

## CHAPTER 3

# ACCOUNTING STANDARDS FOR SUPPLY CHAINS

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**Abstract.** In this paper principles for accounting in supply chains will be developed. The three principles we introduce are: the reciprocity in information access, asset investment and retrieval, and matching risks and returns. The principles provide guidance in managerial and stakeholder decision making, monitoring and control. The information that management and other stakeholders need is based on these standards.

The use of the supply-chain accounting principles increases transparency. Transparency is one of the main elements of what Fowler et al (2004) call 'virtually embedded ties'. We argue that transparency should replace, or at least supplement, relational trust in supply channels. We argue also that technological innovation, such as electronic chain-wide reporting, is beneficial for transparency, decision making and control in/of supply chains, and will reduce the administrative costs of (supply-chain) accounting system at the same time.

**Keywords:** financial accounting; reporting guidelines; accounting standards; reciprocity

### INTRODUCTION AND OUTLINE

In this paper we ask ourselves: (1) does the Dutch legal framework permit supply-chain accounting and (2) for what items (problem areas) is it necessary? and (3) what principles should be applied? Given the lack of research in this area and the presence of single-business accounting standards, the development of supply-chain accounting principles in this paper (1) is a normative rather than an objective enterprise and (2) uses the available standards that have already been developed in accounting theory and practice. In the section on accounting we state that the Anglo-American reporting framework allows for chain-wide reporting better than Roman-based accounting systems, which are existent in France and Germany. Although Roman influences also have permeated in the Dutch reporting structure, it has been influenced more by the Anglo-American framework. The Anglo-American standards are less rigid and more purpose-oriented than the fiscally-minded Roman structure is.

Chain-wide accounting is necessary to assess and account for social, environmental and economic performance parameters (also known as People-Planet-Profit or PPP performance). We oppose the traditional systems of accounting *C.J.M. Ondersteijn, J.H.M. Wijnands, R.B.M. Huirne and O. van Kooten (eds.), Quantifying the agri-food supply chain, 25-36.*

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and performance measurement and argue that it is necessary to develop accounting rules for chain-wide reporting and disclosure. In the next section we set forward three principles of supply-chain accounting. In the final section (on Information processing and innovation) we argue that the development of supply-chain accounting systems should be supplemented by legal and technological innovation, to increase transparency and efficiency in information processing as well as to reduce to the administrative burden of companies.

### ACCOUNTING APPLIED SYSTEMS AND STRUCTURE

In the past, accounting, especially financial accounting, has mainly focused on the *ex-post* quality of information provision by the individual firm (see, for instance, Drury 1992). The business corporation, as a legal entity, has as characteristics: entity, accountability and independence. The entity concept refers to Ijiri's conception of the firm as having rights and obligations different from its financial stakeholders. The distance between the two is bridged by the provision of audited information by management. Management governs the property rights of the firm. Property rights can be *legal property* and *economic rights*.

Economic rights (and related obligations) refer to contracts and constructions to guarantee the exploitation of the economic benefits related to an asset. Supply-chain assets (collective structures for the processing of products) are often economic rather than legal of nature. Not all reporting systems support the disclosure of such assets. As a matter of fact, the way financial accounting systems deal with economic rights is quite different within the European Union. In The Netherlands, which has a reporting system that is strongly influenced by an Anglo-American viewpoint, economic rights held by an individual firm can be disclosed as assets on a balance sheet, provided that the 'assets' have distinct features that are similar to legal property. Under Dutch reporting rules, which hold the middle between an Anglo-American and a Roman system of disclosure, assets are recognized in the published accounts only if they can be traded, can be isolated for individual valuation, and whose value can be assessed in concordance with acceptable principles (see, for instance, Choi et al. 2002; Bremmers 1995). Financial leases, for instance, are regarded as assets under Dutch law. This system safeguards the main function of financial reporting: giving a true and fair view of the financial position of the firm, i.e. of its assets and liabilities, profits and losses as well as of its cash position. Because of this, the Dutch legal system would support the provision of information on the performance, the assets and liabilities of a supply chain if, and only if, this leads to a better insight into the financial position. On a French balance sheet only legal property is accounted for, while in Germany (because of the application of the 'Maßgeblichkeitsprinzip') generally only those assets and liabilities that are disclosed are fiscally acceptable.

Accounting is divided into management accounting and financial accounting. Management accounting focuses at the internal, managerial decision-making process and control of the firm (Drury 1992). It contributes to responsible and accountable governance. Financial accounting on the other hand focuses at the provision of

information to external stakeholder groups, of which the shareholders are the most important (see, for instance, Wubben and Bremmers 2003). Both accounting methodologies stimulate the creation of shareholder value. The relationship between shareholders and management is one between principals and agents. The agents (management) should, in a world with asymmetrically distributed information, respond to the need for transparency of different stakeholder groups (principals). Accounting, whether it is management accounting or financial accounting, creates the needed transparency and accountability. It does so by composing and sending messages, and therefore can be depicted as a *communication device*. Communication is defined as interaction through messages. In the words of Shannon and Weaver (1949, cited in Alter and Roche 1999) communication is “all procedures by which one mind may affect another”. Since accounting is ‘the art of communicating financial and non-financial data’, according to Shannon and Weaver three problem areas exist:

- technical: achieving efficient transmission and reception of data;
- semantic: increasing precision of message transfer;
- effectiveness: level of behavioural influence.

Improvement in these areas could reduce the level of information asymmetry. Information asymmetry exists, among other things, with respect to performance assessment: environmental performance (Planet), social performance (People) and financial performance (Profit). The Balanced Scorecard approach would depict the level of performance in the areas depending on the efficacy and efficiency of processes (channels), learning and growth activities and consumer satisfaction. These are also the main topics in supply-chain management. This means that supply-chain reporting should address the main performance areas, as well as the causal relationships between PPP performance and channel structure and processes.

*Environmental performance disclosure* is necessary for several reasons. Legal obligations (public policy), valuation of changes in product configuration, as well as necessary changes in perceived utility of environmental improvements all require some form of environmental performance measurement (Bremmers 2000; 2001). Since it can be expected that in practice environmental measures are taken more willingly if ‘pollution prevention pays’, or ‘the polluter is made to pay’, environmental performance indicators should inform about the consequences of alternate environmental strategies (Bremmers et al. 1996). This is not only true for a single firm but also holds for an entire supply chain, as is the case in life-cycle analysis (LCA). Supply-chain environmental efforts are not only accompanied by costs (Buzzelli 1991) but also reduce costs (Madsen and Ulhøi 2001; Tyteca et al. 2002) and possibly create first-mover advantages (e.g. Welford and Gouldson 1993; also: Carroll 1979; Wartick and Cochran 1985; Clarkson 1995; Waddock and Graves 1997; Husted 2003).

*Social performance* disclosure is relevant because of the fact that human and social assets are of more importance for the individual firm than are easy-to-replace tangible assets, like machines or buildings (Sporleder and Peterson 2003). Nowadays, social responsibility of companies is not limited to increasing wealth but stretches out towards accomplishing this in a socially and environmentally

sustainable setting (Friedman 1970; Beamon 1999; Hart 1995). This is emphasized by the development of Corporate Social Responsibility (CSR) in the corporate world.

*Financial performance* is traditionally measured by the amount of profits that is made by individual firms. Since financial performance measurement has a long history both in practice and financial literature, this measure is scrutinized in the following paragraph.

#### *Traditional accounting systems and performance measurement*

Traditional accounting systems focus on static, isolated and *ex-post* profit measurement. Modern performance measurement instruments on the other hand, include a multitude of areas of performance, related to the different (primary) stakeholder groups. In our view, supply-chain accounting standards will have to include multiple performance measurements at different levels: operational, managerial, logistic and at a communicational level. The specifics depend on the supply-chain structure. A traditional supply-chain structure is centralized with respect to strategic decision making and control and focuses on a single-company profit increase. Power exertion is the coordination mechanism that is applied. On the other hand, a supply-chain governance system that focuses on relational equality (cooperative supply-chain governance) will try to meet different goals of stakeholder groups that are involved. At the far end of the continuum, an atomic supply chain will leave all coordination to the market.

The present disclosure of the *ex-post* profitability by individual firms, as is exercised under commonly accepted accounting standards, is based on neo-classical economic theory. Neo-classical economic propositions include the availability of homogeneous products, the absence of influence on prices by individual firms, and the existence of many competing suppliers. Under these propositions, performance measurement instruments are output-oriented and profit-related (Acs and Gerlowski 1996). The focus on single-firm profitability has major disadvantages (Bremmers 2001).

First of all, profit measurement is carried out retrospectively. The accounting concept of profit that is generally applied measures the equity at two moments in time, to assess profitability. The precision of this type of profit measurement can be questioned, since profitability can easily be influenced by the asset valuation system. For decision making by stakeholders, a Hicksian (dynamic) *economic* concept of profit would, therefore, be more appropriate.

Secondly, the accountant's profit measurement lacks the inclusion of risk as a significant part of business performance (compare Hardaker et al. 1997). Awareness of food-safety issues, due to recent crises in agribusiness produce (like BSE, swine fever and foot-and-mouth disease) has risen. As a result quality assurance plays a major role in agriculture and food processing nowadays. Systems like the ISO-9000 series are implemented, HACCP is obligatory in the meat-processing sector and even at farm level processing industries are forcing quality systems on producers.

From this point of view, profit as a single performance criterion lacks managerial significance (Noori and Radford 1995).

Thirdly, historical data are commonly used in published reports. More emphasis should be placed on cash flows, rather than on past-period profits (Brealey and Myers 1991).

Finally, the relevance of single-business profitability is questioned, since in a supply chain costs of one firm can be revenue for another, and vice versa. Costs as well as risks can easily be transferred from one single firm to another. There is serious danger of opportunistic behaviour if information is not evenly distributed. Stakeholders can be misled; especially the consumers at the end of the supply chain (Barfield et al. 1994). The management of inter-firm interaction and business relationships (by means of legal structures, contracts, covenants, etc.) on the input and output side of corporations is of eminent importance for the survival of companies in food supply chains.

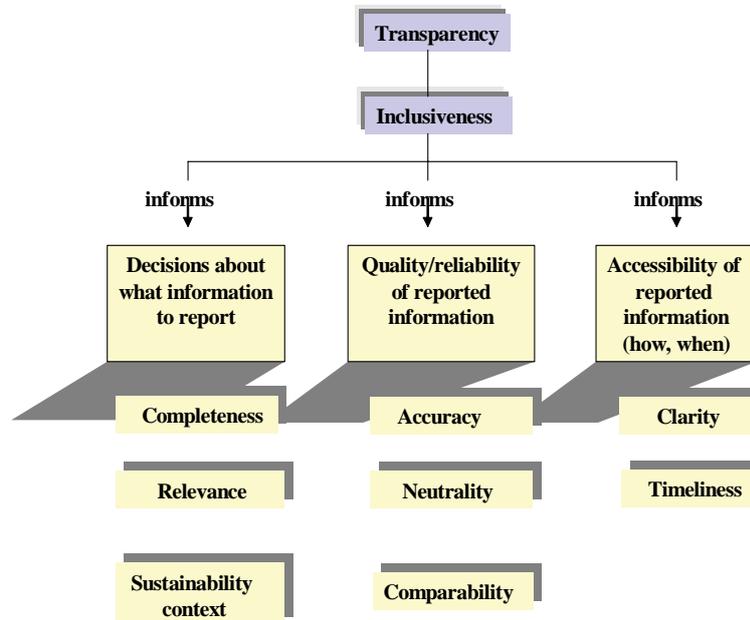
We argue that the measurement of the profitability of the individual firms in a supply chain is inadequate to get insight into the functioning and performance of the channel as a whole. From the previous remarks it follows that performance assessment should be a multidimensional, anticipative and (since individual optimization can hamper overall supply-chain performance) integrated activity.

#### *Accounting principles*

The accounting principles that have been developed in the past refer mostly to the information processing of the single (isolated) firm, and are proposed by rule-making bodies, like the EU (4th Directive), IAS (IRFS guidelines), SEC (NYSE prescriptions), GRI (Global Reporting Initiative, stressing sustainability reporting), and national legal authorities. Figure 1 depicts the GRI standards as an example.

There is an exception to the single-firm focus of modern accounting. If companies are economically interwoven (can be considered a 'group'), then also a consolidated financial statement is published. Coordination takes place through a company that, most of the time on the basis of property of share capital, takes the lead over a group of companies and consolidates by integrating assets, liabilities, profits and losses. In a supply chain with (on the basis of share capital rights) a central governing firm, a consolidated report covers the supply chain as a whole.

For other types of governance configurations in supply chains, supply-chain accounting is non-existent. Three types of supply-chain governance can be discerned: the centralized supply chain, the cooperative supply chain and the decentralized (atomic) supply chain. In a centralized supply chain, all information about the strategic and operational issues is concentrated at one of the firms within the channel. Moreover, the central governing firm not only controls the operational processes and strategy, but also the information flows to the contributing firms. The profit from supply-chain activities is captured by this central governing firm, because of its dominant position and power. An example of this governance system is the EUREP-GAP quality system that supermarkets have imposed on the horticultural and agricultural producers.



*Figure 1. Reporting principles (source: Global Reporting Initiative 2002, p. 23)*

In a cooperative supply chain, the partners have an equal (or better ‘equivalent’) say and have the right to be informed on overall chain performance. Surpluses are distributed to the partners in concordance with their contribution to chain efforts. The cooperative supply-chain governance system is the ideal image of a well-functioning, sustainable supply chain, because centralized governance (hierarchy) could just as well take place within the individual firm. On the other end of the continuum, the atomic supply chain uses market price as the only coordination mechanism. Under these rules, accounting is dispersed over different firms and a collective information system is non-existent. Only in the cooperative supply chain, a collectively designed and controlled information system is viable.

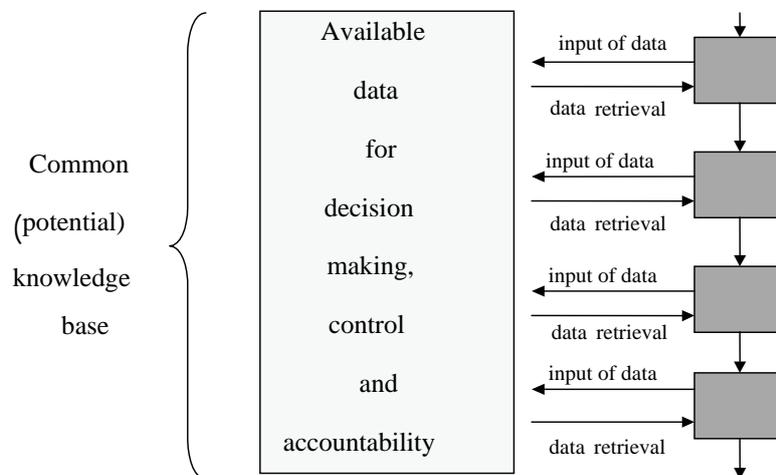
Especially in cooperative supply chains that are not governed by decisive (legal) property rights, an integrated or supplementary reporting structure will be necessary, since intellectual, social and physical assets are for a large part not controlled by a single firm, but are common property. Although such a supply-chain governance structure is a channel structure rather than a cooperative in legal sense, its governance resembles the legal cooperative governance in many aspects. Analogous problems are present: performance measurement, redistribution of benefits and joint governance (member influence). Effective vertical coordination and policy disclosure make the development of special standards for supply-chain accounting necessary.

## ACCOUNTING PRINCIPLES IN THE COOPERATIVE SUPPLY CHAIN

In this section, we formulate three accounting principles that are of importance in a cooperative supply chain: information availability, asset management and portfolio management.

*Chain-accounting standard 1: information availability*

The first principle we propose is the reciprocity in information availability: those that supply (high-quality) data, should be able to retrieve (high-quality) data. This principle states the right of chain partners to be informed about chain operations, strategy and outcomes and the obligation to provide information to the system. For instance, processors in the supply chain who contribute to the tracking and tracing system (T&T) should, as compensation, be able to assess how other partners in the chain operate. The supply-chain partners should eventually be provided with information on emergency call-backs of products, but also for instance with information on what consumer groups buy the product and on the level of perceived consumer satisfaction. So the traditional quality-of-information criteria (accuracy, precision, completeness, timeliness, etc.) (Merchant 1998) should be supplemented with reciprocity in information access as an objective and measurable relational criteria (Figure 2).



**Figure 2.** *Reciprocity in information availability*

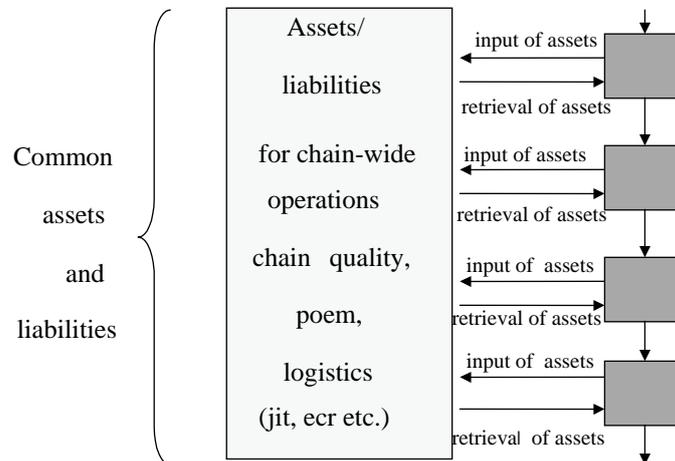
In a cooperative supply chain, trust should be replaced by (or at least supplemented with) transparency, to reduce information asymmetry. Transparency can be created independently of the established relational quality of supply-chain

partners. It can be measured objectively, whereas trust can only be measured by means of interpersonal and subjective relational parameters. In a relationships based on trust, control is purely interpersonal and often ‘not done’. Then again, major financial distress cases like Enron, Parmalat or the financial problems of Dutch companies like Ahold and Laurus, would have been prevented if the stakeholder groups would have asked for transparency instead of trusting the managerial decision making beforehand.

*Chain-accounting standard 2: asset management*

The second chain accounting standard we propose refers to management of assets. In a food supply chain, different partners will invest in systems for common purpose (like T&T, ISO, ECR, etc.). From Williamson’s perspective (1983), asset-specific investments occur. Investments in assets that cannot be withdrawn or given another destination without hampering the profitability of individual firms, and eventually of the supply chain as a whole. Common assets (and connected liabilities) eventually produce excess cash flows. If profit measurement is carried out in an economically sensible way, the assets’ value represents the present value of the future cash inflows they generate. As was already argued, the traditional accounting value provides a bad representation of the economic significance of (supply-chain) assets.

The specificity of assets has (mutual) dependence as a consequence. With dependence and unevenly distributed information, trust can replace suspicion on the fair redistribution of excess cash flows. Trust itself can be replaced by (or at least supplemented with) transparency of the redistribution of surpluses that is applied.



**Figure 3.** Asset management

The following chain-accounting standard can be formulated: the provision of assets should be matched with an equivalent amount of assets (cash flow) in return (see Figure 3).

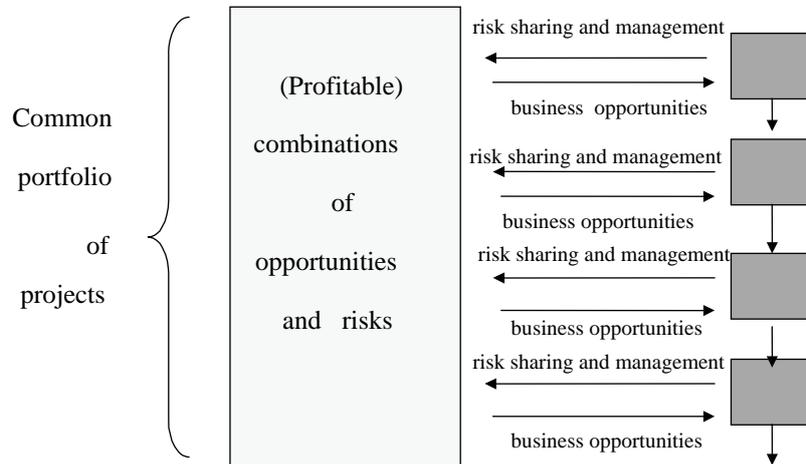
Determine what is 'equivalent' is a complicated issue in this matter. We already indicated that the solution of relational exchange is rejected. From the perspective of relational exchange, trustworthy partners come up with a mutually beneficial and acceptable long-term agreement themselves on the redistribution of excess cash flows. Since trust issues arise here as well, a redistribution system that is quasi-objective is preferred: the market. Pricing of intermediary products in a supply chain can take place at full costs, full costs plus a profit mark-up, at market prices or at marginal costs. The basic pricing rule for intermediate products however is marginal costs plus opportunity costs (also known as Solomons' rule). Under perfect market conditions, the opportunity costs are the difference between the market price and marginal costs (variable costs in proportional situations). Logically, under these circumstances the market price represents the value of the intermediate product.

But with the absence of a market and the existence of a bottleneck in resource availability, the intermediary product price will be the marginal (= variable) costs plus the shadow price of the capacity employed. This could mean that resource shadow prices become zero (which is the case in situations of homogeneous production and abundant supply; not an unfamiliar situation in agriculture). In the latter case, a cooperative supply chain would allow for chain orchestration to guarantee the continuity of all supply-chain processes. The chain-orchestrating firm or body can only safeguard its own continuity, if at least the full costs of production of the marginal companies are paid. In a cooperative supply chain with mutually dependent relations, the long-term continuity of product procurement should be the leading principle for compensation of the supply-chain partners.

#### *Chain-accounting standard 3: portfolio management*

The final accounting standard we wish to propose refers to management of the portfolio of risky projects. A portfolio of supply-chain projects not only creates opportunities for the firms that are involved, but also a diversity of risks. Returns and risks should be in equilibrium: the bigger the opportunities of the single firm, the bigger the contribution to be displayed with respect to risk taking and risk management (Figure 4).

If the market (consumer purchasing power and preferences) is the limiting factor for the level of activity (and profitability) of the supply chain, the retail-companies that control the access to the consumer (and collect the largest part of the opportunities) should be the largest contributor with respect to risk absorption and management. EU legislation is in concordance with this rule: in general, product liability risks downstream the supply chain are bigger than risks upstream. An efficient risk-return trade-off will only take place in markets that operate efficiently. For supply-chain governance this implicates that transparency with respect to supply-chain opportunities and threats should be established. And this exactly is the main task of a viable supply-chain accounting system.



*Figure 4. Portfolio management*

#### INFORMATION PROCESSING AND INNOVATION

Transparency within a supply chain can be brought about using different instruments. The instruments that are available can be classified as personal, social, cultural, technical and legal. In this paper we concentrate on the technical and legal devices.

An empirical study in 2002, performed by Bremmers et al. (2003), focused on the exploration of innovative legal and technical, i.e. informational, devices, to increase the efficiency and effectiveness of data transfer with respect to environmental performance. They sent questionnaires to 2620 companies in the agri-food industry. For the purpose of this paper we selected 92 companies that had a turnover in 2001 of €50 mln or more. The following legal technical devices were evaluated:

- integrated environmental permit for the supply chain as a whole;
- integrated environmental report for the supply chain as a whole;
- electronic environmental reporting.

An environmental permit for the supply chain as a whole was considered a big to tremendous improvement by about 20% of the respondents (N = 92). An integrated environmental report was perceived as a big to tremendous amount of improvement by about 32% of the companies. Electronic environmental reporting was considered a big to tremendous improvement by 39.8% of the companies that were questioned.

This result is favourable for the development of electronic environmental reporting (which was implemented in The Netherlands in 2004), but we consider it

as only one step towards supply-chain transparency. The reason for this is that environmental disclosure reporting still focuses at the single firm and is limited to environmental performance.

### CONCLUSIONS AND SUMMARY

For accounting in supply chains to be effective and efficient, not only technical conditions, like electronic reporting devices, are a prerequisite, but also the availability of (normative) accounting standards. Like all accounting standards, supply-chain accounting standards should mainly come from practice, as well as from theoretical reasoning. In this paper we proposed three accounting standards for cooperative supply chains:

- Reciprocity in information access: those that deliver information to the system should be able to retrieve an equivalent amount. In contrast with centralized and atomic supply chains (in which information is centralized or dispersed, respectively), transparency is best served in cooperative supply chains; they render open access to information concerning supply-chain operations, strategy and results.
- Equivalent cash flows: provision of assets (supply-chain investments) should be matched with an equivalent amount of assets (cash flows) in return.
- Matching risks and returns: the bigger the opportunities for individual firms, the bigger the contribution should be in risk sharing and risk management.

These three rules of reciprocity cause and are an effect of creating a transparent supply-chain policy and performance measurement. Transparency will replace (or at least will have to supplement) *trust* as a measure for relational quality. These three standards are not meant to be exhaustive; other standards should still be developed. We assessed the willingness of system innovations (integrated environmental permit and/or report as well as electronic reporting) for improving the transparency and cooperativeness in supply chains. We found that the devices we proposed are supported by a considerable number of companies. Not only do they improve transparency and cooperative decision making, but they will, if adopted, also reduce the administrative burden of the companies cooperating in supply chains.

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