develop. If, on the other hand, the provider does not allow the consumer to test the information, that latter has to buy the pig in the poke and will probably either completely forego the purchase or–in view of his insecurity about the information's quality–have a lower willingness to pay than if he had been able to safely assess the quality. In such situations, we speak of asymmetric information distribution: there is a gulf between the information distributed to the suppliers' and to the demanders' side. When one side of the market is better informed than the other, this opens up vistas for exploiting this gradient strategically, e.g. by offering low-quality goods. This phenomenon of asymmetric information distribution mainly relates to the quality of the product on sale (Kulenkampff, 2000, 127). Asymmetric information distribution can also, however, relate to the allocation of product prices on the market, demanders' preferences (Klodt & Buch, 2003, 92 et seq.) or–as we will explain in more detail in Chapter 22–strategic market communication.

3.3.1 Information Asymmetries on Markets: The Market for Lemons

The analyses of George A. Akerlof (1970) have been fundamental for all further works on the subject of asymmetric information distribution. He was the first to exemplify the phenomenon of asymmetrically distributed information, on the ex-

ample of the used-car market. The seller of a used car is very well informed about the state of his vehicle on the basis of having driven it in the past. The buyer, on the other hand, merely knows that there are cars of various qualities on the market. He can thus only make an estimate concerning the average quality. If a symmetric information distribution were at hand, i.e. if both sides of the market had the same amount of information about the product on offer, one could easily set a price for each car based on its quality. As this is not the case, the seller has the option of exploiting this, by taking his low-quality car, advertising it as a good car and selling it at a higher price than would be adequate. Akerlof (1970, 489) calls these vehicles "lemons". The demanders, who are unable to assess the quality on offer on this market, will only be prepared to pay a price that meets their expectations. This can be illustrated via a simple numerical example (Varian, 2007, 827 et seq.).

Let us assume the following for a used-car market: there are 100 buyers and 100 sellers of used vehicles, and everyone knows that 50% of the cars on offer are of low quality (lemons). The quality of each individual car is only known to the sellers, i.e. this is a case of an asymmetric distribution of quality information. The sellers of the lemons are prepared to sell them for €1,000. The sellers of the good cars want at least €2,000. The buyers would pay €1,200 for lemons and €2,400 for good cars. If the quality could be easily assessed, we would get prices between €1,000 and 1,200 for lemons and between €2,000 and 2,400 for good cars. If the quality cannot be assessed, however, the buyers must try to estimate the value of the car in question. If the consumers generally derive the quality from the price, this will result in a uniform price that is oriented on the average quality (Graumann, 1993, 1337). In order to determine this price, the economist will calculate a so-called expectancy value, which is an estimate concerning a chance result to be expected. For the same probability of one of the two quality levels posited above, the rational buyer will be prepared to pay the expectancy value of the cars: ½ * €1,200 + ½ * €2,400 = €1,800. Which leaves us with the question: who would sell his car at that price? The lemon-sellers would be prepared to sell for €1,800, but not the sellers of the good cars, as they are aiming for at least €2,000. The consequence: at this price, only lemons would be sold. The situation becomes even more dramatic when the buyers can see that the price they are willing to pay is only met by lemons. Why? They would have to lower their expectancy value again, which in the extreme case would mean: 1 * €1,200 + 0 * €2,400 = €1,200. The buyers would then only be prepared to pay €1,200 at most. The consequence is that no good cars would be offered on this market. This result is particularly remarkable as there is definitely a willingness to pay for good cars (namely €2,400); it just does not take effect, because the necessary information for assessing the quality is missing. We are looking at an acute case of market failure, i.e. the result of marketary coordination deviates from the ideal result derived with the help of a reference model. The ideal result would be that all cars, good and bad, are sold at their respective prices.

What is so special in this case is that we have to expect not just a few mispurchases, where the buyer is disappointed to find out that the car he has acquired is a lemon, but that it is to be feared that not a single higher-quality vehicle will be

sold. Why is that? If a person tries to sell a bad car, and this is discovered after the transaction, this will influence the buyers' perception of the average quality of cars available on the market. They will lower their expectancy values, and thus the price they are willing to pay for the average car. This in turn puts the sellers of good cars at a disadvantage. The cars that will most probably be sold are the ones that their owners most want to get rid of. In summation, it can be said that when too many units of low quality are on the market, it will become difficult for providers of quality to sell their products at a reasonable price (Varian, 2007, 829).

What can we derive from this model? What we have here is the phenomenon called Adverse Selection in economics. The terms "Adverse Selection" and "Moral Hazard", which we will consider at a later stage, spring from insurance economics (Molho, 2001, 9 and 46 et seq. with further "lemon" examples in the context of experimental studies). The so-called Principal-Agent theory deals extensively with this problem (e.g. Richter et al., 2003 or, with a specifically economical perspective, Jost, 2001). The fact that one side of the market, in this case demand, is inadequately informed about the quality of the goods on offer (Hidden Characteristics (Göbel, 2002, 98 et seq.)), and that this information deficit cannot be made up for via search activities, the result is–due to the quality estimates that were made–Adverse Selection. The good offers are ousted by the bad. A general consequence of existing information asymmetries is thus that good quality is superseded by bad quality.

In the extreme case, it can come to the wholesale destruction of the market, namely if the providers–other than in Akerlof's fixed-quality model–can determine the quality they offer themselves (Varian, 2007, 829 et seq.). In this scenario, the (dishonest) providers of low quality–they are dishonest because they demand premium prices for poor quality–will not only drive the (honest) providers of good quality from the market, but in the end break the market itself, when it becomes clear that the (low) quality on offer is linked to too high a price. The downward spiral of the step-by-step withdrawal of quality providers will lead not to partial but to complete market failure.

3.3.2 Information Asymmetries on Information Markets

Let us now turn to information goods. Analogously to the above considerations, it will also be the case for information goods that there will be providers of good quality and providers of poor quality on a market. High-quality offers will be those that meet demanders' expectations. Hence, poor offers lead to disappointed expectations. If the demanders are not able to determine the quality of the offer from the outset, providers will feel the impetus to sell "lemons", advertising poor quality as good and thus increasing their profits.

If, furthermore, the manufacturing costs for poor quality are lower than they are for high quality and the provider can assume that the demander will not be able to assess it–at least prior to purchasing–it makes economic sense under profit maximization conditions to produce poorer quality at lower cost and offering it as high quality. It is also evident, though, that that this only makes sense as long as the

demanders allow themselves to be deceived, which can only be assumed, permanently, if either the buyer is unable to assess the quality–even post-purchase–or if the product is a one-off buy and there is no exchange of consumer experiences between the demanders. However, the buyer does have the opportunity for a quality experience, particularly if it is his first buy, i.e. if future buys from the same provider are still an option. As long as he is able to assess the quality, this will lead to his willingness to pay for future products being lowered and even–should he share his experiences with others–influence that of other demanders into the same direction. If this occurs, it will lead to the same downward spiral that Akerlof already described for the used-car market. Due to information deficits on the part of the demanders, Adverse Selection occurs, as a consequence of which the poor-quality offers increase at the expense of high quality.

Such an information-deficit-induced market failure occurs on markets for information goods, when the demanders are unable to acquire the necessary quality information (Hopf, 1983, 76). If we disregard the generally undesirable variant of having to make these unpleasant experiences oneself, they can only be avoided by searching for decision-relevant information. Economically speaking, this information gathering is pursued until the marginal cost of acquisition is equal to the marginal utility of the information acquired (fundamentally Stigler, 1961). Put simply, one puts up time and money for the information search–e.g. by buying consumer magazines or talking to other buyers–as long as the result is beneficial. This benefit can be a discount for the product, or the ability to better assess the quality of different offers, allowing the buyer to choose the better quality. It is evident that the benefit (marginal utility) is significantly higher with the first consumer magazine bought than it is with the twelfth.

Information goods display the peculiar characteristic that the acquisition of further information about an information good is principally to be deemed equal to the successive acquisition of the good itself (Kulenkampff, 2000, 129). The more intensively one informs oneself about a specific information good, the more one comes to know about its content. For software, one must differentiate between the application level and the source code level. On the level of the application, the common user can comprehensively inform himself without owning the software. If the user acquires access to the source code, however, he will be in possession of the entire good. If he is then fully informed, this would mean, as a last consequence, that he no longer needs the original information since he already has it. This phenomenon occurring with information goods is called the “information paradox” after Kenneth J. Arrow (1962, 615):

> [...] there is a fundamental paradox in the determination of demand for information; its value for the purchaser is not known until he has the information, but then he has in effect acquired it without cost.

The occurrence of asymmetrically distributed information is particularly pronounced for information offers. Hopf (1983, 76), following Akerlof, describes in-

formation as a typical "lemon" good. The providers have a strong head start in information compared with the demanders. On the other hand, the demanders can only really inform themselves about the information good if the provider makes it available–at least partially–prior to purchase. If he doesn't, the buyer will only be able to assess the quality post-purchase, by processing the information.

A very apt example for such a situation can be found on the markets for technical knowledge (Klodt, 2001a, 41 et seq.). The existence of the information paradox is the cause, here, of the subordinate role played by industrial contract research (i.e. awarding R&D assignments externally). The majority of (large) companies prefer to produce their technical knowledge internally, because they have insufficient control over the quality of the execution and the results. It is almost exclusively smaller businesses who use the possibilities of external contract research, as they shy away from the high fixed costs of having one's own R&D department.

3.3.3 Search, Experience and Credence Qualities of Information Goods

Information, following Arrow, is subject to a paradox: the value of an information good cannot be assessed prior to purchasing without getting to know at least parts of the good itself. Having complete information about an information good, though, would mean having the good, which was meant to be bought, for free. The transmission of information before the transaction creates the problem that as a provider, one can no longer know how high the buyer's payments will be, or if he will pay at all. Contrary to Arrow's allegation, the demanders–if not all of them–definitely have a willingness to pay, even after they have already acquired a(n information) good. In Chapter 18, on Pricing, we will address this under the keyword Reverse Pricing.

As the quality of information goods generally reveals itself only after the purchase, they are often labeled experience goods (Shapiro & Varian, 1999, 5 et seq., 2003, 117 et seq.). **Experience goods** are, according to Phillip Nelson, all manner of goods whose quality characteristics are only revealed after having been bought. For **search goods**, on the other hand, the quality can be ascertained before, via a simple inspection (Nelson, 1970). A third feature that goods can have, according to Darby and Karni (1973), are so-called **credence qualities**. Some examples for this are the services rendered by a doctor or a mechanic, which the consumer cannot entirely assess with regard to their quality even after they have been completed. He can only trust that cost and benefit were adequate.

Now many goods display all three of the above-named characteristics. Even if we are tempted to spontaneously label a daily-needs good, such as a loaf of bread, as a search good, i.e. a good whose quality we can assess in its entirety prior to purchasing via a simple looking-over, a closer look will soon show that here too, experience and credence qualities can be found. Where the color of the crust and the smell may still be search qualities, the bread's taste is already an experience quality that only transpires after the purchase, by taking a bite. Whether the bread has in actuality been biologically produced, as advertised, is not really something