Arnt Meyer
Institute for Economy and the Environment (IEE-HSG)
University of St. Gallen/ Switzerland
Tigerbergstrasse 2
CH-9000 St. Gallen
e-mail: Arnt.Meyer@unisg.ch

The Role of New Communication Technologies in the Substance Chain Management

Introduction

Ecologically-oriented products can be seen as a contribution to substance chain management due to the reduction of ecological impacts inside the whole value creation chain.[1] Regarding today's industrial sectors, we can constitute that a lot of those products appeared in the past few years. Nevertheless, we have to realise that they normally stay in niches with a market share of less than three percent, far away from big business. Thus, we can learn from the past that the greening of industry sectors goes ahead but the speed is lower than one could hope.

Since realising this, the Institute for Economy and the Environment (IEE-HSG) has started some research projects[2] in which we are trying to find ways to push ecological products out of the niches and into the mass market. We have found out that there are two major problems for this intention: firstly, **companies construct their own barriers** because of competitive strategies and marketing operations that keep the products in niches.[3] This results into products with reduced (non-ecological) qualities and high prices as well as — from a marketing point of view — a limitation of their potential market share by concentrating on environmentally conscious consumers as target groups and ignoring the rest. Last but not least, companies have little knowledge of their potential to influence the companies' external structures. The second major reason for mass market limits is the **intransparency and lack of information** concerning ecological aspects that companies face on every stage of the value creation chain. Ecologically-oriented companies have only little knwoledge of possible suppliers (or customers) of ecological products and, therefore, have to purchase conventional goods respectively supply to the conventional market. Furthermore, a lot of ecological sub-markets are on the way to become real and well working institutions but rest in niches since they are not widely well-known (see the market for organic cotton).[4]

Considering an effective substance chain management, it is of little interest to look at the constructed strategy and marketing barriers. In this paper, I am much more interested in the importance of information for the substance chain management, in the nature of the information deficits in the value creation chain and in options to reduce the deficits. In this paper I try to structurise the discussion by using the textile industry as an example. Before that, I will start with some theoretical approaches to the increasing importance of information for future market dynamics and their role for a substance chain management.

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1 Cf. also HENSELING 1998: 17

2 „Ecology and Competitiveness (COSY-Workshops)", „From the Eco-Niche to the Ecological Mass Market in the Food Market" or „The Development of Ecological Clothes in the Swiss Clothing Sector" (Cf. http://www.iwoe.unisg.ch).

3 Cf. SCHNEIDEWIND 1998 and MEYER 1998c

4 Cf. IEE-HSG 1998: 2

Theory: Substance Chain Management and Information

Information seems to become a highly important factor for future market dynamics as well as for the competitiveness of companies and the substance chain management. To underpin this estimation I will describe in a first step how markets emerge, develop and what kind of role information plays in this process. Furthermore, I show that information will decide more and more about the competitiveness of companies. After this general introduction, I will continue with the relationship between substance chain management and information.

Information – Key Factor for Market Dynamics and Corporate Competitiveness

In economic theory, the satisfaction of human needs is the basic principle for economic actions. Since the needs are (with exceptions) unlimited but the resources for satisfying the needs are limited, we face the problem of scarcity. Markets and institutions emerge in order to reduce the scarcity because, it is then possible to allocate input resources in such a way that human needs can be satisfied more efficiently. This works especially by **division of labour** and **specialisation**.[5] Furthermore, the production process is taken apart to pieces so that one company only produces one piece of the whole product or combines all pieces. As a whole, we have a production process with several production steps executed by several specialised companies.

The division of labour and the specialisation result from the (time and capability specific) limitation of individual workers to complete complex jobs on their own. With specialisation, workers can handle their jobs more efficiently and more productively due to the creation and use of special capabilities. A higher working efficiency causes higher resource efficiency and a better satisfaction of human needs.

The problem of scarcity and, consequently, the emergence of markets and institutions lead to the necessity of exchange deals and contracts. Since the individuals (and the institutions) do not produce their needed products on their own they have to get them from elsewhere. For this, they have to make exchanges and have to fix the conditions for these exchanges. For the coordination of these processes additional resources are needed. The involved parties have to negotiate the details for the contracts; they have to agree and to realise the contracts.[6] **Information is an essential to make contracts**.

The neoclassical theory underestimated for a long time the importance of information by supposing that prices include all relevant information (complete information). It was assumed that market actors can get all information that are interesting for their decisions without transaction costs. Actually, the **coordination of economic activities is one of the basic problems of resource efficiency** so that the reduction of information dissimilarities and of the costs of getting information is central for market dynamics. [7] The importance of these „costs of transaction“[8] is shown by WALLIS & NORTH in their empirical study about the development of the amount of transaction costs in the US economy.[9] Not only did they prove that the absolute amount of transaction costs increased step-by-step from 1870 to 1970 but were able to describe as well that the share of transaction costs of the general income increased by more than fifty percent until 1970. WALLIS & NORTH concluded that the biggest part of the national income was spent for information and communication in the sense of coordinating

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5 Cf. PICOT/ REICHWALD/ WIEGAND 1996: 20. The following reflections in this chapter are largely based on this book.

6 Cf. FURUBOTN/ RICHTER 1991

7 Cf. HAYEK 1945

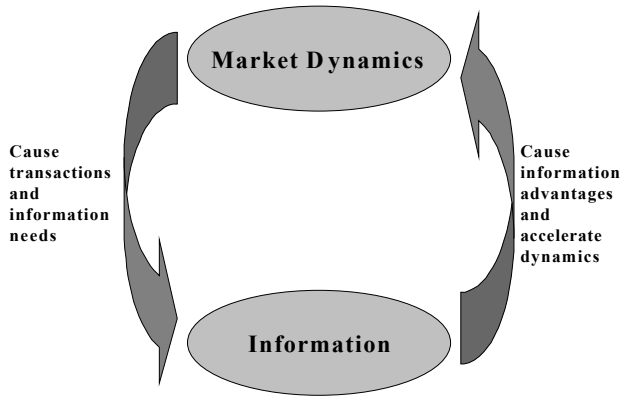
8 Cf. COASE 1937 or WILLIAMSON 1975

9 Cf. WALLIS/ NORTH 1986

economic transactions.[10] These results show on one side that the ongoing specialisation and division of labour processes limit economic growth due to their own need of resources that can not be used for other actions. On the other side, information and information technologies gain strategic importance for companies because, today, companies are not clearly defined bodies but have structures that work with world-wide autonomous departments, decentralised leadership and a lot of cooperations. [11] Since we have to assume that economic activities are only efficient if they are based on adequate information but we know that complete information is impossible, we have to provide the market participants with those information which they need for their specific decision situation.

These results show that information and market dynamics depend on each other (see figure 1).

Figure 1: Dependency of Information and Market Dynamics



Market dynamics cause transactions and transactions are accompanied by information needs. Information itself accelerates market dynamics if it is not equally allocated. This causes advantages for those market actors who have the necessary information and disadvantages for those who have not.[12] Considering the emergence of markets for ecological products, **information dissimilarities** seem to be very important. Moreover, the described process theories neglect that market dynamics emerge by social interactions. This is highly important in ecological contexts since the greening of businesses is based on the relations between companies inside the production chain as well as between companies and external pressure groups. I therefore show in the following part how the greening of businesses can be described by considering the interactions of actors and which importance information and information dissimilarities have.

The Importance of Information for the Substance Chain Management

Ecological market dynamics can be described from a bird's perspective. We then see effects and results but can not see the motivations. **Environmental activities of companies** though exist to a big amount because companies stay in a very complex relationship with different **stakeholders**.[13] Those

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10 This means e.g. search cost or cost of negotiating, contracting and controlling.

11 Cf. PICOT/ REICHWALD/ WIEGAND 1996: 23

12 There is a lot of research activity that concentrates on corporate decision under uncertainty, asymmetric information and game theoretical approaches (Cf. as an example ARNOTT/ GREENWALD/ STIGLITZ 1993).

13 Cf. FREEMAN 1984

can be environmental protection groups, local interest groups, the government, consumers and so on. These pressure groups limit the companies‘ possibilities to act since they observe the effects of those actions and try to influence the companies. While the government enacts laws, other groups use the media to mobilise the public opinion or try to confront the company directly.[14] Today, companies have to take these external claims seriously since their short-, middle- and long-term competitiveness can be damaged if they do not.

If we take a look at how the claims emerge, we can identify three succeeding steps.[15] On a first step, there are the environmental effects of a company or its products. Those material or energetic data can be scientifically described with the helpof eco-balances, life cycle analyses or similar instruments. They show what kinds of effects the company's products or processes cause and where improvements have to be made. In a second step, pressure groups then take these facts and transform them into claims. This can be public attacks via the media system, an ecological push by the consumer market or legal restrictions. For companies there are different possible strategies to manage these claims.[16] There are pioneers who try to push the greening of businesses by innovating and showing best practices (offensive). And there are followers who are more defensively oriented and try to copy as far as it is necessary.[17] The greening of markets is therefore essentially dependent on the existence of those pioneers.

What can be concluded from these two perspectives of (ecological) market dynamics? We have seen on one side that information become more and more a key factor for market dynamics and corporate competitiveness. But there is still more. The whole social process of putting companies under external pressure and of showing best practices by pioneers is based on the need of information. If environmental effects of the company's processes or products can not be identified, then there is no pressure and no best practice. **Information is therefore the basis for improvements and a substance chain management**.
Looking at this more intensively shows that making a substance chain management efficient means to identify the biggest ecological problems or, with other words, to identify the greatest environmental impacts of the company's actions. The problem is that sometimes these impacts are not obvious and, in worse cases, are not controllable by one company alone. To solve the problem, the company has to register all ecologically relevant effects throughout the whole product life cycle (inventory table) and sort the data to impact categories.[18] Afterwards, the categories have to be evaluated and weighted. In the end, the company is possibly able to identify where there is the greatest need for action in the product life cycle.

This perspective supposes three aspects that are rarely given:
1. The company already produces a product and is able to optimise it without the need of changing suppliers or putting them under pressure.
2. The company has all information about the ecological impacts of the product and can identify a clear order of necessary action.

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[14] Cf. DYLLICK 1990. One of the best examples for the influence of pressure groups is the conflict between Greenpeace and Shell in the case of the Brent Spar.
[15] Cf. DYLLICK/ BELZ/ SCHNEIDEWIND 1997: 7
[16] Cf. in detail DYLLICK/ BELZ/ SCHNEIDEWIND 1997: 75ff.
[17] In this context cf. WÜSTENHAGEN 1998 who describes the green strategies of companies in relation to their power and size. Cf. also MEYER 1998c
[18] Cf. MÜLLER-WENK 1994: 3ff. The following description is reduced and simplified.

3. The company knows what is the best (ecological) alternative for an ecologically critical aspect of the product and where to get it, too.

Considering managerial and sectorial practice we have to assume that the opposite is normal.

Rarely, the company can get the suppliers to agree with the new demand. Only big companies have the power to reach this due to the dependency of the suppliers.[19] This means that the small company (which often is a pioneer rather than a follower) either has to change suppliers or has to forget the plans of ecological optimisation.

As far as the second point is concerned, it is clear that even eco-balances or life cycle analyses can not take into account all information. This means that only the most important environmental effects (from the researcher's view) are analysed. Furthermore, it is difficult to identify a clear order of the impact categories, since the effects are not „objective" but go through a social process of interpretation. Herein lies the insecurity of where to start with environmental improvements since external groups can have other preferences.

Identifying best practices is a problem of information deficits. As I described in the introduction, ecological products usually have less than three percent of the market share. These three percent are shared by a lot of small companies so that we can assume that they are not widely known in their industry. Moreover, the suppliers of these companies are not known as well and real markets are not established. This leads to high information costs for all participants and those who want to enter the market for ecological products.[20] The information dissimilarities have a second dimension: ecological advantages of a special product or process in relation to alternatives can change dramatically in time. Let us take the example of organic cotton. Changing to organic agriculture means that the crop reduces in the first years. Comparing such a product with conventionally cultured cotton leaves a bad impact on land use since more acres are needed. If we consider that the crop increases after three to five years to a level that can be even higher than for conventional agriculture, the advantages change absolutely. In simple words: what can be (ecologically) good today may be bad tomorrow.[21] Furthermore, ecological activities depend to a high amount on the supply in a way that there has to be supply. In some areas of business, ecological innovations are not to find yet so that the companies have to purchase conventional products.

All the limits can be regarded as information problems. Coping with these difficulties means first of all reducing the information deficits and dissimilarities. Therefore, new information technologies can contribute as we show in the following chapter.[22]

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[19] This can be explained by the gatekeeper approach, which describes how big retailers can influence the companies in the value creation chain (Cf. HANSEN 1988 or KOTLER 1991: 201).

[20] Cf. MEYER 1998b

[21] This opens a new entry to the research of information. Information in this understanding are neither objective nor independent on time or culture. Dealing with information means automatically dealing with some kind of uncertainty.

[22] We have to underpin that this can only be understood as a contribution that has to be followed by other activities like deeper cooperation, a widening of the market perspective, pressure on competitors or the government to change the market's framework and so on.

New Information Technologies and Substance Chain Management in Practice – Ecotex-Hyperlink

In a series of workshops that the IEE-HSG held the idea of creating an Internet based market for ecological textile products was born.[23] This was called "Ecotex-Hyperlink" and should be done to concentrate the information about those products and the suppliers, reduce as a consequence the search costs[24] and try to widen the market by creating a new demand. This example of using new information technologies in order to accelerate ecological market dynamics is described after a short view at the information problems in today's textile markets.

Information Problems in today's Textile Markets and the effects

The textile chain is a worldwide and highly complex system that includes normally at least five production steps. These can be further divided and have several sidelines.[25] In order to produce textiles a lot of information has to flow through the value creation chain. However, an empirical study has shown that the **information is only forwarded from one step to the next**, so that a company of a specific production step does not know what kind of information the company two steps before forwarded.[26] This phenomenon is caused and multiplied by the anonymity of the relationships in the polypolistic textile sector. Information about ecological aspects of production processes or products is nearly ignored. The only relevant information that is somehow spread through the chain are prices and some kinds of technical quality factors.[27]

Apart from the information flow that concerns material and energetic data there are information deficits related to the existence of environmentally oriented companies and products.[28] This causes the problem that those companies that want to engage in ecological improvements face problems to find partners. Since the ecological production of textile goods strongly depends on cooperations[29] high information needs are left for the company. To stress this let us once again have a look at the market for organic cotton: while conventional cotton is traded on world-wide institutionalised stock exchanges organic cotton is sold directly via individual contacts and contracts.[30] Therefore, interested companies have to have the knowledge about how to make the contact with a supplier of organic cotton. This leads to higher transaction costs and, as a consequence, to a market for organic cotton that stays in a niche.[31]

Until today, there are nearly **no defined standards or widely accepted agreements** about what kind of processes or products should be preferred from an ecological point of view. The only "ecological" standard that is defined is the European "Ecotex Standard 100" which is likely not an ecological but a human toxicity standard. Even though there are actions on the side of the International Federation of Organic Agriculture Movement (IFOAM) and the European Union to fix an ecological standard, companies have to manage this uncertainty. The innovation dynamic that determines the textile sector

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23 Cf. MEYER 1998a

24 „Search costs" are a special form of transaction costs (Cf. FURUBOTN/ RICHTER 1991)

25 Cf. ENQUÊTE-KOMMISSION 1994: 117

26 Cf. CLAUS ET AL. 1995

27 Cf. CLAUS ET AL. 1995

28 Cf. MEYER 1998c

29 Cf. SCHNEIDEWIND 1998

30 Cf. MEYER 1998c

31 Today the annual crop of organic cotton is approximately 10000 tons, while the annual crop of conventionally cultured cotton is 20 Mio tons (Cf. HOHMANN 1998).

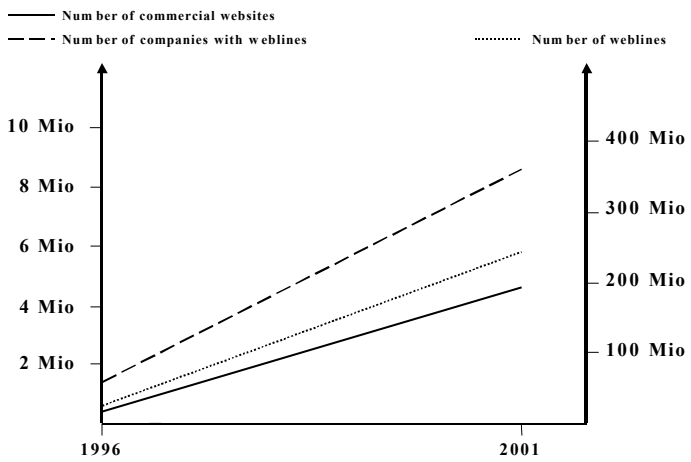
causes further uncertainties. It is difficult for the scientific research to evaluate the possible effects of textile innovations (e.g. dyes). To exemplify this: it is still not proved whether natural dyes or synthetical dyes should be preferred to minimise environmental impacts and, as can be assumed, will never be absolutely. On the other side, the innovation dynamic is foremost responsible for ecological improvements, so that there is a conflict between improvements and technology assessment.[32]

Ecotex-Hyperlink: Internet, Benefits, Problems

To reduce the described information uncertainties and deficits, I propose a platform where details can be discussed, contacts can be made and institutions similar to stock exchanges can be set up. This platform has to consider that textile companies are widely spread, that environmental aspects depend on cultural differences, that the dynamic in the textile chain is high and that trends to a further integration of information technologies can be seen in business-to-business trade. Therefore, an Internet based platform is obvious. During our research, we called this Ecotex-Hyperlink.

A great commercial future is forecasted for the Internet (see figure 2). Today, there are nearly 50 Mio Internet users worldwide and the expectations show 100 Mio people until the year 2000. Online-shopping is an example for the growing importance of the net for economic transactions: experts forecast an annual market turnover between $100 Bn and $600 Bn. In the business-to-business area, the importance is even higher since the internet which is independent of time and place can reduce transaction costs dramatically.[33] It can, therefore, work as an addition to conventional economic transactions. Furthermore, using the Internet means to open new distribution and advertising channels, to make commercial contacts easier and cheaper and to create new markets.[34]

Figure 2: Potentials of the Internet



source: own, see also RÜKGAUER 1997

[32] Until a few years ago, an environmental as well as synthetical dye was not possible due to a non-existence of dyes. This changed somehow with the development of synthetical dyes by CIBA and the reactions of other companies of the chemical industry.

[33] Cf. IEE-HSG 1998

[34] This can revolutionise the structures of whole sectors. The company „amazon“ which offers its products exclusively via the Internet advanced to the worldwide leading bookstore.

Which are the benefits of an Internet based platform for environmentally oriented companies and green products of the textile chain (Ecotex-Hyperlink)? And who could possibly profit from these benefits?

The advantages of the Internet regarding the business-to-business transactions are of great importance for reflections about a better substance chain management because this is foremost an inter-corporate aspect. Besides, the Internet has the technical potential to reduce some of the information deficits that I described above: it is easy to handle, can offer a huge amount of information, has effective search functions to manage these information, is dialogue oriented and knows no regional or national borders.

In the special context of the information dissimilarities in the textile chain, it can provide interested companies with information about environmentally oriented products and companies. This could accelerate a market dynamic and increase the turnovers. In a best case scenario, there could be an **institutionalised trade for green products**, comparable to stock exchanges. Those actors that are already engaged in ecological aspects could communicate much more easy and, therefore, reduce their information cost. The improvement of the competitiveness could be a middle term result.

Furthermore, discussions about best ecological practices and products could be held without the necessity of meeting, and **standards, labels or at least agreements** could be passed. This lets expect that bigger companies catch the train since they can, then, easier advertise and position themselves. A substance chain management could be promoted by establishing a wide information basis so that companies as well as governmental institutions can better arrange their strategy. Bringing the actors together can help **coordinating common actions** as well. These can be directed to the market (like advertising together), to other companies of the sector (by sharing costs of acquisition) or to the government by concentrating power and influencing the political framework.

As far as a better information of consumers of textile articles is concerned, Ecotex-Hyperlink can support consumer advice centres or environmental protection groups. This could lead to a deeper understanding of the environmental impacts of the textile production and eventually an ecology push from the consumer market.[35]

The possible advantages of Ecotex-Hyperlink are based on special demands it has to fulfil. First of all, it has to ground on existing actors relationships at the beginning. This helps establishing a working basic structure and guarantees that only those aspects are on the platform which really interest the affected companies. Additionally, initiated discussions are possibly easier to handle since the actors know each other. The platform has to be organised in special issue fields so that a time- and cost-saving "surfing" is given and unacceptancy can be avoided. Ecotex-Hyperlink has to offer different "scientific levels", too. This is because it should work on one side as a professional discussion site, on the other side as an information basis for advisors and consumers even. Regarding the process of establishing such a platform, it has to be pushed at the beginning by a few actors who take it to their responsibility. After some time, the platform has to work alone by the dynamic of the actors and the economic advantages.

After having described this project, I have to make two limiting remarks: first of all, Ecotex-Hyperlink is just one example of possibly accelerating ecological market dynamics. It is not a stand-alone solution. Furthermore does it rise and fall with the realisation: the best option can be worth nothing if

[35] In view of today's user structure of the Internet this perspective seems to be futuristic but not impossible.

it is not realised adequately. Herein lies probably the biggest problem if we have a look back to the list of information problems in the textile chain.

Conclusions

In this paper I showed that information becomes more and more important for general market dynamics and corporate competitiveness. We can assume that tomorrow's market structures depend to a big amount on how companies manage the increasing information necessities.

In ecological contexts, the supply with information is not only the basis for improvements as I have described at the example of the substance chain management but is also one of the big problems. Since we face a whole bunch of information deficits, uncertainties and dissimilarities, the greening of businesses does not move on with high speed. The textile sector is an industry in which environmentally oriented companies are confronted strongly with these information problems. Born in a series of workshops, the IEE-HSG therefore developed the idea of creating an Internet based platform to solve some of the problems. This „Ecotex-Hyperlink" has the potential to bring relevant actors together, to help coordinating transactions, to accelerate standardisation or agreements and to increase turnovers. Though it is not the one and only solution for all problems, it can bring more dynamics to the textile sector.

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