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## **Internet-based sustainability reporting**

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**Abstract:** The early stages of corporate environmental reporting – in the late 1980's and early 1990's – have been focused on free-standing environmental reports, produced on print media and usually prepared as “one size fits all” universal documents. Using the internet provides an array of benefits and offers a number of capabilities of how to progress in the field, particularly along three dimensions: *integration* of financial and social issues, provision of reports on *various media* and *fine tuning* reports to users' needs and preferences. These trends are pushing the field towards sustainability reporting, based on the internet as a backbone for companies' underlying ICT-infrastructure.

**Keywords:** cross media reporting; customisation; environmental reports; eXtensible Markup Language; Global Reporting Initiative; internet; sustainability reporting; triple bottom line.

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### **1 Introduction**

Since its early incarnations in the late 1980s and early 1990s, corporate environmental reporting is increasingly entering the business mainstream. Within the field, using the internet represents one of the latest and fashionable trends (Cf. [1–9]) and thus environmental online reporting has now become part of companies' daily affairs. Today, a growing number makes use of certain capabilities provided by this computer-based method: Reports, brochures, leaflets, newsletters, slides, presentations, audio sequences, video clips, etc. are available on the WWW, e.g. several documents could be downloaded in Portable Document Format (PDF) and/or are accessible online in HTML (MP3 for

audio and MPG for video), prepared for being pulled or automatically disseminated via e-mail or other push technologies (Cf. [8]).

The cutting edge approach in the rapidly developing field of environmental reporting seems to be *internet-based sustainability reporting*. Such a reporting approach offers a variety of added value creating features compared with early stages. For example, an internet-based sustainability reporting approach provides a set of:

- important *contents* (environmental, financial, social issues and mutual interrelations) that make the pillars by which corporate sustainability is usually described (Cf. [10, pp.9, 10, 19, 49], [11, p.18] and [12, pp.29–41])
- different *media* (print media, internet, CD-ROM etc.)
- corresponding *distributing principles* (push, pull)
- various *presentation styles* (media-specific, target group tailored)
- in technological terms, it is fully supported by an underlying ICT-infrastructure that has its basis in using the *internet*.

The goal of this contribution is to shed more light on the movement from environmental reporting towards sustainability reporting [13], technically based on the internet [14]. Without considering crucially important trends in the field, approaching such a forward-looking concept will probably become quite difficult, as moving away from early stages cannot be performed easily. In any case, current reporting requirements as well as future challenges are rarely to be met without using the internet in a proper way.

To accomplish an ambitious approach needs progressing in current environmental reporting along three dimensions: integration of financial and social issues, provision of reports on various media and fine-tuning reports to users' needs and preferences. According to this goal and scope, the contribution is structured in three major parts, highlighting three key trends in the field:

- First, it is necessary to exceed the rather free-standing nature of available reports when disclosing exclusively environmental issues towards an *integrated* reporting system that comprises also crucial interrelations with financial and social issues – often called 'triple bottom line approach' – probably leading to more balanced reports [15,16].
- Second, there is also need for transcending the narrow focus of producing reports predominantly on print media towards a *cross media* reporting system that offers reports on different media, in various formats and several presentation styles.
- Third, another requirement is fine-tuning reports, which are so far prepared as 'one size fits all' universal documents towards a *customised* reporting system that provides tailored, individualised or even personalised reports on demand, exactly meeting target groups' different information needs and requirements of a number of regulations, recommendations and guidelines.

Although not actually new, a more comprehensive and rather balanced approach of corporate reporting draws our attention immediately; it is intuitively appealing because it may spring from a company's wish for a broader presentation of its business and willingness to disclose its performance in a variety of dimensions. Additionally, the

approach may also be rooted in target groups' demand for a new type of reporting that embraces financial, environmental and social issues as integral parts of a total that discloses a company's integrative performance and perhaps overcomes traditional stand-alone reporting methods.

On the one hand, some may think that moving towards internet-based sustainability reporting is an ambitious task, really worth pursuing. On the other hand, however, some others again are probably more sceptical if such a reporting approach could be meaningful at all, because of its voluntary status, its definitional vagueness, its complexity and growing number of competing frameworks, guidelines and scoring systems proposed [17,18], its lack of generally accepted standards and other missing conceptual consensus (Cf. [19, p.317], [20, pp.13, 14] and [21, pp.8, 9]).

These sceptical comments are well-founded, indeed. They reflect a similar issue with a sceptical note that indicated the inception of environmental reporting: will (internet-based) sustainability reporting be just a new reporting hype, or will it increasingly become good business practice? In response to the challenge by some critics against a concept of (internet-based) sustainability reporting, there may be an array of arguments that integrated reporting supported by the internet is, in fact, acknowledged more and more a meaningful approach. Perhaps, when asking companies about why they are expanding the scope of reporting, they will answer that it works. Also a number of target groups may say that they could reap benefits. Finally, despite some evidence of a deficient status quo [22,23], current practice itself may not be an argument against a concept of (internet-based) sustainability reporting.

Regardless of the perspective from which internet-based sustainability reporting ultimately is seen, it can be described by a developing path towards a concept of balanced reporting, technically based on the internet and providing fine tuned reports on a variety of media [24,25]. As such, it could be seen as an improvement because it will create added value for reporting companies and target groups addressed.

## 2 Three key trends in environmental reporting

Environmental reporting is a multifaceted, rapidly developing field, influencing a company's communication strategy and image profile as well as its organisation, staff and particularly its ICT capabilities. Despite certain difficulties with which the companies are struggling at present, there are – among other developments – three crucial trends facing companies in the near future [26,27]:

- *integration* of financial and social issues into environmental reports
- provision of reports on *various media*
- *fine-tuning* reports according to users' needs and preferences.

Together, these key trends are setting the scene for any forward-looking approach in the field and as such, they are taken as drivers to stimulate companies' efforts by improving their practice and pushing them to moving towards sustainability reporting while using the internet.

### 3 From free-standing environmental reports towards integrated reporting

The first trend highlighted here aims to be moving towards integrated reporting. At the early environmental reporting stages – in the late 1980s and early 1990s – environmental reports were thought of as the primary vehicles or core instruments for environmental communication, addressing a wide range of target groups, produced in many cases as single documents and issued for a certain period of time [28–32]. Companies use these documents for disclosing their environmental performance, often including the following topics: top management statement, management policy and system as well as input–output inventory of environmental impacts of production processes and products (Cf. [11, p.11] and [33, p.15]).

It then became apparent that a very narrow perspective exclusively focused on environmental performance, probably cuts down interrelations with closely linked financial indicators and social aspects. In order to integrate these issues, which are crucially important for sustainability matters, many companies have *broadened the scope* of reports' contents. This is a still ongoing process of gradual integration. For example, the Global Reporting Initiative (GRI) recognised that for a number of companies expanding the scope of reporting, is a rather challenging task requiring the building of resources and expertise when pursuing the achievement of a high standard of quality.

Due to this challenging task, GRI proposed to implementing an incremental approach, illustrated in four simple models (Table 1), from producing an 'environmental report' towards a 'full adoption', finally meeting a fully integrated reporting approach (Cf. [34, pp.74, 75]). The four basic models of the incremental approach may particularly be useful in structuring towards full adoption of the GRI framework, depending on companies' capabilities, stakeholder needs and overall communication strategy.

**Table 1** Incremental approach for achieving fully integrated reporting according to GRI

<i>Model</i>	<i>Description and characteristics</i>
Environmental report	Experience in environmental reporting, but no attention to financial and social issues
Fragmented report	Reporting on environmental performance, but no integration across the three pillars
Limited three-dimensional report	Reporting on one or a few sustainability integration themes Some evidence of integration across the three pillars
Full adoption	Reporting in accordance with GRI guidelines, including full integration

Closely related to the four models, Isenmann and Lenz (Cf. [9, p.183] and [35]) illustrated the benefits of using the internet especially for integrated reporting in terms of a three-step strategy, bearing in mind that integrating environmental, financial and social issues could be interpreted in several ways:

- First, the internet facilitates *incorporation of complementary information* into so far free-standing reports, e.g. incorporation of financial and social issues into environmental reports.
- Second, the internet provides *skilful connection* and *smart cross linking* between stand-alone single environmental, financial and social reports in the sense of a virtual compound document, featured with hyperlinks, perhaps leading to a company's environmental department, stock exchange or rankings. These hyperlinks are employed to assist user's navigation when browsing through such virtual reports, intended to feel always comfortable without 'being lost in cyberspace'.
- Third, the internet keeps companies in a position to provide *customised sustainability reports of a piece*. Perhaps, some target groups may wish to get a short division sustainability report. Some others may prefer a sustainability report in a more detailed fashion, just including two 'dimensions', e.g. financial and environmental issues, while some others again may be interested in a general all-inclusive sustainability report with detailed disclosure of environmental, financial and social interrelations.

The trend for expanding the scope of reporting has a number of reasons and is thus promoted by several drivers, almost to the extent that the concept of sustainability is increasingly recognised as a vital challenge and applied in companies' business entering the 21st century [36]:

- Many employees are environmentally and socially conscious and prefer working for a company that 'feels' the way they do and 'acts' accordingly. Integrated reporting contributes to increase an employee's job satisfaction and loyalty because well-informed employees are less likely to change companies.
- Further, there is a growing sensitivity in the public for the concept of sustainability taken as a whole. This increasing awareness closely linked with the demand for corporate transparency and credibility has compelled many companies to think hard about their 'licence to operate'.
- A number of critical customers tend to discriminate against companies when the expected commitment of these companies towards environmental and social responsibility is missing. Thus, reporting on such matters is at least a reasonable defensive action that companies can do to prevent themselves from being stigmatised as insensitive.
- Moreover, financial analysts, bankers and insurance agencies all want assurance that companies are doing their business well. For example, Dow Jones Sustainability Asset Management, Innovest and the Investor Responsibility Research Center are three of the major influential actors within the financial community that take companies' environmental and social performances explicitly into account, not just business indicators in monetary terms like it is usually done.
- Directly related to the above, institutional investors, such as pension funds and ethically motivated organisations, increasingly expect the companies to disclose their environmental and social responsibility. Recently, Morley – one of UK's largest insurance and pension fund managers – has been urging large companies listed in the London Stock Exchange, to publish environmental reports (Cf. [37, p.11]).

- In response to the growing demand, several companies particularly in the food, beverage, communication, media and finance sectors think that it is important to have good sustainability reputation, (Cf. [38, p.10]) and so they provide additional information, e.g. on the protection of the biosphere, greenhouse gas emissions and ozone depleting gases, biodiversity and reduction of environmental health and safety risks to employees and communities.
- Leading edge companies, global players and multinationals, as well as a growing number of sensitive middle-sized companies may need integrated reports nowadays. Because their range of influence extends across borders, their responsibilities also extend beyond basic compliance with national law and regulations and hence they are going to define their responsibilities on a global scale, often according to the triple bottom line approach.
- A number of governmental initiatives and other institutional programmes elevate sustainability reporting [39], e.g. the European Commission with its ‘green paper’, promoting a European framework for corporate social responsibility [40] and its communication concerning the business contribution to sustainable development [41], the recommendations for communicating corporate social responsibility of CSR Europe [42] as well as the framework and guidance on sustainable development reporting, recently proposed by the World Business Council for Sustainable Development (WBCSD) [43].
- Probably the most forceful project is GRI, a non-governmental international organisation that was launched in 1997 as a joint initiative of the Coalition for Environmentally Responsible Economics (CERES) and the United Nations Environment Programme (UNEP). The goal of GRI is to enhance the quality, rigour and utility of sustainability reporting, particularly by developing globally applicable guidelines. Despite its voluntary nature, by applying the sustainability reporting guidelines (Cf. [34]), GRI has a truly catalysing role for stimulating the inclusion of social and financial performance in environmental reports and vice versa, perhaps finally converting them into sustainability reports. As Morhardt [18, p.32] argued, “its guideline will become the de facto standard for sustainability reporting worldwide” and thus companies “almost cannot avoid meeting the GRI standard in any case” [18, p.38].
- Together, companies’ movements towards integrated reporting are often not driven just by altruism but by self-interest. Some companies, which are going to create a new type of *competitive advantage*, think of integrated reporting as a current way to differentiate themselves, enhancing their success in the marketplace (Cf. [44, pp.10, 11] and [12]). Some others again are rather disappointed when their polished free-standing environmental reports receive little response today. One reason may be the phenomenon that reports are often poorly targeted to the needs that the target groups actually have (Cf. [33, p.16]). Another reason could be the ‘plateau effect’ [45], i.e. the fact that single environmental reports will probably receive much less media attention and public perception than at the early stages because they have become business as usual, even to a certain extent. Hence, companies are thinking about appropriate ways to move from ‘additive reporting’, frequently with limited success, towards integrated reporting, hopefully reaching a greater audience.

Summing up, the early stages of environmental reporting have been focused primarily on companies' environmental issues. Now that more and more companies have committed contributing towards sustainability at large, the future focus will become more comprehensive, i.e. it will be gradually supplemented with financial and social issues. This trend is increasingly referred to as sustainability reporting while asking how environmental issues are closely linked with financial and social ones. Sometimes, this integration is seen in terms of 'making values count' [46], 'linking values with value' [47] or just understood as a matter of combining shareholder value, eco-efficiency and corporate citizenship. In terms of corporate sustainability, all efforts mentioned above recognise the recent rapid increase of interest in sustainability matters, and are also responsive to demand from some of the companies' target groups. This will mean a need to move from free-standing environmental reports towards a more balanced approach, including environmental performance as well as financial and social aspects, and therefore a challenge.

#### **4 From reports solely on print media towards cross media reporting**

The move towards integrated reporting, the first trend, is followed by the move towards cross media reporting, the second trend. In the early years most companies prepared environmental reports in the form of documents solely available on *print media* (Cf. [48, p.40], [49, p.13] and [6, p.7]). More recently, however, with the technological progress in ICT applications and internet technologies in line with their overall penetration in corporate business, as well as increasing access of the public have led to a rapidly growing use of the *internet* as the reporting medium (Cf. [5,8,9]).

Due to emerging ICT-laden capabilities, today many companies produce paper-based reports supplementing – and in some cases replacing – these with electronic versions available on the WWW. Perhaps surprisingly, at present, the print focus is still dominating and even now paper-based reports are predominant vehicles, whereas the internet i.e. electronic versions are frequently viewed as a complementary supplement, still.

Since environmental reporting has become business commonplace and – resulting from this – more sophisticated, companies especially some in environmentally sensitive industries paid growing attention and thus experimented with alternative reporting methods. One consequence of such behaviour is the increasing level of environmental reporting in its different forms. Thus companies are going to provide reports in different *formats*, *presentation styles* and on several *media* (Cf. [50, pp.412, 413] and [51, pp.308, 309]).

For example, Beiersdorf produced its 1996 environmental protection and safety report as a hardback. Closely, AEG called its 2000 environmental report a 'green paper', a tome with a huge collection of environmental statements according to EMAS of about 200 pages. Heidelberg provided its 1999/2000 environmental report in a fashionable hard cover folder with spiral binding and hands on index features. Daimler Benz again produced its 1997 environmental report in the form of a newspaper, whereas EPCOR Group created its 1997 and 1998 environmental reports as small booklets. In addition to reports on print media, some companies provided CD-ROMs, for example, Hoechst 1996 and Swiss Air 1995/1996. Unilever produced its 2000 environmental performance report

as a digidisc, a smart CD-ROM in the form of a business card. Henkel's CD-ROM 2000 – which is called eco communication 6 – again contains a considerable collection of publications, including milestones in eco management and several other documents. As a supplementing source to the environmental report, Merck produced a more entertaining CD-ROM in 1999, providing a mix of infotainment, ecotainment and emotainment, available in two languages. The contents can be updated via internet, including sound and hypermedia features.

Despite the fact that some companies produced environmental reports in different forms in print media and although a small number of companies have distributed electronic reports on CD-ROMs, the rapidly emerging medium through which these environmental reports are more and more disclosed and on which a growing number is available on the *internet*, particularly the WWW, one of the most common internet services. Confirming this trend, Jones and Walton clearly made the point [50, pp.416, 417]: “Whatever the nature of the current debate, it is evident that the internet is becoming an increasingly popular medium for companies to communicate their environmental reports”. Moreover, borrowed from Sustain Ability and UNEP [6, pp.20, 21], closely [50, p.425], the internet is seen an ‘indispensable tool’ to pass premature reporting stages, providing environmental reports solely on print media towards approaching an integrated reporting system, producing reports *cross media*, i.e. to make these available on different media, truly meeting users’ needs and preferences for accessing information.

The rationale why more and more companies are using the internet as a reporting ‘enabler’ or ‘facilitator’ can be seen in its *unique capabilities* provided by this computer-based medium (Table 2). Compared with traditional media the internet embraces a broader range of beneficial characteristics which are vital for current environmental communication (Cf. [50, pp.413, 414]).

**Table 2** Comparison of media used for environmental communication [50, p.414]

<i>Media</i>	<i>Capabilities</i>				
	<i>Text</i>	<i>Still image</i>	<i>Moving image</i>	<i>Sound</i>	<i>Interaction</i>
Print	✓	✓			Simulated
Tax	✓	✓			Simulated
Audio/Tape				✓	Simulated
Phone				✓	✓
Video		✓	✓	✓	Simulated
Video conferencing		✓	✓	✓	✓
PC disk	✓	✓			Simulated
CD-ROM	✓	✓	✓	✓	Simulated
Internet	✓	✓	✓	✓	✓



In pursuing to gain greater conceptual clarity on using the internet, Isenmann and Lenz [9] proposed a *generic classification framework*, arranging its overall usefulness in terms of reporting along four categories:

- first, benefits concerning the underlying *purposes* of reporting, e.g. disclosing performance, improving efficiency, polishing reputation, improving image and engaging employees
- second, benefits concerning certain reporting *processes*, e.g. in terms of automation, efficient production and multiple-utilisation of contents
- third, benefits concerning the report *contents*, e.g. retrieval, tailored views, personalised reports on demand
- fourth, benefits concerning the report *design*, e.g. online/offline availability, navigation, hypermedia features, interactivity and dialogue.

Despite its unique capabilities (Table 2) and wide range of technical benefits mentioned above, the internet, however, is often seen as yet another channel for dissemination [52], frequently used as a platform with public access just for providing reports that are available as PDF files [53]. Today, many environmental reports put on the internet still have a clear print media focus, representing mere electronic duplicates of hard copy reports in print media. In the words of Elkington and Priddey [3, p.52], a number of companies “seem to have got stuck in the rut of thinking in terms of the printed page”. In a number of cases, e.g. the 1996 environmental report of RheinLand Versicherungen, the 1999 environmental report of Bayerische Landesbank, the 2000 environmental statement of Badische Stahlwerke and the 2000 sustainability report of Dresdner Bank, one can see this through the note ‘printed on recycling paper’. Further, a number of reports initially prepared for hard copy are then translated by external multimedia agencies or internet services companies into HyperText Markup Language (HTML), the common formatting language used by the WWW, and then directly transferred to the internet [54]. This orthodox reporting practice is confirmed through empirical findings:

- Based on an exploratory survey, a total of 121 environmental reports available on the internet in Germany, in 2000, were analysed (Cf. [9, pp.195–197]). This survey was carried out by the Department of Business Information Systems and Operations Research at the Kaiserslautern University of Technology, Germany. The goal was to evaluate environmental reports on the internet according to its technical standards and concerning the extent to which its specific benefits have already been exploited. In line with an underlying classification framework highlighting three methods prototypical for internet use (Table 3), it was found that most of the reports can be called ‘converted’, i.e. using the internet merely for presentation; a number of reports can be assigned as ‘enriched’, i.e. using the internet additionally as a channel for distribution; but of the reports analysed, surprisingly, no report can be called fully ‘integrated’, i.e. using the whole potential of this computer-based medium.

**Table 3** Classification of environmental reports on the internet, proposed by Isenmann and Lenz [8, pp.195–197]

<i>Method of internet use</i>	<i>Description and characteristics</i>
Converted	<ul style="list-style-type: none"> <li>• Duplication of a paper based report</li> <li>• converted in an electronic version</li> <li>• available offline as download (PDF, RTF) or online when translated into HTML</li> </ul>
Enriched	<ul style="list-style-type: none"> <li>• Electronic version</li> <li>• still with print media focus</li> <li>• translated into HTML and online available</li> <li>• supplemented by a few nice multimedia features</li> </ul>
Integrated	<ul style="list-style-type: none"> <li>• Computer-based report</li> <li>• full potential of opportunities is exploited</li> <li>• cross media focus</li> <li>• perhaps stored as XML-file</li> <li>• featured with multiple linking and complex hypertext structure</li> </ul>

- Closely linked to the insights above, there is another empirical analysis of how the internet is currently used for environmental reporting, carried out by ACCA (Cf. [55, pp.10–13]). This analysis was based on two samples: first, 240 companies within the UK, EURO and Global FTSE 100 Indexes have been surveyed; second, 42 UK FTSE 100 companies producing electronic reports in 2001 have been analysed. Three distinct ways of using the internet were found. These are called ‘piggy-back’, ‘integrated’ and ‘stand-alone’ (Table 4).

**Table 4** Classification of environmental reports on the internet, proposed by ACCA [56]

<i>Method of internet use</i>	<i>Description and characteristics</i>
Piggy-back	Paper-based report, hosted within the company’s website in PDF
Integrated	<ul style="list-style-type: none"> <li>• Short hard-copy summary report, with references to the URLs where further information can be found</li> <li>• The ‘piggy-back’ approach is used, but the HTML version has certain additional features incorporated</li> </ul>
Stand-alone	No hard-copy report, solely on the internet

To conclude, despite some diversity in detail and though the terms used are different, both analyses demonstrate that there are substantial differences between current environmental reports available on the internet and also as to how to make use of the internet taken as a whole; should it be used primarily as a means of presentation, a channel for distribution or performance of the reporting processes. When analysing such environmental reports on the internet in the context of its technical benefits, it could

be helpful to use such classifications, perhaps providing a basic tool: first, from a reporting company's perspective, for developing a clear strategy concerning internet-based environmental reporting, probably for moving away from 'converted' environmental reports towards 'enriched' or fully 'integrated' ones; second, from a benchmarking institution's point of view, for rating and ranking reports in terms of internet-specific features.

On the basis of the above insights, one may ask if it is sufficient that environmental reports should still be directly translated and then transferred to the internet without creating any added value. An increasing number of target groups, probably, will no longer be satisfied when provided solely with reports in print media or mere electronic duplicates of it. Professional users in the financial community, especially, financial analysts, investment consultants, brokers, private and institutional investors, banks, and insurance companies, as well as raters and benchmarkers, need updated and fine tuned environmental reports, preferably available online [57,58] and specifically prepared for machine processing without any need to capture the data in an electronic form once again. Such a scenario may not be irrelevant or meaningless at all. On the contrary, this could make good business and environmental sense because of two main reasons: first, environmental reporting is becoming increasingly relevant for decision making in this field (Cf. [59–61]); and second, companies' receiving multiple inquiries from a variety of target groups is really a time-consuming and costly exercise [62]. Rather than endure these procedures, companies are recognising the value of having a readily available tool for providing the information needed.

Internet-based applications will almost certainly be implemented in pioneering companies, very soon in the near future. Verie Sandborg, Baxter's manager of environmental health and safety requirements, views a good environmental or sustainability report as an excellent source for responding to formalised requests for environmental or sustainability issues [63]. Many of the queries have already been answered in meaningful reports. Hence, it would be helpful to have a fully internet-based reporting system: Users could then extract the information they need from a publishing database, they could create reports themselves, i.e. users could generate their own 'reports à la carte' exactly meeting information needs, just selecting with keywords, clicking on preferences on a menu or choosing a certain guideline – perhaps creating a sustainability report in accordance with the GRI-guidelines at one's fingertip – and the report is generated 'on the fly' by the system in an automated manner (Cf. [35, p.337] and [64, pp.177–203]).

Together, it is *cross media* reporting that seems to be needed now, preferably based on the internet [65]. Such a system enables companies to provide environmental reports and other communication vehicles on a single source, be it a common database or another kind of repository. Consequently, the question should not be how to translate a hard copy report with its strict print media focus to other media. Instead, the question should be how to create a cross media reporting system that comprises relevant content to produce different reporting instruments on various media on demand.

In technical terms, such a system is called (web) *content management system* [66,67], appropriate for performing *single source multiple media publishing* (Cf. [68]). A content management system allows content to be stored, retrieved, edited, updated, controlled and then output cross media in a variety of ways. It usually includes database, workflow and editorial tools. As a result, the report content has to be structured in small modules or substantial entities – in terms of computer scientists these are called semantic

components – and stored in a suitable data format e.g. XML [69,70]. XML has already proved its usefulness for providing fine tuned environmental reports on different devices and various media (Cf. [71,72]). Borrowing the words of Jones and Walton [50, p.416, with own emphasis], it can be stated that according to the second trend there is a need to define an environmental reporting system “that develops environmental disclosures in a *holistic* manner in *all* media”.

In contrast to a monolithic recommendation either for print media or computer-based media, arguments are in favour of a cross media reporting system that rests on an underlying ICT-infrastructure, and rather based on the internet and using the benefits of XML, supporting the whole reporting workflow. Such an approach keeps companies in a position to provide environmental reports and other communication vehicles on a variety of media, based on a single data source that serves as a shared publishing basis. Bearing this in mind, it is not going to be a case of either print media or computer-based media, respectively, of either paper-based reports or internet-based ones, but of both [73].

## 5 From ‘one size fits all’ reports towards customised reporting

In addition to the former developments towards integrated and cross media reporting, the third trend is referred to as a movement away from ‘one size fits all’ reports towards a more tailored approach. For customised environmental reporting it is characteristic to take into account requirements of several standards, guidelines and different needs of a number of users and then to produce reports exactly meeting all these requirements and needs. There is great consensus that such customisation or target group tailoring is vital for any success of environmental reporting [74–77]. In contrast to its wide acceptance in reporting frameworks, concepts and guidelines, however, current practice shows another picture, with significant room for improvements, even for the best reporters. To sum up, customised reporting and provision of fine tuned environmental reports still remain largely *unrealised*, though it is a challenging requirement, presently lacking but perhaps manageable in the near future.

Throwing more light onto methods of customised reporting is argued to be a real step forward on the way towards sustainability reporting. Hence, customisation should be seen as an integral part of companies’ efforts to improve current practice and finally approach advanced reporting stages. Customisation, however, is not as simple a process as it may appear at first glance. On the contrary, such an enterprise represents a challenging and multifaceted problem requiring both, identification of relevant target groups and clarification of their certain needs, and also a pool of report contents companies are willing to disclose, preferably arranged in a specific structure appropriate for automated machine processing through ICT-applications (Cf. [78] and paper by Amelung and Marx-Gómez in this issue).

Consistent with analyses and empirical findings carried out, mostly it is a clear target group tailoring, which is lacking in the current practice still. This is true for environmental reports on print media as well as on computer-based media (Cf. [8,9,38,72]). In the majority of environmental reports, usually a variety of target groups are addressed, but their specific information needs are rather heterogeneous (Table 5) and thus these needs cannot be fully satisfied through an orthodox practice or can easily be met just by ‘business as usual’ via one universal document (on print media), mostly produced as ‘one size fits all’ report.



Employees, customers, suppliers, local authorities, legislators, neighbours, consultants, financial analysts, investors, insurance agents, media representatives and raters and benchmarkers that are identified as key addressees need more and more target group tailored, individualised or even personalised reporting instruments. This is also true for companies' top managers who hold exceptional positions, for local authorities who claim a specific right to know and also for banks and insurers who require confidential information. Moreover, distribution channels and design preferences may differ [81]. Together, all the above users expect that companies' reports truly address their real needs.

For example, *employees* are interested in environmental performance of their employers and companies. In supply chains and other manufacturing networks, *suppliers* have to exchange environmental information with participating *business partners*, especially in terms of extended product stewardship and other environmental liabilities (Cf. [82]). *Investors*, financial analysts and investment consultants are increasingly interested in environmental issues and its financial interrelations, since they expect that environmental performance influences financial performance and shareholder value (Cf. [83]).

Publishing merely one (paper-based) environmental report – mostly prepared as 'one size fits all' document – shows significant shortcomings in each case, because via a single uniformed vehicle it is rather difficult to meet heterogeneous information needs and individual preferences (Cf. [80]). As a result of this complexity, producing one (paper-based) environmental report actually means to make compromises. A 'report designed to appeal to everybody may end up serving nobody's real needs' [10, p.6]. However, it is very laborious – and probably expensive too – producing a great number of tailored reports on print media through an orthodox practice, because companies are usually addressing a variety of target groups. The former limits are closely linked with difficulties involved in using print media for communication for which they are often poorly suited. In the words of Mach:

“An organization needs to send the right messages through the right distribution channels to the right audiences. To accomplish this, it may need a variety of communications vehicles – not just a single report. One size doesn't fit all in today's Internet world of mass customization.” [84,85]

Approaching customisation and providing fine tuned environmental reports, companies may use the internet as an excellent means while reaping the benefits of XML (Cf. [72]). These tools provide several unique capabilities, e.g. the benefits to employ push and pull technologies for efficient information supply, rapid and cost-saving distribution and provision for updated data and tailored information on demand [86,87]. Initially, the internet was designed as a pull technology, indicating that users 'pull' the information they need from a company's website using the WWW, i.e. they 'pull' a certain website from a server to their local client browser. Users 'surfing' or 'browsing' on the internet are then seen in an active role. The *push* principle again illustrates that reporting companies 'push' information to a wide audience through certain distribution channels, perhaps via e-mail, newsletter, WWW and a number of newer technologies.

In a more detailed fashion, a customised environmental reporting system based on the internet could be realised through three different approaches:

- The first approach is called *stereotyping*, a basic method of customisation employing standard user-profiles. These profiles record information needs that are thought of as characteristic for a specific group of users – e.g. illustrated in the columns in Table 5. Stereotypes are usually based on an analysis of empirical studies and then refined for a certain company via questionnaires and interviews with its key target groups. Using stereotypes, a customised environmental reporting system provides different, but frequently static views on a report, perhaps dependent on a certain target group, users are assigned to. For example, employees probably have a different view on a report compared to the perspective customers will usually take, and thus a company may prepare a set of tailored reports, particularly highlighting the information that the company expects will be actually meeting the needs of the group primarily addressed. A number of users may prefer this way: They are provided with a pre-selected report, probably meeting their needs and likely fitting to their preferences.
- One step beyond, the second method of customisation is described as *individualisation*. Through this more sophisticated method, users are able to create their own reports, they start becoming ‘reporters’ themselves by just selecting the information they need, either according to their current preferences or in line with a certain guideline. Individualisation offers more interactivity. Tailored reports that users request for, however, have to be produced dynamically through a (web) content management system. In order to manage its administration well, it is helpful to employ user-profiles. These profiles record users’ preferences, perhaps regarding the target group (data view), density (status), media (kind of data), breadth (topical selection), depth (specification), time (timeliness and date of availability) and form (style, layout, format) that the report is to be prepared.
- The third method, by which customisation can be realised is termed as *personalisation*. Personalisation is seen as the most sophisticated approach because it can record personal data in addition, according to the users’ preferences. Recording any personal data, e.g. name, address etc., however, is a really sensitive issue that needs to be treated very carefully for preventing misuse. For this reason, any procedure of recording personal data should be voluntary, reversible and made transparent to any user. Further, its employment should be strictly limited for fine-tuning communication vehicles. Realising personalisation mirrors an early stated insight in the field when the focus in environmental reporting is on reaching target groups addressed [48, p.40]: “The choice of audience will directly affect the presentation of information, its tone, sophistication, emphasis, etc.”

To a point, customisation seems to be very useful for reporting companies and target groups addressed. From a company’s perspective, customisation is an opportunity to extend reporting success and multiply the number of actually reached target groups; from a target group’s point of view, customisation is seen as a requirement for truly meeting their needs and thus tracking companies’ performance over time. A considerable approach of customised environmental reporting may be BP’s data desk [88]. It offers

various ways to tailored access and fine-tuned environmental information, linked with financial and social issues within BP's websites. Users can take a specific view and create their website for their specific needs.

Another feature probably important for customised environmental reporting based on the internet is its capability to gain deeper insights of users' information needs and preferences. This can be performed directly through online analyses or indirectly by observing users' pattern via web mining tools. Today, such tools are standard features of current web servers [89].

Summing up, the early incarnations that are described in terms of 'one size fits all' reports have served their purpose well in the preceding years because they helped to communicate companies' environmental performance to a wide range of target groups. Too detailed or too fragmented reports could have stifled interested companies from establishing environmental reporting as a common business practice. In the future, however, further improvement and an increasing demand for different views will call for true customisation, not just piecemeal engineering if it is to achieve an advanced reporting stage. As such, it requires taking different needs of different users into account and providing tailored, individualised or even personalised reports on demand. Customised environmental reporting, linked with a balanced integrated approach and cross media availability will become crucial as more companies produce reports and claim to provide useful information on environmental and sustainability issues for a variety of target groups.

Although environmental reporting serves a wide range of purposes and despite the fact that companies are targeting a diverse group of key users, most of them may emphasise the importance of three trends mentioned above, i.e.: first, providing a set of contents target groups expect, including environmental issues as well as its financial and social counterparts, leading to a more integrated approach; second, cross media reporting seen as producing vehicles on various media in order to reach target groups addressed through the channels they actually prefer; third, customised reporting understood as finding out ways what users want and expect to see in the reports. Together, these key trends are taken as drivers to stimulate companies' efforts, thus improving their practice and pushing them to move towards sustainability reporting, based on the internet.

## **6 Conclusions**

The three key trends clearly illustrate that environmental reporting rapidly evolves or has already developed towards sustainability reporting, to a certain extent. While the early stages of the field have been focused primarily on single, free-standing environmental reports, predominantly produced on print media and usually prepared as 'one size fits all' universal documents, in future, as companies learn their lessons and practice matures, the focus will become cross media, customised and more comprehensive, thus disclosing how environmental issues are linked to financial and social aspects, probably concurring with the triple bottom line approach and finally leading to sustainability reporting.



This developing path recognises the general interest in sustainability issues and the increasing need for accessing fine-tuned environmental reports on a variety of media. In terms of corporate sustainability, it is in response to demand from certain target groups, e.g. critical investors, pension funds and financial analysts who are now going to request business behaviour in line with the triple bottom line approach. This will mean a need to report not only on financial aspects of performance but also on environmental and social ones.

In total, the goal of this contribution was to shed more light on moving away from early environmental reporting stages towards an internet-based sustainability reporting approach, bringing to the surface tacit opportunities and benefits using the internet as a reporting backbone while developing from a status quo with significant room for improvements towards integrated, cross media and customised reporting. Approaching such an advanced reporting approach will improve the way in which companies give information, communicate and manage their business internally and externally, certainly to the benefit of all members involved or affected by environmental reporting, be they companies, employees, local communities, investors, customers or other target groups, stakeholders or interested parties addressed like raters, environmental pressure groups and benchmarking organisations.

For companies not yet providing some kind of sustainability reports or not yet using the internet properly, it is probably time to consider doing so. For most companies a good first step is just a matter of being aware. For some companies internet use for advanced environmental reporting might seem purely a smart accessory, a nice extra or just a buzzword compared to orthodox environmental reporting practice focused on print media. The idea of internet-based reporting, however, is its unique capabilities and its benefits on the whole, which elevate it beyond the status of a mere buzzword. Internet technologies and services, employed with XML and performed through a (web) content management system can do more than only offer new channels for distribution or presentation. Finally, they are going to spur a *shift* towards efficient, hypermedia featured, interactive and dialogue-oriented reporting.

Together, the internet is seen as a powerful means of supporting the workflow of environmental reporting on the whole, from preparation and administration to distribution and presentation. Sensing that traditional environmental reporting might be limited, companies are considering how to improve their practice and the use of environmental reports in general. With this in mind, one major challenge for companies seems to be using the internet in a proper manner. Internet-based reporting will facilitate to moving away from early environmental reporting stages towards sustainability reporting seen as a forward-looking approach, including integration, cross media availability and customisation.

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## References and Notes

- 1 Kerkhoven, J. and Nelson, S.B. (1994) *Electronic Environmental Reporting. The Internet and Corporate Environmental Accountability*, <<http://www.communicopia.bc.ca/library/emar&WWW.cfm>>, © and last update 1994, access 2000-01-11.
- 2 Ollier, A. (1996) *Corporate Environmental Reporting on the Internet. Environmental Issues in Visual Communications Design*, Workshop Proceedings 27th March 1996, London (UK).
- 3 Elkington, J. and Priddey, C. (1997): *The CER Report. Next: The Paperless Report*, Tomorrow (May–June), pp.52–56.
- 4 Charter, M. (1998) *Electronic environmental reporting (EER)*, The Centre for Sustainable Design. Surrey (UK), <<http://WWW.csfd.org.uk/eer/indey.htm>>, © 1998, access 2000-02-07.
- 5 Jones, K., Alabaster, T. and Hetherington, K. (1999) ‘Internet-based environmental reporting. current trends’, *Greener Management International*, Vol. 26(summer), pp.69–90.
- 6 SustainAbility Ltd., United Nations Environmental Programme (UNEP) Technology, Industry and Economics Division (1999) *Engaging Stakeholders 1999. The Internet Reporting Report*, Beacon Press, London (UK).
- 7 Wheeler, D. and Elkington, J. (2001) ‘The end of the corporate environmental report? Or the advent of cybernetic sustainability reporting and communication’, *Business Strategy and the Environment*, Vol. 10, No. 1, pp.1–14.
- 8 Isenmann, R. and Lenz, C. (2001) ‘Customized corporate environmental reporting by internet-based push- and pull-technologies’, *Eco-Management and Auditing*, Vol. 8, No. 2, pp.100–110.
- 9 Isenmann, R. and Lenz, C. (2002) ‘Internet use for corporate environmental reporting: Current challenges – technical benefits – practical guidance’, *Business Strategy and the Environment*, Vol. 11, No. 3, pp.181–202.
- 10 Deloitte Touche Tohmatsu International (DTTI), International Institute for Sustainable Development (IISD), SustainAbility Ltd. (1993) *Coming clean – Corporate Environmental Reporting, Opening up for Sustainable Development*, DTTI, London (UK).
- 11 United Nations Environmental Programme (UNEP) SustainAbility Ltd. (1994) *Company Environmental Reporting. A Measure of the Progress of Business & Industry Towards Sustainable Development*, Technical report 24, Paris (France).
- 12 Institut für ökologische Wirtschaftsforschung (IÖW) imug – Institut für Markt – Umwelt – Gesellschaft (2001) *The INEM Sustainability Reporting Guide – A Manual on Practical and Convincing Communication for Future-Oriented Companies*, International Network for Environmental Management (INEM), Hamburg (Germany).
- 13 ‘Sustainability reporting’ and ‘sustainable companies’ are not the same, regardless how sustainability is defined. The production of sustainability reports does *not* imply that reporting companies are sustainable, but it *tells* us that a company has *recognised* the challenge as a part of its business.
- 14 The internet stands for a global computer network, based on a set of information and communication technologies (ICT) and services. Basic internet *technologies* include client-server-architecture, technical protocols resp. standard interfaces (TCP/IP) and hypermedia. These technologies provide several internet *services* such as WWW, e-mail and *markup languages*.
- 15 Kaptein and Wempe [16, p.7] understand sustainable development applied to companies as performing business while systematically linking *economic, environmental and social* issues (triple bottom line).
- 16 Kaptein, M. and Wempe, J. (1999) *Sustainability management: Balancing and integrating economic, social and environmental responsibilities*, Management report no. 51-1999, Erasmus Universiteit Rotterdam (The Netherlands).

- 17 For different scoring systems cf. [18, pp.161–169].
- 18 Morhardt, E.J. (2002) *Clean, Green, and Read all Over. Ten Rules for Effective Corporate Environmental and Sustainability Reporting*, ASQ Quality Press, Milwaukee (USA).
- 19 Adams, R., Houldin, M. and Slomp, S. (1999) 'Towards a generally accepted framework for environmental reporting', in Bennett, M. and James, P. (Eds.): *Sustainable Measures. Evaluation and Reporting of Environmental and Social Performance*, Greenleaf Publishing, Sheffield (UK), pp.314–329.
- 20 Fédération des Experts Compatibles Européens (FEE) (2002) *FEE Discussion Paper Providing Assurance on Sustainability Reports*, FEE, Brussels (Belgium).
- 21 Lange, C., Ahsen von, A. and Daldrup, H. (2001) *Umweltschutzreporting. Umwelterklärungen und –berichte als Module eines Reportingsystems*, Oldenbourg, München (Germany), Wien (Austria).
- 22 Gröner [23] found that companies are still at a premature stage in reporting on sustainability issues.
- 23 Gröner, S. (2000) *Umweltberichterstattung für eine nachhaltige Entwicklung – eine theoretische und empirische Analyse*, Shaker, Aachen (Germany).
- 24 It is one of the early stated goals that environmental reporting will develop towards sustainability reporting, or at least that sustainability issues should be an integral part of it. (Cf. [10, p.1] and [25].
- 25 United Nations Environmental Programme (UNEP) Technology, Industry and Economics Division (2001) *Environmental Management Tools*, <<http://www.unep.org/pc/pc/tools/reporting.htm>>, access 2003-03-04.
- 26 The three developments highlighted here are the essence of a comprehensive analysis carried out by Isenmann *et al.* [27].
- 27 Isenmann, R., Lenz, C. and Müller-Merbach, H. (2002) 'The future of corporate environmental communication. Trends, contents, media, technologies', in Pillmann, W. and Tochtermann, K. (Eds.): *Environmental Communication in the Information Society*, International Society for Environmental Protection, Vienna (Austria), pp.234–241.
- 28 Cf. Herremans *et al.* [29, p.158] and [30, p.44]. The variety of vehicles used by companies for communicating environmental issues is described by Brophy and Starkey [31] and Mesterharm [32, pp.555–565].
- 29 Herremans, I.M., Welsh, C., Kane, D. and Bott, R. (1999) 'How an environmental report can help a company 'learn' about its own environmental performance', *Business Strategy and the Environment*, Vol. 6, No. 4, pp.155–169.
- 30 Fichter, K. (1998) *Umweltkommunikation und Wettbewerbsfähigkeit. Wettbewerbstheorien im Lichte empirischer Ergebnisse zur Umweltberichterstattung von Unternehmen*, Metropolis, Marburg (Germany).
- 31 Brophy, M. and Starkey, R. (1996) 'Environmental reporting', in Welford, R. (Ed.): *Corporate Environmental Management. Systems and Strategies*, Earthscan, London (UK), pp.177–198.
- 32 Mesterharm, M. (2001) *Integrierte Umweltkommunikation von Unternehmen. Theoretische Grundlagen und empirische Analyse der Umweltkommunikation am Beispiel der Automobilindustrie*, Metropolis, Marburg (Germany).
- 33 Lober, D.J. (1997) 'What makes environmental reports effective: current trends in corporate reporting', *Corporate Environmental Strategy*, Vol. 4, No. 2, pp.15–24.
- 34 Global Reporting Initiative (GRI) (2002) *Sustainability Reporting Guidelines*, GRI, Boston (USA).

- 35 Isenmann, R., Lenz, C., Reitz, C. and Müller-Merbach, H. (2001) 'Nachhaltigkeitsberichterstattung. Internet als Medium zur Integration der Geschäfts- und Umweltberichterstattung von Unternehmen', in Buhl, H.U., Huther, A. and Reitwiesner, B. (Eds.): *Information Age Economy. Innovations, Methods and Applications for Electronic Commerce*, Physica, Heidelberg (Germany), pp.817–830.
- 36 [16, pp.42–49] and [18, pp.3–26] presented a number of reasons and drivers for sustainability reporting.
- 37 Morley Fund Management (2001) *Corporate Governance and Voting Policy 2001*, Morley Fund Management, London (UK).
- 38 KPMG (2002) *International Survey of Corporate Sustainability Reporting 2002*, Research carried out by Kolk, A. and van der Veen, M. Amsterdam graduate Business School, University of Amsterdam, in collaboration with KPMG Global Sustainability Services, KPMG, De Meern (The Netherlands).
- 39 For an overview cf. [18, pp.27–38] and [38, pp.31, 32].
- 40 Commission of the European Communities (COM) (2001) *Green Paper. Promoting a European Framework for Corporate Social Responsibility*, 366 final, Brussels (Belgium) 2001-07-18.
- 41 Commission of the European Communities (COM) (2002) *Communication from the Commission Concerning Corporate Social Responsibility: A Business Contribution to Sustainable Development*, 347 final, Brussels (Belgium) 2002-07-02.
- 42 Corporate Social Responsibility (CSR) Europe (2000) *Communicating Corporate Social Responsibility. Transparency, Reporting and Accountability. Recommendations for CSR Reporting*, CSR Europe, Brussels (Belgium).
- 43 World Business Council for Sustainable Development (WBCSD) (2003) *Sustainable Development Reporting. Striking the Balance*, WBCSD, Geneva (Switzerland).
- 44 Andrews, O. (2002) 'Getting started on sustainability reporting', *Environmental Quality Management*, Vol. 2 (spring), pp.3–11.
- 45 Wheeler and Elkington [7, p.5] and closely [10, p.9] anticipated that the "honeymoon period, in which early reports were welcomed more for the fact that they had been produced than because of what they said, will soon be over."
- 46 The Association of Chartered Certified Accountants (ACCA) (1998) *Making Values Count: Contemporary Experience in Social and Ethical Accounting, Auditing, and Reporting*, The Certified Accountants Educational Trust, London (UK).
- 47 KPMG (2000) *Beyond the Numbers: How Leading Organisations are Linking Values with Value to Gain Competitive Advantage*, KPMG's Assurance & Advisory Services Center (AASC), KPMG (Switzerland).
- 48 The Canadian Institute of Chartered Accountants (CICA) (1994) *Reporting on Environmental Reporting*, Carried out in association with Canadian Standards Association, Financial Executives Institute Canada and International Institute for Sustainable Development (IISD). Toronto (Canada).
- 49 The Association of Chartered Certified Accountants (ACCA) (2001) *An introduction to environmental reporting*, ACCA, London, UK.
- 50 Jones, K. and Walton, J. (1999) 'Internet-based environmental reporting. Key components', in Bennett, M. and James, P. (Eds.): *Sustainable Measures. Evaluation and Reporting of Environmental and Social Performance*, Greenleaf Publishing, Sheffield (UK), pp.412–425.
- 51 Shepherd, K., Abkowitz, M., and Cohen, M.A. (2001) 'Online corporate environmental reporting: improvements and innovation to enhance stakeholder value'. *Corporate Environmental Strategy*, Vol. 8, No. 4, pp.307–315.
- 52 Lober [33, pp.15, 17, 18] views the internet primarily as a distribution channel.

- 53 PDF is a document format, primarily used for reproducing hard copy reports and other documents on the internet. A report stored as PDF file retain design, layout and formatting features and thus has exactly the same appearance as the underlying hard copy document. Although PDF is an offline-document format that could be downloaded, such a file can also incorporate some interactive features of a website, for example hyperlinks. These opportunities have made PDF the format of popular choice for electronically distributing reports although produced with a clear print focus. PDF can be opened, viewed and printed via Acrobat Reader, a freely available software tool. Miele's 1999 environmental statement as well as Cherry's 1998 environmental statement clearly demonstrate that PDFs incorporating well-designed hyperlinks could be in fact a suitable and cost-saving alternative, particularly for small and medium sized companies.
- 54 HTML is the most common formatting language, used to design webpages whose content appears on linked pages and which are performed via hyperlinks. Today, the majority of websites may be formatted in HTML.
- 55 The Association of Chartered Certified Accountants (ACCA) (2001b) *Environmental, Social and Sustainability Reporting on the World Wide Web: A Guide to Best Practise*, The Certified Accountants Educational Trust, London (UK).
- 56 This classification follows ACCA [55, p.13].
- 57 Gassen [58] observed a really interesting phenomenon: Due to increasing internet use in the field of financial reporting, he analysed impacts that reports' data format will have on user-friendliness and quality assessment. More precisely, he tested, whether a report should be provided exclusively offline as PDF file or if it would be more useful disclosing reports' content online via HTML. Maybe surprisingly, the results strongly demonstrate that HTML was clearly preferred, for example in terms of time needed to answer certain questions, smaller data transfer, correctness of data users are searching and usability. Perhaps, the findings are in contrast to insights of the early stages of environmental reporting when PDF is thought of a fairly proper and cost-saving format used for environmental reports available on the internet. Further, for companies starting with a paper based report – as many still do – producing PDFs can be a first step to provide reports on the internet because this could be performed with little effort without reengineering the reporting workflow.
- 58 Gassen, J. (2001) Internetbasierte deutsche Jahresabschlusspublizität. Eine experimentelle Analyse der HTML- vs. PDF-Entscheidung, *Die Betriebswirtschaft*, Vol. 61, No. 4, pp. 409–426.
- 59 Axelrod, R.A. (2000) 'Brave new words: the financial value of environmental communications', *Environmental Quality Management*, Vol. 9, No. 4, pp.1–11.
- 60 Edwards, D. (1998) *Andersen Consulting: The Link between Company Environmental and Financial Performance*, Earthscan, London (UK).
- 61 Müller, K., de Frutos, J., Schüssler, K-U., Haarbosch, H. and Randel, M. (1996) *Eco-Efficiency and Financial Analysis*, European Federation of Financial Analysts' Society, Basel (Switzerland).
- 62 The beneficial role environmental and sustainability reports probably are playing in investor relations is outlined by Axelrod [59, pp.4, 5].
- 63 Sandborg's statement is borrowed from Axelrod [59, p.5].
- 64 Marx-Gómez, J. and Rautenstrauch, C. (Eds.) (2001) *Von der Ökobilanzierung bis zur automatisierten Umweltberichterstattung mit Stoffstrommanagementsystemen – eine Fallstudie*, Shaker, Aachen (Germany).
- 65 Cf. Henkel's variety of instruments, including special interest papers, CD-ROM, site reports, open house events, sustainability ratings, reports, direct dialogue, internet platform, consumer information, press releases and other vehicles relevant within this field: [http://www.she.henkel.com/com/html/content/main\\_05-01.htm](http://www.she.henkel.com/com/html/content/main_05-01.htm), access 2003-03-13.
- 66 For an introduction cf. [67].

- 67 Kartchner, C. (1998) 'Content management systems: getting from concepts to reality', *Journal of Electronic Publishing*, Vol. 3, No. 4, <http://www.press.umich.edu/jep/03-04/kartchner.html>, access 2003-01-18.
- 68 Schoop, E. and Gersdorf, R. (2001) 'Content Management für single source multiple media and multiple usage publishing', *Wirtschaftswissenschaftliches Studium*, Vol. 30, No. 7, pp.991–998.
- 69 XML is a promising formatting language, providing a standardised, platform-independent format that could be used in many ways for structuring data and documents. Used for environmental reporting, it may be appropriate to understand XML a collective term, summarising a multitude of technologies associated in this context. For an overview in the field of environmental reporting, cf. [70].
- 70 Arndt, H-K. and Günther, O. (Eds.) (2000) *Environmental Markup Language (EML)*, First Workshop, Berlin 1999, Metropolis, Marburg (Germany).
- 71 Brosowski, J. and Lenz, C. (2004) 'Customised corporate environmental reporting', *Int. J. Environment and Sustainable Development*, this issue.
- 72 Lenz, C., Isenmann, R. and Reitz, C. (2001) 'Zielgruppenorientierte Umweltberichterstattung von Unternehmen mit XML', in Tochtermann, K. and Riekert, W-F. (Eds.): *Neue Methoden für das Wissensmanagement im Umweltbereich*, Metropolis, Marburg (Germany), pp.57–69.
- 73 Charter [4, p.2] and Isenmann and Lenz [8, p.187] are sharing this perspective.
- 74 Spencer-Cooke [75], Van Dalen [76], Skillius and Wennberg [77] and Isenmann and Lenz [8] are all emphasising the vital importance of customisation.
- 75 Spencer-Cooke, A. (1995) 'Engaging stakeholders: the next challenge in corporate environmental reporting', *IÖW/VÖW-Informationsdienst*, Vol. 10, Nos. 3–4, pp.4, 5.
- 76 Van Dalen, M. (1997) *Company Environmental Reporting. Conditions for the Optimal Information Structure of Environmental Reports*, Dissertation thesis. University of Humberside (UK) and Zeeland Polytechnic Flushing (The Netherlands).
- 77 Skillius, Å. and Wennberg, U. (1998) *Continuity, Credibility and Comparability. Key Challenges for Corporate Environmental Performance Measurement and Communication*, The International Institute for Industrial Environmental Economics at Lund University (Sweden).
- 78 Lenz, C., Isenmann, R., Marx-Gomez, J., Krüger, M. and Arndt, H-K. (2002) 'Standardisation of XML-based DTDs for corporate environmental reporting: Towards an EML', in Pillmann, W. and Tochtermann, K. (Eds.): *Environmental Communication in the Information Society*, International Society for Environmental Protection, Vienna (Austria), pp.416–423.
- 79 Borrowed from [80, p.232] who surveyed a number of empirical studies identifying users information needs in the field.
- 80 Lenz, C. (2003) *Empfängerorientierte Unternehmenskommunikation – Einsatz der Internet-Technologie am Beispiel der Umweltberichterstattung*, Eul, Köln (Germany).
- 81 At present, very little work is being done to identify users' information needs in terms of channels, presentation styles and media favoured. Cf. van Dalen [76, p.19] who complains a lack of more profound insights in this certain area.
- 82 Wycherley, I. (1999) 'Greening supply chains: the case of the body shop international', *Business Strategy and the Environment*, Vol. 8, No. 2, pp.120–127.
- 83 Dutch Association of Investors for Sustainable Development (VBDO) (1998) *Environmental Information for Investors*, VBDO, Culemborg (The Netherlands).
- 84 Cited in MacLean and Gottfrid [85, p.248]; closely [7, p.2] who claimed that companies may provide the 'right mix of information in the right format at the right time'.
- 85 MacLean, R. and Gottfrid, R. (2000) 'Corporate environmental reports: Stuck management processes hold back real progress', *Corporate Environmental Strategy*, Vol. 7, No. 3, pp.244–255.

- 86 For a description of using push and pull technologies cf. [8]. Environ [87] documented several cost-savings of internet-based reporting compared with orthodox practice.
- 87 Merrick, J. and Crookshanks, C. (2001) *Report on a Survey of Environmental Reporting Costs and Benefits*, Tempe, UK Department of Environment, Food and Rural Affairs (DEFRA), <http://www.defra.gov.uk/environment/envrp/environ/environ.pdf>, access 2002-08-19.
- 88 Just visit BP's website on 'environmental and social' <[http://www.bp.com/environ\\_social/index.asp#](http://www.bp.com/environ_social/index.asp#)> and then leading to the data desk: <<http://www.bp.com/datadesk02/selections.asp>>, access 2003-01-18. Closely related to the above, but in the field of financial reporting, Software AG offers several features to provide tailored views on its online financial report, visit <<http://213.68.23.41/de/index.htm>>, access 2003-01-18.
- 89 Web mining is an evaluation procedure supported through software analysing internet protocols, cookies and other foot prints while surfing or browsing on a company's websites. It gathers information on how many users have visited a reporting website, who they are, where they are from, which websites they have read or which are preferred ones.