

INFORMATION MARKETS TO IMPROVE INFORMATION VALUE AND UTILISATION

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ABSTRACT

The Internet and Intranet reduce much of the costs of information sharing, but they do not solve receivers' reading and interpretation limitations. Alternatively, browsers and navigators ease information retrieval but do not solve the problems of specifying information needs and evaluating retrieval results. This article approaches these problems as a non-optimal situation for supplier as well as buyer of information goods. The author applies insights from pure markets, networks and hierarchies to detect six types of information goods, whose trade can be facilitated by a corresponding trade service. The author argues that the development of these services contributes more to the reduction of under-utilisation and under valuation of information than technological developments alone.

1. RESEARCH PROBLEM

The use of the Internet for the dissemination and retrieval of information has become a common practice, because of the ease of access of information sources. Navigators and browser have been developed to detect sources with the requested information (cf. Schwartz (ed.), 2000). The problem, though, is not the lack of supply of information, but the size of supply. This size makes it difficult to attune the supply with information needs.

Where the information need is explicit and unambiguous, queries can be formulated which hit the desired item(s). Where the information needs are incompletely defined and ambiguous, the chance of a good hit is unlikely in a first attempt, and multiple searches are required to create a high quality information need, c.q. information product specification (cf. Meyer and Zack, 1997). Several automatic feedback procedures have been proposed to improve the semantic and actionable relevance of information items in implicitly specified information product situations (Spink, 1997). In practice, these procedures do not solve any semantic problem, but only "help" the client to select from the large list of items retrieved in the hope that there is some correspondence between the meanings intended to be represented by the terms used by the information supplier and the information buyer. But the chance of missing an important hit when people use different meanings with the same words (homonyms) or use different words for the same meanings (synonyms) may be very high. To solve these semantic asynchronies people use socialization in networks to create mutual understanding (Nonaka, 1994), standardization to dictate interpretation rules in hierarchies (cf. Mintzberg, 1983), or reference to a standard or source whose meaning has become common knowledge as a

consequence of market power (a potential *de facto* standard) (cf. Hamel & Prahalad, 1994). Economists have identified three market types that correspond with these synchronisation modes: networks, hierarchies, and pure markets (cf. Boisot 1998; Ciborra, 1987; Ouchi, 1980; Williamson, 1991).

Though much has been written about markets, no analysis of information markets exists. This makes it difficult for information scientists to contribute more than technological solutions for search and retrieval, and this makes their efforts insufficiently effective from the perspective of information buyers and suppliers. Two aspects of information markets seem to be particularly problematic (Williamson, 1991): (1) the definition of the good (asset) traded, and (2) the mechanism by which market actors come to an information transaction. The definition of the good is problematic because information is an intangible good and hard to quantify. Also the property rights of an information good may be problematic (cf. Picot et al, 1997). The market mechanism is problematic, because price and volume information are often far from sufficient to decide to supply or buy (Liebeskind, et al, 1996). Consequently, information market services are needed to realise a transaction. From this problem perception we aim at the definition of characteristics of an information market, information goods, and the definition of transaction supporting services. To reduce space here, this analysis is limited to internal information markets, which by itself is complex enough to be traded in an article.

The approach taken here is that of information markets consisting of information producers, information suppliers, information transactions, transaction services, and information buyers. This study consequently has three major questions:

1. What are the main characteristics of information markets?
2. What types of information goods are traded via information markets?
3. What information market services facilitate the trade of a specific kind of information good?

To answer these questions it is required first to define the major dimensions for the analysis of information markets.

2. ANALYSIS OF INFORMATION MARKETS

Information markets consist of minimally one supplier and minimally one potential buyer. In the pure market type the number of buyers and suppliers is large, in others this number is moderate (networks) and in hierarchies this number is small. An important reason for this number is the type of information good traded. In pure markets, the information good is a commodity, which implies that the asset specificity of the good is very low (Williamson, 1991). Information goods exchange though often needs intense mutual adjustment of their understanding in networks (Nonaka, 1994), or adjustment to the principal's needs and language in hierarchies. The importance of information asymmetry for gaining market advantage and power (Douma & Scheuder, 1991) requires a very strict information ownership. Four types of ownership exist: (1) the right of use, (2) the right of changing forms and structure of the transferred good, (3) the right to reap the profits of the good, and (4) the right to sell the good (Picot et al (1997). For pure markets the right to sell is fundamental. In networks the sharing of information is emphasised as an important asset for the network's success (Liebeskind et al, 1996), implying group ownership of information. The transfer of information goods from a supplier to a buyer requires some kind of payment. The price mechanism consists of an invisible hand in pure markets, handshaking in networks, and the visible hand (*fiat*) in hierarchies. Because prices are hard to define in networks (Liebeskind et al, 1996), the payment for use mostly consists of invitations for collaboration, and sharing profits when the information good can be exploited. In the hierarchy, the most important ownership is the right to reap the profits exclusively. The sales right may be less relevant because the information assets in hierarchies are mostly asset specific and thus it may be

1 Boisot (1998: 127) also identifies fiefs, which are informal systems under hierarchical control of a person, and thus combines some network and hierarchy characteristics. Williamson prefers the term 'hybrid' instead of network.

irrelevant to others or nearly equal to selling the firm. To improve the efficiency and effectiveness of the information markets, several *services* may be needed, consisting of infrastructures and commercial actors that help supply and demand to meet (brokers in pure markets), coordinators who help to shake hands in networks, and expertise centers that help to formally institutionalize information supplies in the hierarchy. For a summary see table 1.

	Market type		
	Pure information market	Network information market	Hierarchical information market
Number of actors	Many	Several	Very few (agent & principal)
Type of information good	Information commodities	Heterogeneous professional information	Asset specific information goods
Ownership of information	Individual right to sell	Rights to use are shared by a group	Individual right to reap profits
Price mechanism	Invisible hand	Handshaking within network	Visible hand
Services	Brokers	Co-ordinator(s)	Expertise centres

Table 1: Characterisation of information markets

3. PURE INFORMATION MARKETS

3.1. Market Actors: Many Suppliers and Many Buyers

The idea of many independent suppliers and buyers implies that insufficient supply would lead to a competition among buyers, driving up the price, and consequently motivate suppliers to increase their supply capacity to a level that would not lead to extra profits. The reverse happens in case of too much supply or insufficient demand in relation to the supply volume. Consequently, price and volume are most important determiners for supply and demand.

Applied to information markets this may happen when many actors supply similar information. For instance at a world level, many press and news agencies supply similar information. The Internet is a potentially cheap multi-media channel for the distribution of the information goods. Similarly within a firm, several suppliers of information commodities (like books and CD-ROM) may exist and a large number of potential buyers must exist. Of course this large number only exists in large firms.

3.2. Goods: Homogeneous Information Commodities and Data Products

Two different kinds of information commodities require diversity in the market services:

1. Homogeneous information commodities. These commodities consist of clearly identifiable (highly codified) information products. This is the case of books and CD-ROMs. These information commodities consist of bundled information packs, supplied at one time.
2. Data packs. In comparison to homogeneous commodities, these data packs are more flexible in shape and may have larger opportunities of meeting specific information needs, because much of the information is unbundled. The buyer may be given the opportunity of specifying his/her information

need, and as such create their own information bundles. Examples of this kind are the market information services (cf. A.C. Nielsen) and news agency services.

The fundamental distinction thus is between bundled information goods versus separate information packs, and a service that bundles these information packs in one big composite product or in more flexible packs, probably delivered at different moments in time (cf. Thatcher & Clemons, 2000).

3.3. Ownership: Rights to Sell

Although ownership is important to create profits in information markets, it is often ineffective. The reasons for this are the following:

1. Low costs of reproduction and the principle of give-away-and-still-have-it. In contrast to buying i.e. a car, a copy machine or printer may be sufficient to make a copy of an information commodity. In the publishing industry it is vital that the supplier keeps the copyright after having sold the information carrier (book or diskette) to the buyer, and the law helps to prevent moral hazard in this case.
2. Inspecting and transfer are the same. In material goods markets, a buyer may experience every user experience before buying the product, but may lose the experience when the product is not bought. With information commodities these products have a value also after the product experience. Data products on the other hand may consist of data that are relevant at a certain moment and quickly depreciate after their experience. This means that payment will have to be done in advance of access to the data.

3.4. Mechanism: Invisible Hand

Price as a means to establish a transaction between anonymous suppliers and buyers is complicated because measuring the meaningful volume of information is difficult for a buyer. As such it is difficult for a buyer to evaluate how much he wants to pay for a certain number of information products of the kind offered. This problem seems to be solved differently for homogeneous information commodities and data products. Homogeneous information commodities consist of information packs, which can be transferred once or several times. If a buyer wants one piece he will pay less than if he wants several pieces. This is typically the case with books and movies. Although the original supplier (the author) will be known and his price is based also on reputation, the buyer has a limited budget and the offer has to compete with many similar offers. Data products are mostly smaller packs of information supplied at a certain moment. The data mostly have a limited period of use value, and as such they will have to be supplemented by more topical data each period. This implies that the price of the data product mostly is a subscription. Information services and press agencies are examples here.

3.5. Services: Brokers

Even pure markets consist of more than suppliers and buyers alone. They require transportation services (i.e. roads and logistic services) and transaction services (i.e. banks). Information markets need services as well. These are called brokers. Brokers do not own knowledge contents, but know about supply and demand. Two types of brokers exist (1) shops, who sell homogeneous information commodities, and (2) information refineries, who sell data products (cf. Meyer & Zack, 1996). Looking more closely at shops, they do not own the intellectual property rights of the author, but own reproduction and distribution rights. Looking at information refineries, they mostly do not own the data they distribute, but they are an outlet (production, trade and distribution platform) for the data producers.

An information Shop: Rabobank Winkelplein

Source: http://www.rabobank.nl/onderwerp/onderwerp.asp?node_id=33176 (site address at October 12, 2000).

This is the originally internal virtual shop of Rabobank, a Dutch bank. The shop originally only served internal supply and demand, particularly of office equipment and supplies for Rabobank branch banks. Recently, the Rabobank Winkelplein is a site for external bank relations as well. Rabobank is not a charity foundation, and earns its services back via contributions of suppliers, improved economies of scale, and buyer adherence to Rabobank services.

An Information Refinery: The CNN Site

Source: <http://www.cnn.com/>

CNN provides a large static database, and behaves like a cafeteria in which a buyer can pick his items of interest, but also can navigate and arrive in areas not planned in advance. Some of the content supplied is produced by CNN reporters, but much is gained from other press agencies and independent journalists. Refineries (Meyer & Zack, 1996) supply the specific information requested, when people have submitted their profile and interests, and as such use CNN as a refinery and help CNN to attune its resources to personal interests. Although CNN seems to be free of charge, its expenses are covered by market principles.

4. INFORMATION NETWORKS

4.1. Market Actors: Few Suppliers and Few Buyers with Mutual Relations

There are many reasons why a network may be a better means of supplier-buyer interaction than markets:

1. It may be too difficult to select the best supplier in cases of an over-abundance of suppliers. This argument demonstrates human limitations of rationality (Simon, 1976) and networks thus serve to reduce search costs.
2. It may be difficult to detect who may be interested in the information products outside the lines of known people.
3. The intangible nature of the many information products complicates price formation and ownership (Liebeskind et al, 1996).

4.2. Information Goods: Heterogeneous Professional Information and Intranet Content Resources

The information traded in hybrid information markets are particularly professional information, which has lower codification levels and has a very limited number of suppliers and buyers. This professional information may consist of semi-finished scientific insights (cf. Liebeskind et al, 1996), but sometimes this information is not economically nor technically well-codifiable. The transfer of poorly codifiable information is realized via information owner's self-representations and interpersonal information exchange in networks. This distinction of codification and personalization is also a major topic in the development of knowledge management strategies (Hansen et al, 1999). The self-representing information has its value based on what people want to supply. High quality supply is hard to enforce, and top quality content providers often have not much time to put efforts in supply (Wijnhoven, 1999).

4.3. Ownership: Right to Use is Shared by the Group

Like in pure markets information goods are distributed in networks, but unlike markets they are not monetary priced (Liebeskind et al, 1996). Professional information products behave like public goods, although it is not always available at the same time for all network members. The actual distribution of the information is based on social norms of exchange. Disobedience to these norms may result in removal from the network, and as such loss of access to important professional information products. For academic networks these

norms consist of respecting the information suppliers ownership. The professional information product transfer thus does not automatically imply the right to change (norm is to invite the original idea producer to further collaboration), nor the right to exploit the profits (norm is to share profits), and sell (it is hard to sell something owned which is the intellectual property of someone else, plagiarism is severely punished in professional societies).

4.4. Mechanism: Handshaking

The heterogeneity of an information good implies that there may be only one or a few suppliers. Heterogeneity also may imply that only a few potential buyers exist. Consequently the price is more the result of negotiation among known actors. With intangible goods, like a psychologist's services or art products, the goods are always heterogeneous and often unique, and consequently the price formation is mostly the result of reputation (cf. Wijnberg & Gemser, 1999), which is mostly built up via reputation creation services like art critics, galleries, professional evaluations, certification agencies, and educational institutes. The same counts for the professional information products, which provide background insights, research and development outputs, and are often tacit (Boisot, 1998; Nonaka, 1994). Much less customised is the supply of information from the Intranet. When this supply is large, knowing the reputation of the source is an important means of separating the wheat from the corn.

Obviously, the invisible hand cannot do it alone, because price information is insufficient for understanding a supply and demand of heterogeneous professional information and Intranet resources. Consequently, several services exist that enable transactions in networks.

4.5. Services: Co-Ordinators

The services that help to let supply and demand meet in networks are called co-ordinators. Two types of co-ordinators exist: (1) meeting realiser, who help experts to exchange information, and (2) Intranet services management, which help people to submit content and retrieve relevant resources.

Meeting Realiser: ACIB

An example of a meeting realizer is ACIB (cf. Wijnhoven, 1998). ACIB is an office established by the Dutch government to coordinate knowledge fragment exchange on information security of Dutch official information systems. Much security knowledge is available on many places of Dutch government agencies, but it is dispersed and therefore difficult to use in specific circumstances. Instead of establish one expertise center on security, ACIB was established to optimize the flow of information. For this purpose ACIB organizes conferences, workshops, an intranet site, and facilitates workgroups that create information products like flyers, bulletins and manuals. A meeting realizer has the following generic characteristics, as part of the meeting realizer model.

1. Publication policies (esp. quality guidelines) control the quality of content submitted to buyers at meetings.
2. Publication goes through four stages: sponsoring (someone has to give resources to an author), reviewing, editing, making accessible to buyers. The buyer accesses the content via search (information pull) or via automatic reporting (information push).
3. Informal information exchange, in physical or virtual ways (conferences and discussion lists). The conference manager controls this process.

Intranet Service Management at KPN Mobile

Source: <http://www.kpn-mobile.com/>

KPN Mobile is the Dutch mobile phone operator, with 3,8 million clients domestically and 10,3 million clients abroad. KPN Mobile has thousands of employees and several subsidiaries in other countries. To increase sharing of expertise and information, an Intranet site is developed. Appropriate documents put on this Intranet though are hard to find. This problem of supply and demand match has been approached by the use of Life-Link® software. KPN Mobile recognised that life link would not be able to match supply and demand, and consequently developed services. These services consist of the following: (1) technical infrastructure management, (2) application (Life Link) management, (3) functional content independent management (operational user groups support, user consulting, monitoring of developments of Live Link, feedback to application management), (4) content management, which consists of inserting documents, management of relevance and topicality of documents, management of directory structures and folders, specification of user rights and authority, and (5) information management, which consists of the definition of goals for the system and knowledge management.

The content and application management services consist of the following:

1. Manual filtering and clustering of new documents, and placing high importance documents for notification on the Intranet start-up page.
2. Structuring of the user start-up page. At KPN Mobile's marketing group, predictable information needs are defined in market research reports, market monitors, some standard queries, and an list of documents ordered by date of publication (news).
3. Document use monitoring and feedback via the following options.
 - Login frequencies enables the network monitor to assess if certain users are lagging in use and should be motivated to higher use. Possibly extra support or training can be supplied.
 - View frequencies enables to analyse how many documents are viewed. A strong deviation among these uses of documents may indicate a low value perception of these documents, or that the document's presence has to be better marketed.
 - Fetch is the download facility of Live-Link. A high fetch frequency indicates high intensity of use, and as such may be an important indicator of value.
4. Personal profiles facilities. These personal profile facilities define personal queries, personal tasks, projects involved in, and personal expertise. These may be used to filter automatic information supply and may help in developing all the other Intranet management services. Personal query facilities exist already, but the other aspects of personal profiles are still in development at KPN Mobile.

5. INFORMATION HIERARCHY

5.1. Market Actors: Agent and Principal

In hierarchical information markets the information traded is highly asset specific, implying that:

1. Information given to people outside the hierarchy will not have any value for the receiver,
2. Or, information given to people outside the hierarchy will destroy the competitiveness of the original owner.

In the first situation we think of information given to a specific production facility, by which it is able to plan, monitor and improve effectiveness. Because production facilities may differ enormously, providing that information to another facility may be meaningless (Weick, 1985).

In the second situation we think of strategic information, which can be very interesting for competitors. Hoarding this information causes an information asymmetry (Douma & Schreider, 1991) which may be a major cause of strategic advantage. Information types related to this are strategic documents and specific

(R&D) knowledge of products, markets, and production performance. Business intelligence is an important method to reduce competitive information disadvantage.

5.2. Information Goods: Strategic Information Products and Nontradable Operational Management Information

The information supplied to operational systems is locally relevant and as such not externally tradable. Though this information is a resource for everyone with a stake in a specific production platform.

Strategic information is highly person and situation specific. Strategic information may be required to guarantee the progress and future opportunities of the firms, and as such is nearly as valuable as the whole firm, though separate strategic information products may have this value at a certain moment only. This information has high trust demands.

Obviously, in hierarchies we recognise a distinction of information goods along the decision levels of the organisation (cf. Anthony, 1988).

5.3. Ownership: Exploitation Rights

The distribution of strategic information must be well controlled and restricted. The right to modify and change is an obvious property of this information product, but most dominant are the strategic and operational exploitation rights.

5.4. Mechanism: Visible Hand

In hierarchies, visible hands link supply and demand. Similarly hierarchies create special units for business intelligence and allocate this information to specific decision-makers. The price of strategic information is based on the subjective valuation of its opportunity to control some part of the business by creating information asymmetries. Operational information supply and demand are organised and designed via information systems and their design processes. The price of operational information is based on production costs and the efficiency gains it generates in operational processes.

5.5. Services: Expertise Centres

Hierarchies have two types of expertise centres:

1. Information production departments which are responsible for the availability and quality of the information supplies for operational processes.
2. Specific organisational units that create information about the firm's environment and whose output is not freely available but requires specific authority or transactions. These units also may use external data from marketing research agencies like A.C. Nielsen, <http://www.acnielsen.com/>.

Information Production Centre: Enterprise Resource Planning Systems

These systems are specifically developed to improve operational management in companies, particularly by integrating information from the diverse resources of the firm. This implies that information on human resources, production management, sales, and inventories are possibly linked, to integrate an optimised use of all these resources together. The information of these systems is nontradable, because each production environment will be most specific.

Business Intelligence

Business intelligence includes the opportunities of catching all kind of possibly important information and augmenting this information to relevant reports or information supplies for strategic management. Catching this information requires the collaboration of many people who have contacts with outsiders (i.e. politicians and trades people), or people who systematically collect data about issues in the business environment (i.e. market researcher). The interpretation of these data requires extensive knowledge of strategic policies and the information needs of the strategic managers, or the delivery of facilities for strategic managers to define their own information needs and retrieve relevant data for databases (Westney and Goshell, 1994). Also analysis of patent information (published by Derwent) may be valuable resources for discovering competence profiles of competitors (cf. Bogner & Thomas, 1994).

6. CONCLUSIONS AND DISCUSSION

We have identified two information market services and products for each market type. A summary of these insights is given in table 2.

		Information products					
		Information commodities		Professional resources		Asset specific information	
		Unbundled data resources	Bundle homogeneous information commodities	Codified intranet content resources	Personal heterogeneous professional information	Non-tradable operational management information	Strategic information products
Market type	Pure	Brokers					
		Information refineries	Shops				
	Network			Co-ordinators			
				Intranet service management	Meetings		
	Hierarchy					Expertise centres	
						Management information production centre	Business intelligence centre

Table 2: Summary of identified services in information markets

Minimally six services are distinguished to help supplier and buyer to come to an information transaction. These services may be further analysed to detect possible general features, which make up information

market services reference models for information professionals. As such the article gives an answer to the general research questions by describing characteristics of information markets, information goods, and information services. It has been shown that browsers, navigators, and personal profiles are just a few examples of a much larger collection of technologies to built information market services. Additionally, the information market services define a number of organisational roles, procedures, and rules, to realise effective use of the market service technologies. This gives an important context to the research being done in the field of Intranets (cf. Schwartz, 2000).

Although this article resulted in an innovation in the Intranet research field by providing a conceptual, theoretical and academic foundation, it also helps the practical activities in design of Intranet services. However, there are some limitations to this study:

1. The theory proposed here applies ideal types, which represent extreme cases. In practical situations there is always much between extremes. These situations have not been analysed here.
2. If information goods can be represented on three axes, (1) bundling, (2) codification-personal, and (3) decision level, and if we propose two extremes of each dimension, than theoretically there could be eight combinations, each representing one type of information good. This analysis of information goods dimension interactions has not been done here, and may give fruit to an interesting further study.
3. The services discovered now all have been based on current prototypes, and as such they may have high educational value. However, they have not yet been used explicitly in the design of information markets. It is important to evaluate to what extent the ambitions of semantic synchrony among suppliers and buyers are actually achieved by the application of the proposed concepts.

Though this article admits its limitations to Intranet environments, there are many fruitful ways to make a similar analysis of Internet environments. For instance, the analysis of Internet-based pure information markets may shed new lights on electronic publishing and the sales of imaginary products (movies, software, art). This may also be a fruitful extension of electronic commerce, which at the moment is mainly occupied with very rigidly defined commodities, and has problems of coping with the less precise nature of information commodities and data products. The analysis of Internet-based information networks may results in contributions on understanding knowledge exchange among firms, and the possible economics, organisation and technologies involved. The analysis of Internet hierarchies may lead to insights in information transactions between firms and the government, and new insights in information exchanges in co-design and supply chains.

The article's contribution is in a framework for analysis and design. The actual realisation of these concepts requires a further understanding of the actors involved, and thus a further breaking up of the black boxes of suppliers and buyers. Finally, the practice with these concepts will have to lead to a further understanding of the project activities and management problems in realising and exploiting information markets.

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