4.3 Transparency: Perceptions, Practices and Promises

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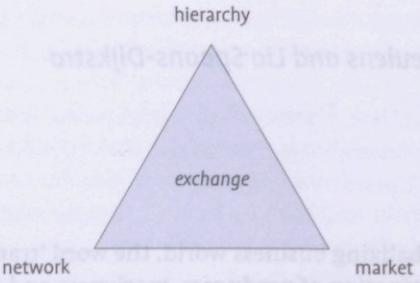
1 Introduction

In our hectic society and globalizing business world, the word 'transparency' has recently caught the imagination of producers, marketers and citizens. It is appearing in titles of papers and books. Business scandals lead to calls for transparency of companies in the media (sceptically received by some; see e.g. Van der Zwan (2002). World leaders are depicted at conferences with transparent bottles of mineral water. Transparency denotes clarity, purity, integrity.

The word transparency actually carries a family of possible meanings. Borgman (2002) claims he uses it as a 'guiding design principle' for the design of 'simple, effective and flexible information systems within and between organisations'. In business, the notions of 'value transparency' and 'product transparency' at the interfaces between business partners are used. 'Network transparency' is thought to be a prerequisite for responsiveness of supply chains.

In this chapter we define transparency as follows (abbreviated from Hofstede, 2002b): *Transparency of a netchain is the extent to which all the netchain's stakeholders have access to the information that they request.* A more elaborate definition is presented below. Note the use of 'netchain' as a contraction of 'chain' and 'network' (after Lazzarini et al., 2001). We use the term netchain to denote an institutional arrangement between at least three partners that is neither a hierarchy nor a market but a hybrid structure with a mix of long-term contracts, internal markets and informal co-operation in which goods, money, information and affective signals are exchanged (see figure 1).

Figure 1 **The spectrum of institutional mechanisms (from Powell, 1990, p. 25; Diederen and Jonkers, 2001). The corners of the triangle depict ideal types while the surface connotes the various mixes of institutional mechanisms that can occur in a netchain**



Transparency affects many stakeholders. Consumers, various types of companies, citizens and governments all have different perspectives on transparency. Because transparency implies information exchange between various stakeholders, these different perspectives have to be addressed and reconciled. As a rule, transparency should enable connectivity, or being able to react to one another's processes – as e.g. in collaborative planning.

The chapter first examines the perspectives of a number of stakeholder groups. After the various perceptions we shall take a closer look at current practices aimed at improving transparency. Two sectors serve as examples: the food sector, historically leading in the field, and the health care sector, of great public significance. Because these sectors are so different, the reader will be in a position to extrapolate those issues that are generic to both of them to other sectors of interest. Finally we explore promises that the concept holds for the future. When the buzz has subsided, what will be left of transparency?

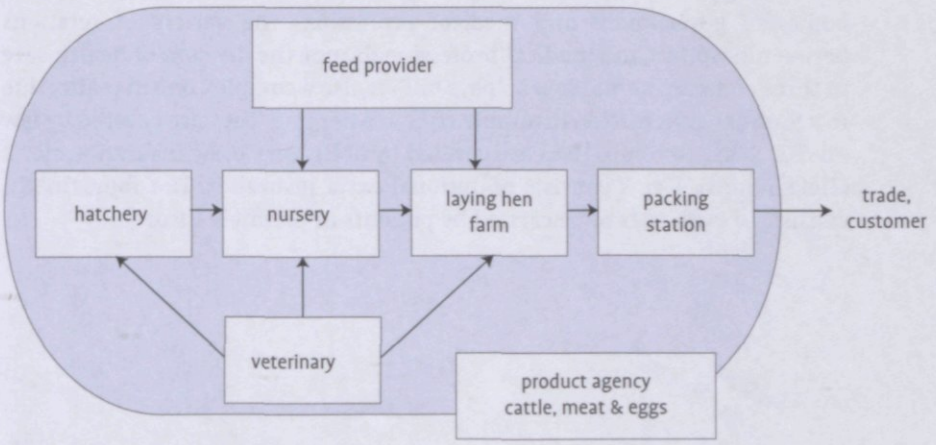
Transparency is of obvious societal relevance in the two sectors of this chapter. Its importance in the food sector needs hardly be argued. The Dutch spend 30 billion euro per year on food, most of which has crossed borders. Recent food scares that have disturbed rural areas and economies in Europe, as well as the general public, could have been contained much better through better knowledge of animal movements – and would have been much worse in the absence of any such knowledge. The health sector being much more nationally organized than the food sector, we take the Dutch example in this chapter. Compared to the Dutch health care sector, the food sector is eminently transparent. Consequences of lack of transparency in the health care sector are obvious to those who have had to visit several hospital departments for the same complaints. Less anecdotally, Schut (2003) cites numerous projects that show how organizational and budget structures in hospitals effectively provide barriers to transparency, causing vast losses of money.

1.1 *Food sector*

Large companies in many sectors have been developing transparent procedures for decades. The food sector has a number of special attributes that caused it to take the lead in public awareness about developing transparency. Perishability of foodstuffs has been an incentive for producers to co-operate in chains. This holds particularly in the Netherlands with its agricultural tradition and egalitarian society. Public concern for health has been a direct driver towards transparency, since consumers want to be certain that they are buying safe food. Recently, governments have become active in the field, both nationally and transnationally. As of January 1, 2005 the European Union's General Food Law (Commission of the European Communities, 2002) enforces traceability in the food sector. Other sectors and laws follow. Companies in the food chain are not awaiting these changes passively. Quality systems, certification and branding are in full swing among producers, manufacturers and retailers (see e.g. Grievink et al., 2002).

As far as netchain structure is concerned, the food sector is straightforward and to a large extent linear. The system consists of actors such as producers, manufacturers, distributors and retailers. Three main streams flow through the system. Produce flows from 'farm to fork', while money flows in the opposite direction. Information, the subject matter of transparency, flows in more directions and may be stored in shared databases. Service providers and material suppliers are also involved. Together these actors can engage in communication about logistics, risk allocation or innovation. Government attempts to regulate the sector, both at the level of primary production and through food legislation. A sample netchain is shown in figure 2.

Figure 2 **A netchain in the Dutch egg sector (from Hofstede, 2003). A rectangle indicates a company or other institution, the oval indicates the netchain as a whole. Arrows indicate product flows. Money flows in the opposite sense while information is shared throughout the netchain**



One or two companies of each type make up the netchain of figure 2. Chicks stay in the hatchery for three weeks. Then they are sold to the nursery, where they stay seventeen weeks and grow into hens. They are then sold to the laying hen factory to lay eggs for over one year. The factory is highly optimized: one staff member can deal with 60.000 hens. The eggs are sold to the packing station, packed and sold to manufacturers and retailers. Feed providers and veterinarians provide feed and medical services, respectively. The product agency is responsible for both PR and good conduct of the sector. A number of parallel networks of similar composition exist in the Netherlands. Through improved communication, this particular netchain has enabled the participants to improve their supply chain logistics. Creating a better price for the eggs has so far been tricky because of the extreme 'commodity' image of eggs. Figure 2 is incomplete: it does not include the manufacturers that process part of the eggs, nor the retailers in whose outlets they are sold. Many of these retailers are not Dutch. The average food item we Europeans consume travels 3000 to 4000 kilometres before reaching our plates (Luttikhuis, 2002).

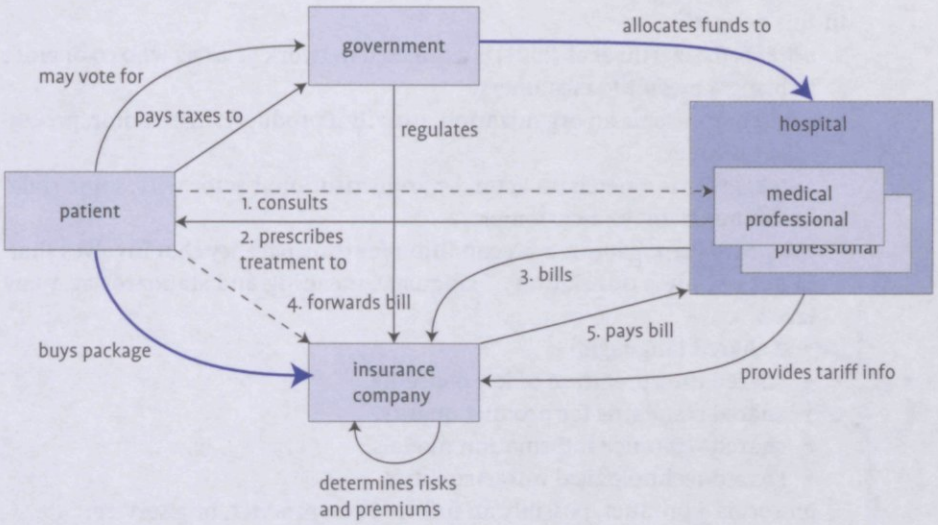
1.2 *Health care sector*

The health care sector employs ten percent of our work force and is by far our largest public sector, with a turnover in 2003 of 44 billion euro. It is about as different a sector from the food sector as you can get, although recent developments in functional foods bring the two closer together. These force consumers, producers and legislators to consider the role of food in health care and the boundary between food and medicine.

A very salient feature of the health sector as it is organized in the Netherlands and similar countries is that the 'consumer' does not pay for the 'product' directly. Figure 3 elucidates this.

Figure 3 is obviously a gross simplification. For instance, banks, pharmacies and numerous service organizations are not shown, nor the manifold subbodies of government and medical profession, the variety of relations between hospitals and medical professionals, nor the division of health care in three compartments. Step 5, 'pays bill', is also a complex one in reality due to a four-tier system. Non-insurable risks are tier one. They are covered by law (AWBZ). Most common risks are covered by obligatory basic insurance, tier 2 (Ziekenfonds). Tier 3 consists of optional extra insurance. Tier four, finally, consists of own costs to be carried by patients or privately insured.

Figure 3 **Flows of information, service and money in the Health Care sector. Step 3, 'send bill' can occur either to the patient or to the insurance company. Arrows show the sense of reading the text along the lines**



Even taking into account these simplifications, figure 3 shows that in health care there is no question of the near-linear structure with opposite flows of products and money that characterises the food sector. This has radical effects on the incentive structure of the actors in the netchain. In food chains all actors have a strong incentive to be cost-effective. This is not the case in health care. Consumers are not rewarded for cost-effective behaviour. Neither are care providers. Doctors operating on fixed budgets, for instance, have no incentive to help patients above their quota. Yet at country level all are concerned about exponentially rising costs and long waiting lists. All this makes for a sector the operation of which is difficult to understand, let alone control.

1.3 *Key concepts*

Let us return to the definition of transparency in netchains and elaborate on it so as to define key concepts for this chapter. Much of this material is taken from Hofstede (2002b). The full definition of transparency in a netchain is as follows:

Transparency of a netchain is the extent to which all the netchain's stakeholders have a shared understanding of, and access to, the product-related information that they request, without loss, noise, delay and distortion.

In this definition,

- *netchain* (Lazzarini et al. 2001) is a directed network of *actors* who co-operate to bring a *product* to customers;
- a netchain *actor* is an organization, usually a producer, distributor, processor or retailer;
- a *stakeholder* is a netchain actor, or an institutional actor with some stake in the netchain, or a customer;
- a *shared understanding* is a precondition for transparency that involves sharing or seamless translation of language, meaning and standards at many levels:
  - a shared language,
  - shared interpretation of key concepts,
  - shared standards for product quality,
  - shared reference information models,
  - shared technological infrastructure;
- *product* is a product, possibly an information product, or a service;
- *product-related information* is meant in the widest sense. It includes 'technical' attributes such as information about raw materials used and production process attributes. But it also includes 'value-related' attributes (Hofstede et al. 2003) such as labour circumstances or environmental impacts. It can serve various aims, e.g. preserving identity, food safety, or adding value;
- *loss* means that an actor does not transmit information. It affects completeness;
- *noise* means that an actor adds non-relevant data to the information. It affects relevancy. This is a subjective notion. Noise can point to lack of agreement among actors as to what information is relevant;
- *delay* means that an actor delays information. It affects timeliness;
- *distortion* means that an actor changes the information either by accident or on purpose, or fails to update it if the product changes, so that the information no longer actually describes the product. It affects validity.

If the netchain's stakeholders did not request information, there would be no reason to make the netchain transparent. Therefore, knowing what information the stakeholders need is a precondition for transparency. This is why the definition specifies *all the netchain's stakeholders* and *the information (...) that they request.*

The stakeholders can only exchange information if they have a shared language. In fact sharing or seamless translation of language, meaning and standards is needed at many levels, as indicated in the definition by the clause *a shared understanding.*

1.4 *An inter-discipline*

The definition of transparency leaves out some important elements. For instance, who decides who counts as a stakeholder? This brings us to the necessary interdisciplinary nature of the study of transparency. In table 1, we list some of the most relevant contributing disciplines, questions about transparency in netchains that might be asked from their perspective, and for some of these, searchlight theories that could throw light on these questions. This list is by no means exhaustive. It serves to indicate the multifaceted nature of transparency as a research issue. Note that some of the disciplines in table 1 are themselves inter-disciplines of recent origin; perhaps chain and network studies will acquire the same status. Some of the theories are not consistent bodies, or they might be contested, while others are well established. Many theories that are not mentioned could also be useful. The table serves to show that one needs a mixed bag of tools to study netchains.

Table 1 **Theories, possible research questions from their perspective, and possibly contributing bodies of theory (a searchlight theory is a theory that is not being built or tested through research but used as a tool to shed light on the object of study)**

Discipline	Relevant issue	Searchlight theory
Engineering	With what technology to capture data?	Design
ICT	How to manage data?	Data and process modelling
Law	How to allocate ownership of innovations?	Intellectual property rights
Economics	How to divide costs and benefits?	Transaction cost theory
	How to allocate chain responsibilities?	Institutional economics
	Where must trust supplement contracts?	Game theory
Social psychology	Why do some solutions not work across borders?	Culture theory
Marketing	What information do customers want? How delivered? How motivated?	Consumer behaviour
	How much can one ask for products?	Pricing theory
Organization studies	What transparency makes a netchain successful?	Actor network theory
	How to organise a netchain efficiently?	Logistics
Political science	Whose interest do netchains serve?	Critical theory

1.5 *Effects*

Ideally, transparency leads to *responsiveness* of the netchain to outside events. It notably enables

- producers to anticipate market demand accurately;
- intermediate netchain actors to plan their capacity accurately;
- quality control actors (e.g. various governments) to quickly take action when defects surface so that the origin is traced and spreading of the problem can be curtailed;
- customers to assess where their purchase comes from and what quality- and value-related attributes it possesses.

In reality, another effect could also occur. The investments in common standards and infrastructure could entail that actors are faced with high barriers to leaving the netchain. This could lead to loss of flexibility in the market.

In relation to the previous, at a psychological level the 'we' of a netchain creates a 'they'. In industries with strong incentives towards netchain formation, competition is likely to shift from between-company to between-netchain. A similar effect, at country level this time, occurs in health care where consumers who live near the Belgian and German borders flee to hospitals across the border where there are no waiting lists.

2 Perceptions

A netchain has a different meaning to each stakeholder involved in it. For a comprehensive view, one needs to be able to combine and reconcile the various actors' points of view. We shall now discuss the perspectives of some key stakeholders in both sectors.

2.1.1 *Food: consumers*

Ultimately, a netchain has to serve the needs of its consumers. In the food sector the consumers 'vote with their feet' by failing to buy what they don't like, don't trust, do not hear about, or do not want to pay for.

It is frequently claimed that today's consumers are fickle and that their wishes change all the time. We believe that if one uses appropriate social scientific theory, this turns out not to be the case. Consumers may vary in the specific products they buy, as they are forced to because shop contents change through marketing and innovation activities. Other context factors, e.g. economic developments and political events, also impinge on purchasing behaviour. But below that level there are stable motivators for consumers' purchasing behaviour. These reside in value-related factors at the level of social groups. De Mooij (2000, 2001) carried out meta-analyses of European consumption data for a large number of product categories from 1980, 1991 and 2001, including food. Contrary to the predictions of those who believe

that globalization will lead to global values, she found that over this twenty-year period, consumption patterns converge only up to a certain point when countries become wealthier. Past this point, with converging incomes in richer countries, value-related differences become more manifest. In De Mooij's words (2001, p. 305): 'When people possess more or less enough of everything, they will spend their incremental income on what best fits their value pattern. The ultimate deal of Americans is the five-car garage, the Dutch will buy more luxurious caravans (holiday trailers) and the Spanish will eat out even more than they do now.' De Mooij is comparing country-level societies here. But similar processes operate for social subgroups within a country.

Hofstede (2002a) interviewed 136 young adults from 36 countries studying abroad about their food preferences. On average these people consumed like young urban professionals: they eat what they like and disregard what their parents or their religion would prescribe. But country-level averages for eighteen countries with three or more respondents show that in fact the national culture of the respondent's country of origin is a strong predictor of food habits, notably the country's collectivism and uncertainty avoidance. A Russian respondent put the collectivist attitude into words as follows: '(...) I think eating is something I am very accustomed to doing in the company of others. To me a meal is more of a social event than just a bare satisfaction of nutritional requirements.' Under such an assumption, food choice in a supermarket becomes an issue of little importance to a customer indeed. The uncertainty avoiding point of view was exemplified in answers to the question 'Is there food you will never eat?' Many food items from foreign countries were mentioned with revulsion or disgust for a reason, while almost no reference was being made to food safety issues.

2.1.2 *Food: producers*

In agriculture, producers are normally known as farmers. To farmers, transparency usually implies requirements to gather production data and to comply with standards of safety, quality or hygiene, e.g. HACCP (Hazard Analysis and Critical Control Points). Where farmers are SMEs (Small or Medium Sized Enterprises) they have very little influence, and their choice is to 'comply or die'. Whether they reap any benefits from the exercise other than remaining in business is doubtful. This is true for many farmers in developing countries, see e.g. Engel (2002). Under such circumstances, transparency would mean insight into the markets in far-away countries where their customers reside; but better organization and access to funds for investment are likely to be more important. In the Netherlands, farmers traditionally have strong positions due to their high degree of organization into co-operatives. In figure 2, for instance, the Product Agency is a sector-created body that creates a public face for the sector. At European level, the primary agriculture sector is heavily subsidized, to the point of being one of the EU's main reasons for

existence. Subsidies, as well as increasing safety and quality requirements, constitute trade barriers for non-EU countries, particularly poorer ones.

2.1.3 *Food: manufacturers and retailers*

Manufacturers and retailers have very different and complementary roles in the food netchain. Many manufacturers are small or medium sized enterprises. Yet a number of large manufacturers exist that share some important characteristics with retailers. Both are large to very large international companies and both attempt to capture market share through branding. Because of this last fact, their mutual relationships bear an element of competition. It is expected that in the next ten years the trend towards increasing emphasis on fresh foods in supermarkets will give retailers an edge over manufacturers (Grievink et al., 2002, p. 453).

To retailers, transparency is an important marketing device. They can use it to provide information with their merchandise, promoting an image of quality and reliability. The main effect is likely not to be better prices but increased market share. Retailers tend to anticipate the actions of both consumers and citizens, and the latter force retailers into action around value-related quality attributes such as worker conditions, child labour, use of GMOs, use of pesticides and animal welfare.

Manufacturers are forced to establish traceability in order to improve food safety. This is simply required to remain in business. The European General Food Law, to become effective on January 1, 2005, requires 'farm to fork' traceability in the food sector. Some manufacturers are pro-actively working on traceability systems, e.g. Nutreco, active in pork, chickens and salmon. Nutreco do not think that traceability will fetch them a better price with the retailers. If at all, retailers are only willing to pay more for safer food, not for other issues. This seems paradoxical if one considers that in bacteriological terms our food has never been safer than it is today. The paradox can be explained by acknowledging that public perception is only very partially formed on the basis of facts but rather on salience. If something happens it is not geographically contained and receives broad media attention.

2.1.4 *Food: citizens and governments*

Consumers also play the role of citizens, e.g. when they assemble in NGOs and try to influence public opinion or take institutional action, or if they are members of governments. The type of concerns voiced by citizens, and the types of actions in which they engage, vary strongly across countries. In line with their value system, Dutch citizens and governments are comparatively much concerned with sustainability issues, not very afraid of innovations such as GMO food, and not very concerned with taste and provenance of food, but rather with price. Citizens in EU countries with higher uncertainty avoidance, e.g. Latin countries, tend to be much more particular about food safety

issues, and to value locally produced food. Of course trade interests of countries co-determine their attitude to issues such as GMO and diseases. Often self-interested country policies are couched in language that appeals to the local constituency.

Recent attention for food safety has called international governments into action. The General Food Law of the European Union ('GFL', EC Regulation no 178/2002) is one of the most noticeable effects. As of 1 January 2005, this wide-ranging, comprehensive law requires full traceability for foodstuff. Limiting the spread of diseases and the scope of recalls are the primary objectives of this law. In larger animals, traceability will be required at the level of the individual animal. In fruit, carton level traceability is required.

In practice, it is not likely that the GFL will be enforceable right from the beginning. Traceability systems across company boundaries are only beginning to operate and will no doubt face their moments of truth in future food scares. The GFL does act as a powerful trade barrier to those who have no connection to powerful netchains, and as a political instrument in food markets.

2.1.5 *Food: hybrid organizations*

In Dutch society there is no very sharp distinction between public and private organizations. Private organizations have a habit of creating horizontal branch organizations (e.g. *Land- en Tuinbouworganisatie (LTO)* for farmers and growers, *Nederlandse VoedingsmiddelenIndustrie (VAI)* for producers, *Centraal Bureau Levenmiddelenhandel* for retailers) that represent their interests and closely work with governments. In other cases (e.g. Product Boards, *Productschappen*) representation bodies are created jointly by government and private organizations. Typically these hybrid organizations are pro-active with regard to legislation and market trends and take initiatives in contacting other stakeholders in the sector. This much facilitates network-centred system innovations in a sector. This structure also has symbolic value: it means that the participating companies have invested a small part of their independence in the hybrid organization. In order to participate in netchains, they will have to do the same but to a larger degree. In countries with a weak public infrastructure or without co-operative tradition, achieving a better degree of organization among sibling stakeholders, e.g. among producers, may be required before taking other steps. Alternatively, individual large companies might be the units of netchains, and they would use private, not hybrid governance.

2.2.1 *Health care: consumers*

Consumers in health care are dramatically voiceless compared to the same consumers when it comes to buying food. There is hardly a choice of doctors for them, and information asymmetry makes it impossible for them to assess whether the cure or care they receive is adequate. The Scientific Institute of

Dutch apothecaries estimate that 90.000 people are hospitalized yearly in the Netherlands because of wrong medication (Confidential Report, 2003). Yet there is no information about the quality of medication per doctor or per hospital to be had for the unfortunate consumer.

Insurance companies, in contrast, do provide information to customers in their efforts to gain market share. But this information only specifies the type of health care, and is detached from the who and where of that care.

Health consumers are markedly stratified. Age is of course the biggest stratifying factor, with huge health care consumption in the first and last months of people's lives. But other factors count as well, and are less well understood. A Dutch example in the health care sector concerns the high consumption of care by immigrant Turkish and Moroccan populations even when corrected for socio-economic status (Huiskamp et al., 2001). Figures for frequency of visits to general practitioners for Dutch and various immigrant groups correlate with the country of provenance's 'uncertainty avoidance'. Uncertainty avoidance (Hofstede, 2001) – a measure of a society's fear of the unknown – is known to be stable across generations. Across countries it is statistically strongly related to the psychological 'big five' personality dimension of anxiety.

2.2.2 *Health care: medical professionals*

Doctors have historically been almost all-powerful within their domain of expertise. They are not in the habit of being checked upon or of having to compete with one another for the favours of prospective patients. Over the last decades, government and hospitals have tried to strengthen their grasp on them. The current system budgets the salaries of specialists to an expected number of medical proceedings per year. Excess productivity is not paid for. This leaves them without an incentive to try and eliminate the waiting lists that exist for patients.

2.2.3 *Health care: hospitals*

Hospitals face huge, costly bureaucratic overload. There is no unique coding system for patients. This prevents effective transfer of patient data across the medical chain. Informatization of the medical sector has stagnated over the last decade. Currently, efforts to create a good infrastructure at national level are under way that could improve this state of affairs (Confidential Report, 2003).

Another area in which much can be gained is the logistics of supporting processes, e.g. of medical material provision. Due to lack of co-ordination expensive, perishable stock of materials is kept in too many places.

2.2.4 *Health care: insurance companies*

Insurance companies make the financial side of the health care system run smoothly by moderating the relation between hospitals and consumers. They calculate the insurability and needed premiums for various treatments. The continuous creation of new treatments with unknown risks requires them to keep re-assessing their offer.

Due to their size and limited number, the insurers have a strong position. The government can regulate their offer but cannot afford to put them under too much pressure. It expects them to both control quality and efficiency of care in future, acting in the interest of the citizens. Currently they mostly move money.

2.2.5 *Health care: citizens and governments*

Health care is government-financed; not through taxes but mainly through premiums: collective insurance ('ziekenfonds') premiums and AWBZ premiums account for three quarters of the budget (X 2003).

The government attempts to maintain the solidarity of insurers with weak customer segments. It created collective insurance for lower-income groups, and it presses insurance companies to keep insuring expensive categories of patients, while insurers will attempt to acquire the consumer segments that require little health care.

Several aspects of health care have been politically controversial. Examples are abortion, terminal care and treatment for people who willingly run health risks such as smoking or drug taking. Political controversy invariably makes reasoned policy difficult, favouring electoral considerations rather than long-term systemic ones.

2.3 *Moral*

The examples of consumer demands illustrate that *values* of groups of consumers strongly shape their perceptions and demands. To provide acceptable goods and services it is vital to take these values into account.

The *perspectives* of the various stakeholders show to what extent they live in different incentive structures.

Both values and perspectives contribute to create arenas in which *perception is more important than reality* when it comes to improve a certain state of affairs. With respect to transparency the participants will only be willing to invest and make the most of it *if they are aware of the larger system in which they function*. Seeing the potential benefits for the netchain or sector as a whole is a precondition for increasing transparency, it would seem. But it is by no means the only one.

3 Practices

The prime driver for transparency in the food sector has been food safety. For health care it is economic necessity and patient welfare. This has led to a focus on traceability in the food sector. The health care sector lags behind. This section will therefore concentrate on the food sector.

In this section we first review the 'raw material' of transparency from an information modelling point of view. Then we turn to the lessons learned from a number of pilot projects in the food sector.

3.1 *Product information for traceability*

Traceability consists of tracking the course of a product through the netchain while it is being produced, or tracing back the history of a product after the fact. In cases of recalls both backward tracing to the origin of a suspect product and forward tracing to all consumer outlets of that origin are needed. The starting point for a recall is a consumer's complaint (e.g. allergic reaction to milk, a recent Dutch case); then the chain is traced until the cause is found (here: antibiotics residues in the milk). From that point all other products that might have been affected by the same cause are recalled (in this case: half-skimmed milk of one date in two retail chains). Product-related information, in the context of a netchain, can refer to various types of information from various sources. There will be particularities for each individual netchain. Yet a general-purpose classification can serve as a starting-point for finding information that is to become transparent in a netchain. All these types of information pertain to a smallest homogeneous product unit. It is crucial for a netchain to agree on such a unit, usually termed 'lot' or 'batch'. The smaller the unit size, the better it can serve to limit recalls and other disturbances. A smallest traceable unit is defined on the basis of a number of 'generating properties', i.e. those properties for which all elements of the unit must share the same value. For each smallest traceable product unit, the following needs to be known:

1 *Identifier*
Identity preservation of products or batches can tax the administration of a netchain, particularly primary producers. More and more, identifying information is shipped with the product automatically. Animals are ear-tagged with an identifier, or it could be subcutaneously entered. There are plans to use DNA routinely for identification purposes.

2 *Inherent product properties*
These can be seen or otherwise measured on the product. Most inherent properties are dynamic, meaning they can change over time. These include e.g. taste, content of chemical components, bacteriological status, visual attractiveness. Some are not likely to change, e.g. size. Some never do, e.g. provenance data. Provenance can be contestable, though; 'Parmaham' can be made by slaughtering Dutch pigs in Italy.

3 *Process properties*
These constitute the history of what has happened to a unit. If units are combined, for instance on the basis of equal inherent properties, then you get units with non-homogeneous process properties, which may become a problem when tracing product provenance through the netchain, e.g. in the case of a recall. Properties of means of production used on the product are a special case. This includes machines and labour. In the case of machines, contamination issues can arise. For instance, if a machine is used for non-GM seed after having been used for GM seed, very rigorous cleaning is necessary. In the case of labour, ethical issues can arise, as when customers refuse to buy products because they suspect that children have been used to produce it.
In the case of products that are made up of components, many data have a recurrent element in that they hold for each sub-product in the product decomposition tree. This property makes it possible to model that decomposition tree at an abstract level so that one entity can represent components at any level in the tree.

It is quickly apparent, given this classification, that there is a complex design aspect in providing transparency. Adding the requirement that the netchain be still open to entry of new partners makes this even clearer. Generic information models or architectures that can serve as open standards may alleviate this problem. Open data standards do not force process standardization, while enabling interoperability, so they are a good basis for flexible network structures.

A skeleton data model for tracking and tracing taken from Hofstede (2002c) is shown below. Figure 4 shows a hypothetical history of product batches that are both split and joined at various points throughout the chain. Figure 5 shows an Access database for this case. Figure 6 shows a UML class diagram capable of modelling the general case of which figures 4 and 5 provide an example.

Figure 4 Splitting and joining of lots in a production chain

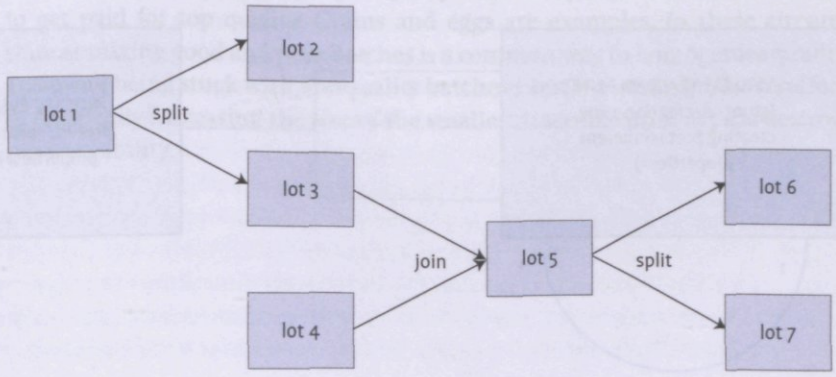
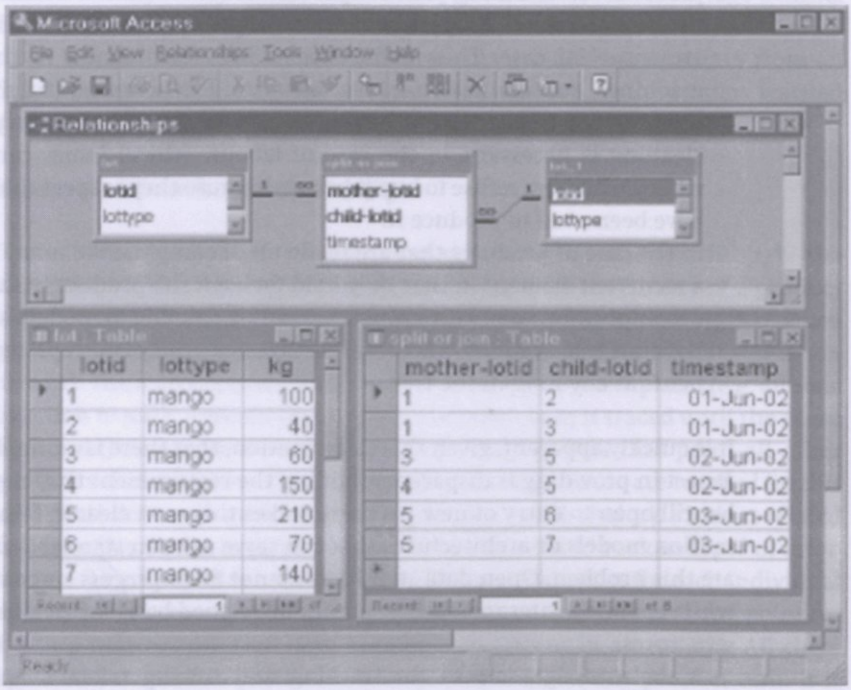


Figure 5 A database for the lots in figure 4. The top window shows the two-table structure with each LOT associated to many SPLIT OR JOINs, and with table LOT represented twice. The bottom left shows the contents of table LOT, bottom right those of table SPLIT OR JOIN



lotid	lottype	kg
1	mango	100
2	mango	40
3	mango	60
4	mango	150
5	mango	210
6	mango	70
7	mango	140

mother-lotid	child-lotid	timestamp
1	2	01-Jun-02
1	3	01-Jun-02
3	5	02-Jun-02
4	5	02-Jun-02
5	6	03-Jun-02
5	7	03-Jun-02

Figure 6 A UML class diagram for the core of a traceability data model, showing no implementation details. There is one 1-to-many aggregation relationship of a STUNT (Smallest Traceable UniT) with its predecessors (with split and join symmetrically modelled), and one many-to-many associative relationship PRET (Process EvenT) between STUNTs. The label <> indicates that the actual properties have to be substituted. For UML syntax see e.g. Stevens (2000)

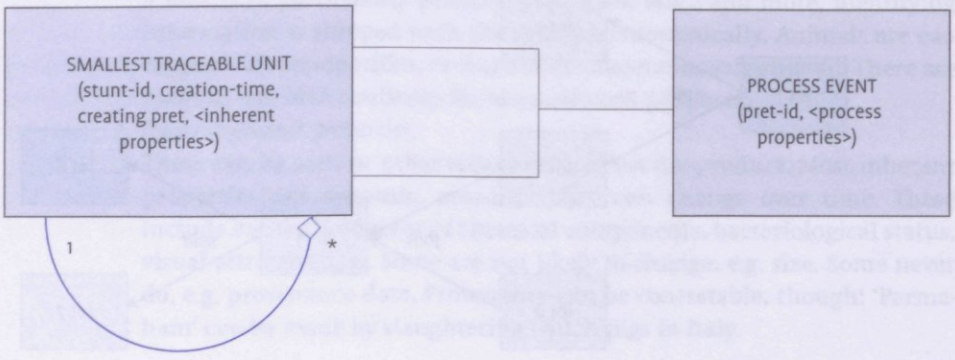


Figure 6 includes an aspect lacking from figures 4 and 5, which is the many-to-many association of STUNTs in a process event. This might e.g. be the slaughtering of a batch of pigs. The figure shows that the data structure backbone for a tracking & tracing system is not very complex. Complexity resides in three other facets.

First, the actual inherent and process properties may be complex in structure and hard to get by, or it may be costly to collect them. See e.g. Beulens (2003) for examples of complexity in detail.

Second, a coherent data architecture has to be adopted by as many organizations as participate in a netchain – in fact they would have to be harmonized per sector. The problem of mutually reconciling different item specification dimensions has been termed semantic reconciliation. A KLICT study on semantic reconciliation (CHASE: Chain Services in ICT, see www.klict.org) concludes that a technological solution is only part of the story, and that agreeing on common mode of communication remains crucial.

A third problem in practice is which of the data should actually travel with the product. The minimum requirement is to have the STUNT-id of the last STUNTs travel with the product. Descriptive information can be decoupled from these identifiers to protect the interests of its owners. The points in the netchain where this occurs are called information decoupling points (Trienekens and Beulens 2001). By entering STUNT-keys in the traceability system, all other data can be retrieved. In this way one needs only use STUNT-keys and other data remain hidden until there is a need for them, e.g. in case of calamities. A TTP (Trusted Third Party) could keep the actual data behind an encryption key, as e.g. in the British Foodtrak system (Wilson and Clarke 1998). If a food scare does occur, it is of course necessary to retrieve the actual data fast, and a TTP could specialise in this. Not everybody in industry is enthusiastic about working with TTPs; some prefer direct business-to-business arrangements. Having all inherent and process data available makes it possible to do analyses on them involving data mining algorithms, e.g. for early warning purposes about bacteriological quality.

Other problems reside in the netchain's organization. For instance, netchains exist with minimum average quality requirements per batch where it is hard to get paid for top quality. Grains and eggs are examples. In these circumstances mixing good and poor batches is a common way to homogenise quality and avoid being stuck with low-quality batches – but it obviously has the effect of drastically increasing the size of the smallest traceable unit, *de facto* destroying traceability.

3.2 *KLICT project results*

KLICT has sponsored a number of pilot projects on transparency. Some projects in the food sector are finished at the time of writing. We shall present a brief summary of results here. More documentation can be obtained at www.klict.org.

3.2.1 *Virtual organization in SMEs (Small and Medium Enterprises)*

This project involved the egg netchain of figure 2. In 2001, co-operating with KLICT and with two universities and two consulting firms, 8 SMEs in the Dutch egg sector decided to try and form a 'virtual organization'. The stated aim was to enhance co-operation in a virtual network while maintaining the independence of the actors and their freedom to entertain other business relations. Preventing food scares was one of the objectives, but achieving economic benefits through branding and better responsiveness to the market was an important motivator.

The actors knew one another very well but were used only to horizontal communication, not to vertical integration. They worked with short-term informal arrangements, keeping dependency to a minimum. They saw one another regularly but where work was concerned they talked price and quantity once a year and that was that. This is not so surprising, since the egg market has been a cost market in the extreme. The actors rather had the feeling of having one pie to share among them, and the fear that if they revealed vital information, others might use that to cut themselves a larger slice. As a result, the firms' willingness to share confidential knowledge turned out to vary widely. Having every participant sign a secrecy declaration and appointing a mediator helped build trust. The project yielded a 'Memorandum of Understanding and Principles' of largely symbolic value, and most participants decided to join in a follow-up project. Deciding on how to divide costs and benefits will be a tough nut to crack in the follow-up project. A prototype tracking and tracing system was delivered but not put into operation yet. Since the project, the participants talk weekly and exchange a variety of product-related information.

The project report (Mevissen, 2002) mentions some critical success factors: involve people with decision-taking authority to keep momentum, and keep the project team constant to enhance trust. This latter result points to the fact that trust develops among people, not organizations. A netchain thus consists of three levels: the netchain as a whole, constituting organizations, and people in those organizations who actually co-operate.

Another result merits attention. The participants became aware that despite their modest size, together they accounted for about thirty percent of the Dutch egg production. This made them realise that as a network they might wield some power against competitors or against the big retailers. Creating marketable value through branding remains hard in a commodity market such as this one, and the netchain partners are still working on it.

A final noteworthy result is that the participants realized that staying independent while forming a network was *not* possible. Even though they were free to do business on the side, the investment in infrastructure, data definition, and agreements bound them together and made exiting costly.

To sum up, while immediate quantifiable results were not impressive, trust building was significant, and so was the acquisition by participants of a sense of agency at the level of the netchain.

3.2.2 *Fruit from South Africa to the Netherlands*

The FRUITFUL project (Van der Ham, 2002, Guis 2002) assembled ten industrial partners, three funding parties and three research institutes. Its aim was to study possibilities for an integrative supply chain information system in the citrus and mango chains from South Africa to the Netherlands that could improve both logistics and quality. Such an information system had existed until 1997 in a typical hierarchical structure under control of only a few parties. The market was deregulated then. With the big bosses gone, entrepreneurial chaos ensued and the central information system was abandoned. From 1999, it became clear to many that South Africa was rapidly losing its position on the international market. Some co-ordination had to be re-established in order to keep up with international competition.

Bottlenecks to reaching these aims were found not to lie on the technical side. Necessary information was available somewhere and realising connectivity and transparency posed no technical problems. Agreeing on common goals and acting towards them rather than opportunistically proved to be more of a problem. The large number of participants did not help. They could not agree on a common infrastructure but instead decided to create a decentralized system that focused on interfaces between proprietary systems and allowed limited transparency. This is an option that involves rather high transaction costs, but more integration was not acceptable.

Getting the partners, and especially their key personnel, on speaking terms has been the most important first step. After this, showing the parties how much redundancy and inefficiency in information exchange was another major activity. For one sample chain it was shown that 35 documents (faxes, websites, e-mails, telephones, hard copy) were needed to cover the chain (grower – exporter – shipping line – terminal – importer – pack house). The consumer is not yet included in this chain. Subsequently standardization of messages and codes accounted for much of project activity. But, as was noted in the evaluation seminar, 'Within the project we just scratched the surface. The real work starts now.'

The project shows that the historical context is a powerful constraint on any improvement in netchain governance. A question raised by this project is the unit of competition. Should it be the individual producer, the co-operation, the multinational company or the country? While the South African companies were competing against one another after the deregulation they

jointly lost ground against foreign competitors. In a price market, economies of scale are needed to survive. The South African fruit companies needed to co-operate. Their brand is 'South Africa', a strong one in the Netherlands, and the Dutch leaders of the FRUITFUL project advise them to join forces at country level for marketing and branding.

3.2.3 *Fresh produce in Thailand*

Ahold is working on local quality systems for fresh produce in Asian, African and Latin American countries. Recent economic developments have put a temporary halt to these activities. One project that was completed is the TOPS project 'Best in Fresh' in Thailand (Boselie et al., 2003). TOPS was a joint venture of Ahold with a Thai retailer (CRC). The project involved a 'preferred supplier program' that forced suppliers (growers, wholesalers) to comply with certain minimum standards. Uncertain quality, long non-cooled storage upstream, frequent out-of-stocks in the outlets, and too many small suppliers upon whom there was limited influence, are some of the problems tackled. A distribution centre (World Fresh) was built for quality control, washing, packaging and processing. HACCP and good agricultural practices were introduced in the chain. Mutual understanding by growers and retailers improved, and so did the distribution centre's service level. Standardized product carriers, pallets and roll containers were adopted. But unfortunately, the Thai market did not respond to the 'added value' created by the project. Also the project seems not to have been so successful at the level of interpersonal trust. Somewhat menacingly, the project report states 'In a multinational and multicultural environment trust remains limited. If this is the case there is a need for other instruments for monitoring and enforcement of agreements and standards'.

After the Dutch left, the Thai fitted the system within their way of working. In the words of Boselie (2002, p. 25): 'Personalistic business relationships remain a latent threat to preferred supplier programs in environments that can be characterized by a high degree of informality'. In the language of the culture discussion above, measures issued from an individualist perspective don't automatically work in a collectivist context. So from a Thai perspective, the causality may be the other way around: preferred supplier programs are a threat to their social fabric. The project report specifies that the representative project members of all four Western companies involved have been replaced at least once. This is never beneficial, but it is a sure way to destroying interpersonal trust in partners with collectivist values where personal relationships, not relationships between firms, are the core of business.

Thai food manager Wallaya Chirathivat of the family enterprise CRC (in Grievink et al. 2002) may have had TOPS in mind when she said: 'I think that it is very important to maintain an open mind and to pay special attention to the specific cultural conventions of doing business in foreign countries'. She also asserts 'A global brand can never penetrate the Thai food market'. The future will tell.

Summing up the learning from the three projects we see that in all three, netchain-level standardization of information was important but building stable operational relationships at the personal level was crucial. The morale seems to be 'when creating a business network, avoid replacing people'. On the economic side, the benefits are controllable internal efficiency gains and uncertain gains in the market.

4 Promises

Transparency has important promises to fulfil. In order to discuss these it is useful to distinguish three levels of transparency (after Hofstede 2003). But there are also threats and impediments involved that will be addressed in this section.

4.1.1 *History transparency*

This level is about *knowing what has happened* in the netchain. Its promise is to improve recall management and prevent calamities. It is also known as tracking and tracing or traceability. The technology is rapidly being put in place by companies in the food sector, particularly the large ones who feel the hot breath of the GFL traceability requirements that will become effective in 2005. In health care the data infrastructure for keeping track of patient history is only partially in place so far.

4.1.2 *Operational transparency*

This level is about *knowing what will happen* across the netchain. It involves keeping netchain partners informed on one's logistics and other operational parameters. Its promise is to improve the efficiency reduce waiting times and stocks, and improve effectiveness and responsiveness of netchains. In the health care sector it is virtually non-existent now, and potential benefits are huge. Supply Chain Management and co-operative planning are examples of operational transparency.

4.1.3 *Strategy transparency*

This level is about *deciding what may happen* in the netchain. It involves creative investigation of the netchain's context to find opportunities and threats and to design adaptive responses. Joint innovation is a case in point. Strategic R&D alliances are vehicles for strategy transparency.

Strategy transparency demands high levels of trust and are vulnerable on that account (see e.g. Omta and Van Rossum, 1999). The usual growth path in the food sector would be to start from history transparency. This forces netchain partners into contact and can be the opportunity to grow to

operational and perhaps to strategy transparency. In the health care and many other sectors, operational transparency would be the likely first step.

Thus defined, transparency clearly stands out as more than just a buzzword. In order to make it happen, we should prepare for the future. One important opportunity in this regard is education. Our higher education can adopt a network perspective to make young people aware of various perspectives. One can e.g. give retail classes at agricultural schools.

4.2 *Threats to transparency*

Transparency is here to stay, as long as the influence of consumers on markets increases. It has its core domain in information modelling. Open standards, shared by all partners in a netchain and preferably in a sector, will allow for leaps forward in traceability in those sectors in which it serves public interests. But transparency has many faces and it is not a cure-all. We shall investigate the problematic aspects of transparency a bit further.

4.2.1 *Transparency can tilt power balance*

The effects of transparency are likely to vary strongly with netchain characteristics. In fresh fruit netchains the netchain is in essence only an indirect way to match growers and consumers. Intermediate links (transporters, exporters, terminals, importers, retailers) merely collect and redistribute the product, but otherwise do not add value. In fact they sometimes destroy value through quality loss of the fruit. Transparency in such a chain, if it includes the grower and customer, is likely to result in streamlining and in a better position for these actors. In netchains of processed foods, the intermediate links do add value, and they have less to fear from transparency. They could in fact use it as a marketing tool.

From another angle, transparency can be a political tool in the hands of powerful parties in netchains. Retailers are the obvious candidates for this role in the food sector. They can set standards and adopt a 'comply or die' strategy with small, unorganized producers. On the other hand the retailers could also help producers improve their practices for mutual benefit. The outcome of these power balance issues will depend largely on the role of consumers, marketing departments and the media. We have more power as consumers than we have as citizens (Kalshoven, 2003). Who succeeds in gaining public favour or, more crucially perhaps, avoiding disfavour?

4.2.2 *Differences across institutional environments*

Private – public

A divide runs between private and public netchains. Private ones have the problem of divided ownership. But at least they can agree on the centrality of economic rationality for taking decisions. In the food sector, the market chastises poor decision taking. In a public network, non-economic criteria take on far greater significance. One cannot agree to a health care system that withholds care from the poor. On the other hand, unlimited care for all is no longer payable at the national level. So painful choices of principle cannot be avoided. The next problem is to put them into practice.

Linear – non-linear

The governance of a linear network is difficult enough. Dividing benefits, costs, and risks is tricky at the best of times. But if the network is far from linear the puzzle becomes confounded. In health care, three major and separately governed binary markets operate between health care providers, insurers and the public. How can government steer a car with three steering wheels?

4.2.3 *Complex networks are intractable*

Too many actors slow down change in any process. In a netchain there is no central authority that can delegate work. This makes them inherently intractable. If structures of delegation, e.g. of data management or customer relationship management, can be created this will do much to improve things. Structures of control, on the other hand, can further slow down change. De Bruin (2003) convincingly argues that setting and tightly controlling performance standards tends to be counterproductive. This is because it punishes risk-taking and innovative behaviours that are, by definition, not included in the performance criteria.

4.2.4 *Level playing field?*

It is a pitfall to pretend that transparency is the same thing all over the world. Anglo-dominated institutions like to create a 'level playing field' and see transparency as a means to that aim. But if one party has good shoes and the other has none, a level playing field will not help the shoeless ones (see Engel, 2002). The GFL, acting as a Chinese wall to those who fail to comply, is a case in point. If transparency is to benefit international society, creating it should never be an aim in itself, but the historical, economic, institutional and social context needs to guide ambitions and progress.

Playing field characteristics are largely nationally determined – e.g. are appointments kept, are they legally enforceable, is bribing acceptable or even necessary to get things done? Even very large companies cannot always

circumvent these national characteristics. They have to straddle the regulations and value systems of the countries in which they operate. Ahold has a reputation of being one of the world's most international retailers (Grievink et al. 2002). Yet after recent failures in Argentina and the U.S., Ahold has become more cautious about globalizing.

5 Conclusions

Netchains emerge from this chapter as complex systems that are hard to comprehend, let alone govern. But the discussion makes it clear that if we wish to get a hold on netchains in general, a language is needed to talk about them from a system perspective. Transparency will be one of the important words in that language, regardless of sector. Without considering netchains as systems and describing them at system level we cannot hope to improve their functioning in a coherent way.

It is at system level that transparency should be considered. A number of disciplinary perspectives need to be combined in a systemic perspective on the netchain as a whole. These include organization studies, human behaviour, law, economics, engineering and information technology. Technological advances are often drivers. Information technology follows: in order to exchange tracking and tracing information it is necessary to standardise data formats or at least to make them interoperable. Processes usually need not be standardized, but outputs do.

Practice shows that the technical side is not the bottleneck. Transparency requires good management, good legal systems, vision and trust. Without these, incentive systems will not favour transparency.

Transparency sets preconditions for customer orientation, for responsiveness and for innovation of netchains. Its promises are huge but its ambition level is high because of the complexity of netchains and because of the trust among actors that is needed to realise transparency.

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