

Open the Window for Interactivity – Sustainability Reporting Powered through Web 2.0 Technologies

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Abstract: Web 2.0 driven sustainability reporting describes an emerging digital approach of sustainability online reporting using the support of web 2.0 technologies. Such a computer-based application of semantics overcomes the limitations of orthodox reporting methods as it provides an array of specific capabilities to improve the way of communicating sustainability issues both, for companies (reporters), and their various stakeholders (report readers), e.g. along interactivity, customisation, reporting à la carte, stakeholder dialogue, and participation. This paper gives an outline on this up-and-coming sustainability reporting approach along three categories: (i) Media-specific trends in sustainability reporting are observed. (ii) New opportunities web 2.0 technologies are offering for sustainability reporting are identified, and first implementations from current practice are described. (iii) The implementation of a software tool for sustainability reporting à la carte is presented indicating movements away from early reporting stages towards the advanced one of a web 2.0 technologies powered approach.

Keywords: Customization; interactivity, online reporting; stakeholder dialogue; sustainability report, web 2.0.

1 Introduction to sustainability reporting

Corporate sustainability reporting has its roots in environmental respectively in non-financial reporting (DTTI et al., 1993). It follows a development path towards a concept of balanced reporting, usually communicating the three pillars of environmental, social, and economic performance and mutual interrelations, in business terms often called the triple bottom line approach. Sometimes, this approach is put in popular terms like “making values count” (ACCA, 1998), or “linking values with value” (KPMG, 2000), or described as “creating value and optimizing prosperity according to the Triple P bottom line” (DCCA, 2006). The latter is understood as combining shareholder value, eco-efficiency, and corporate citizenship, or being part of corporate social responsibility (CSR Europe, 2000).

In the 10 years since sustainability reporting first became a topic of broader interest in academia, business, and government, it has rapidly grown to a field of research with increasing relevance for companies (Kolk, 2004) and capital markets (Hesse, 2007), even in the eyes of investors (BSR, 2008). At present, sustainability reporting seems to become part of companies’ daily affairs, even entering (to a certain extent) the business mainstream. Hence, for a growing number, not just for some pioneering companies, the question is now how to report on sustainability issues, and no longer whether to report at all (Marshall and Brown, 2003). In parallel, a solid and powerful institutional infrastructure for corporate

sustainability has been built, with various initiatives and organizations active world-wide, in particular with a centre in Europe (Waddock, 2008).

Regardless of nationality or other differences in country results, reporting on sustainability is not only an issue for leading edge companies in corporate sustainability and few sector leaders, but also for global players and multinationals (KPMG, 2008), stock-quoted and publicly traded companies (Raar, 2002), as well as for a number of medium-sized (Clausen et al., 2001) or small companies (EC, 2002). This trend is evidently a world-wide phenomenon (KPMG, 2008), with Europe and North America coming first, followed by the Asia-Pacific region, and even spreading to Africa (Visser, 2002).

Within several industrial sectors, there is further empirical evidence that environmental and sustainability reporting today has become of competitive relevance (Fichter, 1998) and strategic importance (Larsen, 2000), with an impact on brand value (Interbrand, 2008). Today, “greenwashing” (Futerra, 2008), i.e. merely provision of “green glossy brochures” (UNEP and SustainAbility, 1994), does not seem to be sufficient any longer; a substantial amount of information is required. Further, sustainability reporting is only successful if the underlying management systems are appropriate and the associated processes are effective and operational. For example, goals have to be set, responsibilities have to be assigned to reach the goals, and outcomes must be assessed and used as the basis for forthcoming efforts.

Following Mesterharm (2001), comprehensive environmental or sustainability reports are regarded as the primary and leading vehicles and thus the pivotal instruments of such voluntary communication (Brophy and Starkey, 1996) because of its unique claim to credibility and reliability external stakeholders ascribe to it, containing quantitative and qualitative data. These reports are usually addressing a wide range of target groups, are often produced as single documents and issued for a certain period of time. Companies use such reports for disclosing activities and integrated performance, often including the following topics: top management statement, management policy and system as well as input-output-inventory of impacts of production processes and products in terms of sustainability.

While the field is still evolving, as sustainability reporting matures and practice develops into a more sophisticated stage, companies have to realize that the “honeymoon period” (DTTI et al., 1993) in which comprehensive non-financial reports received media and public attention just for the fact that they publish reports at all rather than for what was disclosed is over. Nowadays, advanced reporting approaches with substantial information are required. However, further to the relevance of contents, issues of communication style and data quality also become of greater importance (Beattie and Pratt, 2003; Hund et al., 2004; ACCA, 2004), in particular:

- interactivity (Teo et al., 2003; Isenmann and Kim, 2006),
- target group tailoring (Jensen and Xiao, 2001; Isenmann and Marx Gómez, 2004),
- and stakeholder dialogue (WBCSD, 2002; Unerman and Bennett, 2004).

Due to cross media availability and other innovative opportunities offered by the internet and its associated technologies and services, companies are entering a new transitional stage of online reporting (Isenmann et al., 2007; Isenmann and Marx Gómez, 2008). For example, in “The 2001 Benchmark Survey of the State of Global Environmental and Social Reporting” carried out by the CSR network (Line et al., 2002), internet-based reporting and a more balanced reporting approach are seen as the top reporting priorities. Just a short time later, many sustainability communication vehicles and reporting instruments are already available on the WWW, or – at least – benefit from internet support (ACCA, 2001; Shepherd et al., 2001; Isenmann and Lenz, 2002; Scott and Jackson, 2002; Rikhardsson et al., 2002; Andrew, 2003; Lodhia, 2004; Isenmann, 2004): Reports, brochures, leaflets, newsletters, press releases, slides, presentations, audio sequences, video clips etc. are

accessible via download and/or online, or can be “pulled” or automatically disseminated via email or other current “push” technologies (Isenmann and Lenz, 2001). Despite progression companies have made in recent years however, reports are more or less available in a layout oriented data format like HTML and PDF.

In this paper, we provide an outline of how to benefit from web 2.0 technologies for communicating sustainability issues, while moving from early stages towards a more sophisticated digital approach, particularly overcoming monologue and one-way-communication and developing towards more dialogue, interactivity and participation in reporting.

The way companies are communicating sustainability issues are decisive on users’ perceived satisfaction, value, and overall attitude on sustainability reporting, perhaps whether users actually pay attention to sustainability reports, how readers assess reliability and value of these documents, and to what extent stakeholders are willing to make use of such communication vehicles for decision making. Further, companies’ communication style may have an impact on users’ media preferences, e.g. whether they tend to favour primarily hard copies or computer-based reports. Employees and customers but also suppliers and investors usually have different information needs (Azzone et al. 1997; Lenz 2003). Hence, they want fine tuned information and expect tailor-made reports exactly meeting their specific needs in content, form, media, and information supply. Reporting merely through one size fits all hard copies or simple electronic duplicates without any added value may hardly fulfil emerging requirements and future expectations.

In contrast to the widely accepted importance of how to communicate and report in codes of conducts (e.g. Højensgard and Wahlberg 2004), standards (e.g. ISO 2003), guidelines (e.g. WBCSD 2003), and other recommendations (Hund et al. 2004) however, current practice shows significant room for improvements, even for the best reporters. Hence, an outline is given of how to develop from early sustainability reporting stages towards a more sophisticated approach, with special emphasis on interactivity, target group tailoring, and stakeholder dialogue, while fully exploiting the benefits of the internet and using especially support of web 2.0 technologies:

- First, media-specific trends in sustainability reporting are observed.
- Second, a concept of sustainability reporting powered through web 2.0 is proposed.
- Third a software tool for sustainability reporting à la carte is presented indicating movements away from early reporting stages towards the advanced web 2.0 technologies powered approach.
- Fourth, new opportunities web 2.0 technologies are offering for sustainability reporting are identified, and early implementations of current practice are presented.

Trends, concept, software tool, and illustrations from current practice reveal that companies are in a phase of transition, experimenting with web 2.0 technologies, new reporting methods, and using some features new technologies are offering. This may be an indicator that companies are on the way to improving sustainability reporting, paying more attention to target groups’ different information needs, and offering more opportunities for feedback, stakeholder dialogue and participation.

2 Current trends in sustainability reporting

Among a number of movements observed, and despite certain difficulties companies are struggling at present, there are some crucial developments (fig. 1) that seem to be prominent issues of communication facing companies in the near future, finally leading to a more interactive reporting approach (Isenmann 2004).

Figure 1: Developments in sustainability reporting

Traditional reporting approach	Current developments
Managerial closed shop procedure	Quasi public effort
One-way company controlled exercise	Stakeholder involvement
Monologue	Dialogue
One-way communication	Two-way communication
One size fits all reports	Tailored reports
Ad-hoc distribution of information	Continual exchange of ideas
Few opportunities for response	Many mechanisms for feedback and criticism
Hard copies	Computer-based media
Print media fixation	Cross-media availability

One trend highlights that sustainability reporting is moving away from a “managerial closed shop procedure” towards a “quasi public effort” of engaging and involving stakeholder, even to a certain extent (Spencer-Cooke, 1995). Information supply evolves from a strict monologue and one-way company controlled exercise towards an interactive reporting approach, while communicating with a worldwide audience in an open style, perhaps trying to get some feedback and stakeholder commentary, or even to engage interested parties providing a “challenger report” (IfEU et al., 2001). Some reporters are getting to start communicating “big issues” and “hot topics” of global importance such as the protection of the biosphere, greenhouse gas emissions, and biodiversity, intended to “give the good news and the bad!” (Clausen and Fichter, 1995).

Further to the trend of valuing stakeholder relationships, another trend is towards a more customised approach (Isenmann and Marx Gómez, 2004). For target group tailored reporting it is characteristic to consider 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. Such a process of fine tuning results from the fact that key target groups and other stakeholders are more critical on companies’ business and well informed about their activities, perhaps willing to initiate activism, to start campaigns, or to take up other forms of laying pressure or challenging companies.

In addition to the former developments towards interactivity and target group tailoring, a third trend is referred to as a step beyond monologue and one-way communication towards more stakeholder dialogue. Companies undertake considerable efforts to identify its stakeholders, and to learn their issues and concerns. Based on stakeholder analysis and information requirement analysis, companies could use reports to initiate dialogues, and to establish learning mechanisms to continually exchange ideas and knowledge. Such dialogue-oriented forms require open and two-way communication instead of one-way communication as this was usually done when just disseminating good news through communication channels without any opportunities for feedback or criticism.

Taken together, the key developments mentioned above are setting the scene for any forward-looking approach in the field, and thus they are taken for drivers to stimulate companies’ efforts to improve sustainability reporting. Further, the developments clearly illustrate that corporate communication in general and in particular sustainability reporting rapidly evolves or has already developed towards a more sophisticated stage. Moreover, developments towards interactivity, target group tailoring, and stakeholder dialogue represent some of the converging criteria every foresighted company should take into account. Without an understanding of current developments to be addressed, orthodox reporting methods, and

non-targeted sustainability reports without any opportunities for feedback, interactivity and stakeholder dialogue are ineffective, or even misleading and thus a rather useless enterprise.

3 Concept for sustainability reporting using web 2.0

Based on current developments and analysis of literature in the field, a concept of sustainability reporting powered through web 2.0 technologies is proposed. Among other components, such a concept may make use of at least three intellectual resources. In general, it should rest on corporate communication in which interactivity and communicating sustainability issues are playing a key role. Based on corporate communication, stakeholder reporting and internet-based reporting should be taken into consideration as conceptual core elements:

- Corporate communication is the overarching umbrella that summarises company's activities, methods, and strategies to exchange information or any other immaterial resources with its stakeholders, inside and outside the company. As corporate communications represents the conceptual baseline for any certain aspect of communication and reporting, it becomes clear that a more interactive sustainability reporting approach must be incorporated in and consistent with common corporate communication if interactivity is to make any difference in the way companies are reporting. This is especially true for company's guiding communication principles, underlying values, and valuations, e.g. public's right to know, disclosure of corporate performance in terms of sustainability, added value creating nature of stakeholder relationships, and belief in two-way communication.
- Based on corporate communication, stakeholder reporting is an approach of value-based management characterised through ongoing dialogue with company's stakeholders. It aims to build and manage effective relationships with a number of key target groups in a manner, in which two-way communication, possibilities of choosing issues, and expressing personal preferences are the norm, but not the exception (Ernst & Young et al., 1999). As such it is a core building block in implementing continual exchange of ideas with various stakeholders. This stakeholder input should be directly linked to the management through continuous feedback into company's strategy. These feedback loops and other mechanisms for learning ensure that stakeholder reporting is truly embedded in the company, and that issues, concerns, and expectations of key target groups are actually reflected in the company's underlying understanding of itself. Hence, stakeholder reporting is not only for or about stakeholders but rather with and by stakeholders themselves (OECD, 1999).
- The idea behind internet-based reporting is that this computer-based method provides an array of media-specific capabilities and technical benefits (Isenmann 2005, 2004). Compared with orthodox methods, internet-based reporting overcomes the limitations of paper-based communication like one size fits all reports, hard copies, print media fixation, and one-way-communication. In contrast, a fully ICT-supported approach offers a number of features to improve sustainability communication. It finally elevates the field to a more sophisticated stage by adding value for reporters and report users. In particular, internet-based reporting embraces a broader range of beneficial characteristics to enrich the way of communicating sustainability issues, like combining text, still and moving images, sound, feedback, interaction, dialogue, and integration of different contents (Jones and Walton 1999; Isenmann and Lenz 2002).

Because of its overall added value creating opportunities, the internet is already used by several reporting companies and target groups as the pivotal platform to provide or to access information on environmental, social, and economic performance or other related issues of

sustainability (Rikhardsson et al., 2002). As Alan Benjamin, chairman of QSP Holdings plc, argues: (1998, 13): “The Web site will be the prime communications vehicle of the 21st century – largely interactive. It will host a permanent dialogue as the gateway to the company.”

The internal and external value that companies are expecting to gain through stronger stakeholder relationships and interactive, tailored, dialogue-oriented reporting may be described along four ways (Hund et al. 2004; Stratos 2003, Ernst & Young et al. 1999):

- The first benefit is to prevent and avoid shareholder risk. Such risk may occur if a company fails to establish or does not take enough care of stakeholder relationships. Ignoring real stakes, emerging concerns, or reasonable interests seems to be a risky communication strategy, just see the example of Brent Spar.
- Another benefit that companies could exploit is inspiration for innovation. Strong relationships with employees, along supply chains, and within other business networks are a fertile surrounding far more than a prerequisite to create innovative products, or to improve efficiency of processes.
- Closely related, a third benefit lays in the pool of ideas, knowledge, and other resources available in a network of relationships. Such a network provides valuable resources and crucial information necessary for the development of new markets and other business opportunities.
- As reputation is rather based on stakeholders’ perceptions, good relationships are a vital source of intangible assets such as superior reputation and enhanced brand value, both of which generate a number of competitive advantages.

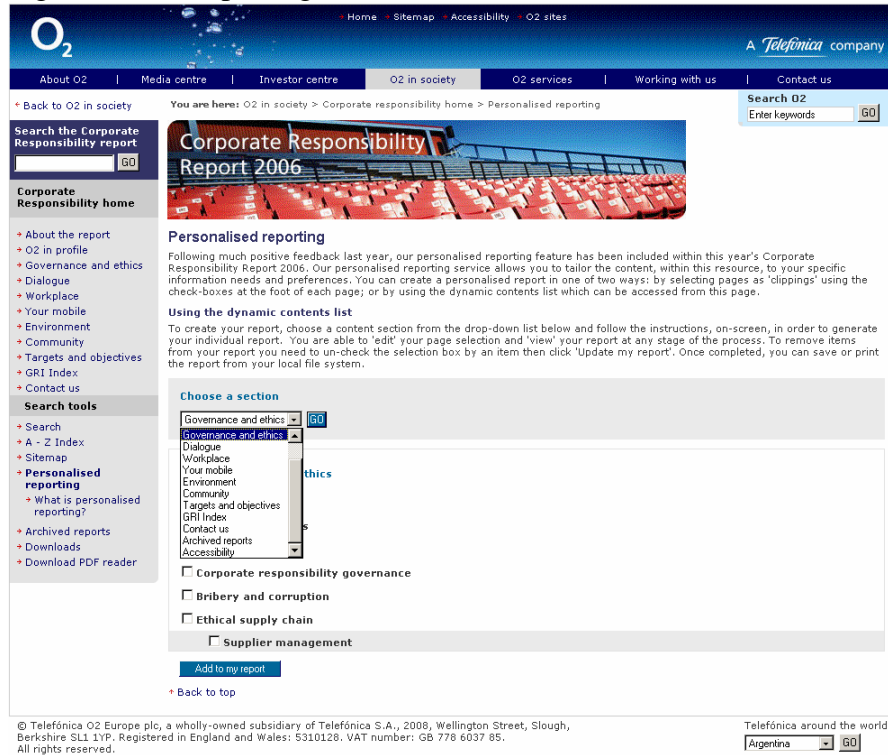
Generally, companies are recommended to see sustainability reporting, progression in communication and use of latest trends in ICT no longer as an extra cost or burden on hard-pressed management, as from a long-term perspective the attainable benefits may exceed its costs by far. Hence, it is argued here that companies weigh the costs and benefits of such advanced reporting against the target groups’ information needs and the companies’ resource capabilities to satisfy them.

4 Software tool for sustainability reporting à la carte

Following the concept of sustainability reporting, the background and implementation of a software tool with shopping cart feature is presented. This software tool provides sustainability reports à la carte. Stakeholders (i.e. users, readers) can create their own tailored report in an interactive manner on the fly, while exactly meeting their detailed information needs and preferred media. This software tool is a module of a comprehensive environmental management information system (EMIS). It is implemented as a web-based ICT application.

The provision of sustainability reports on various media, and tailoring reports according to users’ needs and preferences, while exactly meeting numerous standards, guidelines, and recommendations, are two major difficulties with which companies are struggling at present. Today, an orthodox disclosure practice which merely provides isolated documents and stand-alone printed reports is not sufficient any longer. A substantial amount of information, matters of communication style, and the provision of tailored communication vehicles on various media are required (Isenmann and Kim, 2006). O₂, a global player in telecommunications, provides a so-called personalized reporting feature on its website (fig. 2). This could be regarded as best practice and pioneering effort, so far: Users can tailor the content by selecting issues from a catalogue, and they can choose the preferred media: HTML to view the report or PDF to print and save the report.

Figure 2: O₂'s reporting feature (2008)



In order to go beyond this approach, a software tool with elaborated shopping cart functionality was developed (see fig. 3: moving from cell I to cell IV). The certain conceptual basis at the interface between stakeholder reporting and internet-based reporting is a classification proposed by Lenz (2003): He arranged the different strategies to fulfil target group tailoring along two dimensions (fig. 3):

- degree of user modelling, representing the overall model of a user or a certain user group, and corresponding to information needs identified and preferences stored in user profiles: stereotyping, individualization, and personalization;
- degree of system adaptation, representing the capabilities to adapt the ICT application to users' needs, and corresponding to the extent of a system's facilities for tailoring: adapted, adaptable and adaptive applications.

Following a generic information management approach (Isenmann and Marx Gómez, 2004), three further tasks had to be carried out: (i) modelling the information demand, i.e. conducting a stakeholder analysis and information requirement analysis, (ii) modelling the information supply, i.e. designing suitable XML-based documents (schema, style sheets, document), and (iii) cross matching demand and supply, i.e. designing the software tool.

The software tool is implemented as a prototype. In order to showcase performance and features of this tool compared to current best practice, the content of a digitalized sustainability report of Otto (2004), a German multi-channel retailer, was used. This report was already available as an XML document. At the heart of the software tool's ICT architecture lies Apache Cocoon (2008), a Java-based, modular-structured open source publishing framework, able to process XML schemas and to transform and format XML documents. It is thus suitable to perform single-source cross-media reporting. Sustainability reports à la carte are made possible, prepared by machine processing, and generated in an automated manner. The ICT architecture allows report contents to be stored, retrieved, edited, updated, controlled and then output cross-media in a variety of ways. The reason why Apache Cocoon has been employed lies, among other benefits, in its sophisticated application logic. The modular

components could be arranged in a flexible way, serially grouped in pipelines where different reports are then dynamically created on the basis of an underlying XML-based schema.

Figure 3: Classification of providing target group tailoring (Lenz 2003, 212)

Degree of user modelling	personalised	-	VI	VII
	individualised	-	IV	V
	stereotyped	I	(II)	III
		adapted	adaptable	adaptive
		Degree of system adaptation		

The procedure of using the software tool is like the following: First, users decide whether they may receive a predefined report corresponding to the information needs prototypical to a certain target group, or whether they may create their own report, exactly meeting their individual information needs (fig. 4). The software tool provides a catalogue of predefined report contents e.g. for investors, customers, employees, media representatives, suppliers, and non-governmental groups. Further, the catalogue also covers profiles exactly meeting the requirements of EMAS and of the GRI guideline (GRI 2006), i.e. the de-facto-standard in sustainability reporting. For example, some users such as local authorities are interested in how the company has met the EMAS requirements in order to aggregate environmental impacts for a certain area.

Second, users can fine-tune in a flexible and easy to use manner what contents should finally be included in their shopping cart (fig. 5).

Third, users can choose different output formats (fig. 6): HTML to view reports in the web browser, PDF and Postscript to save and print reports, and – more important – XML to process data automatically by machinery. Among other aspects needed to link the micro-macro-perspective between single companies and their aggregation to a regional level (Seifert 2000; Rathje 2001), it is the progression in ICT that has now opened the window to better exchange environmental information among companies and within the industrial sector. No less important, the interoperability with public agencies could be improved.

In contrast to the progression O₂ and other companies – even the award winning ones – have made the last years, however, current sustainability (online) reporting practice shows significant room for improvements, particularly in interactivity and target group tailoring. The concept and implementation of a software tool with shopping cart functionality shed light on how advanced environmental and sustainability reporting as an integral part of EMIS could be further developed, especially in terms of interactivity and target group tailoring.

Figure 4: Software tool for sustainability reporting à la carte, illustration

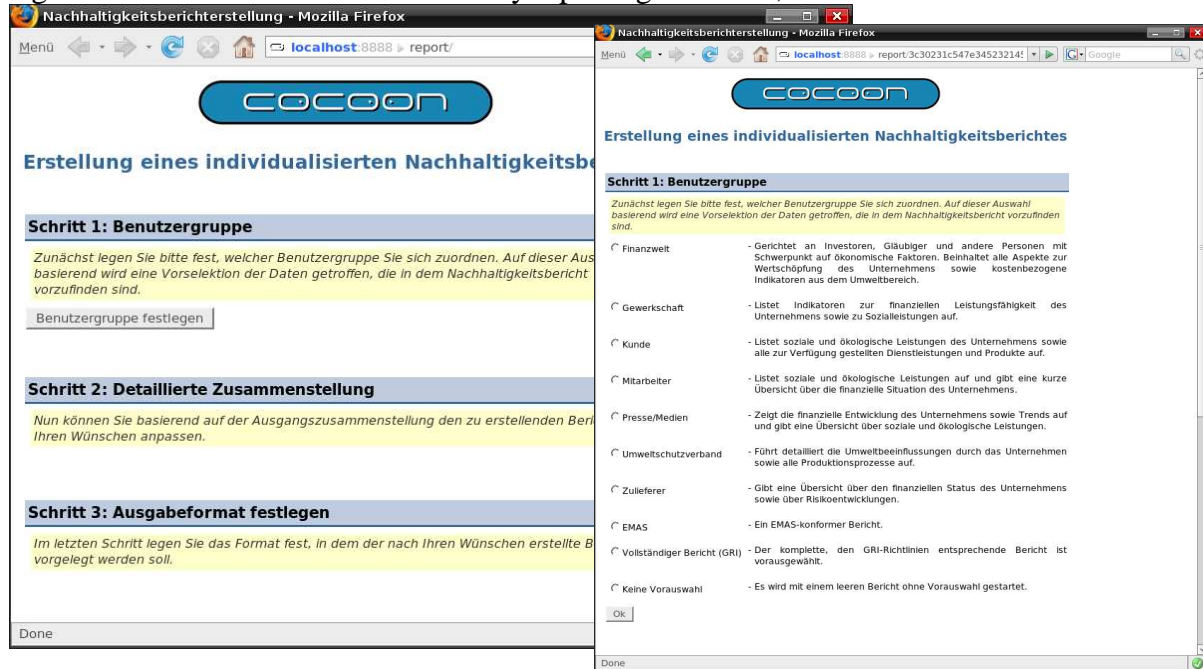


Figure 5: Fine-tuning the contents in the shopping cart, illustration

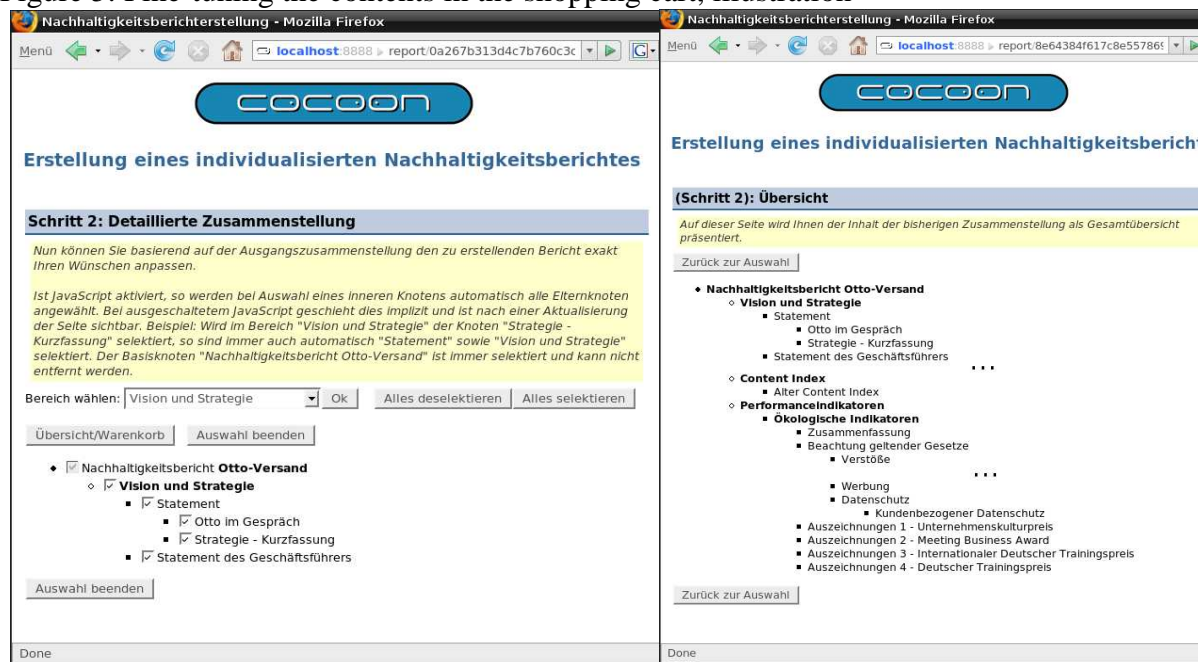
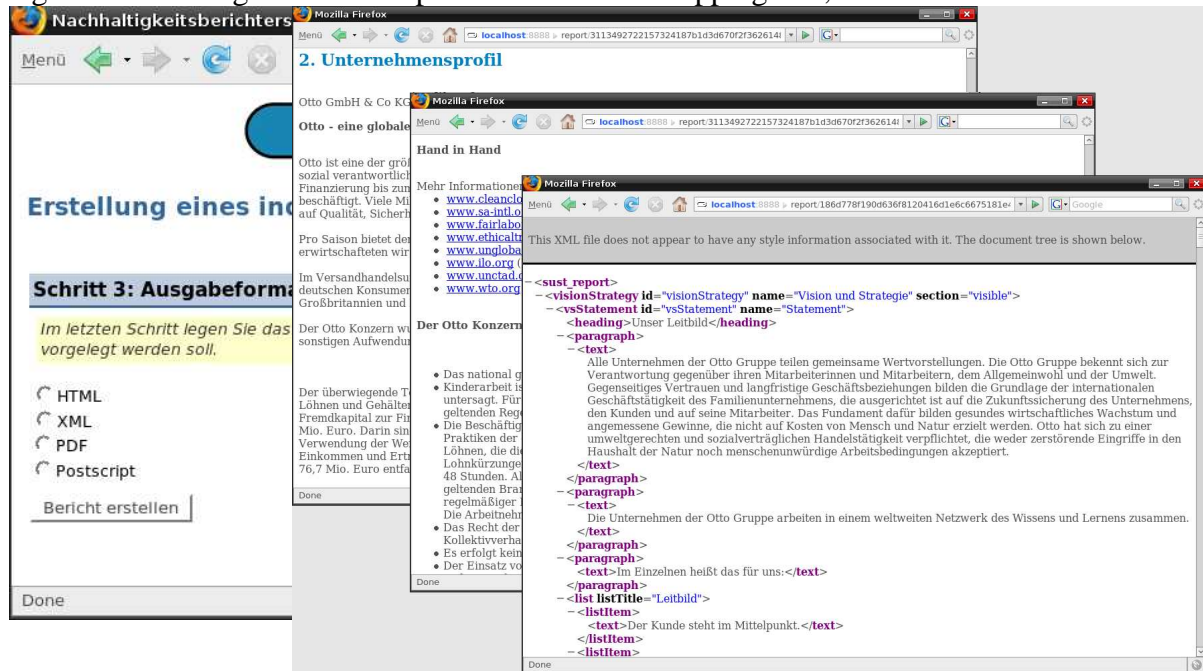


Figure 6: Selecting different output formats in the shopping cart, illustration



5 Examples of using web 2.0 technologies for sustainability reporting

The term “web 2.0” (O’Reilly 2007) indicates a radical change on how websites are presented and used. Up to now, various meanings of web 2.0 emerged. Despite different meanings, one aspect seems to be common: Web 2.0 is about utilising network effects to improve internet applications: The more users a system attracts for using, the better the system becomes. “Web 2.0 is the business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is this: Build applications that harness network effects to get better the more people use them” (O’Reilly 2007).

In order to exploit network effects however, it is not sufficient that a website provides certain functions and features. Moreover, it particularly has to attract for and integrate users into functions. Hence, websites providing content one-way-only is just one part of the story. Another is to provide feedback mechanisms and opportunities for interaction. Only then network effects matter. Since the incarnation of the world wide web the former pattern is still the norm, also for the vast majority of sustainability reporting (online) systems. The network effects are based upon technological aspects of web 2.0, often represented in terms of increasing flexibility due to technologies like AJAX (Asynchronous JavaScript and XML). While these are useful in terms of usability, they are not critical in terms of interactivity, stakeholder dialogue, target group tailoring, feedback mechanism and participation as emphasised here. Thus, these ICT-intensive aspects of web 2.0 technologies are not considered in a more detailed manner.

Three examples from current practice may demonstrate the usefulness of web 2.0 technologies, particularly based on network effects:

- The internet mail-order company Amazon offers the possibility to quickly find other articles relevant to another particular article which is requested: This is done by examining the articles on offer for similarities. Another method is to automatically match users with purchasing profiles (fig. 6). When integrating this similarity search

into the context of sustainability reports then it would be possible to quickly direct users to certain report content like a section on water consumption where similar data or descriptions can be found. In turn, by means of user evaluation and selection it would be possible to automatically supplement and upgrade existing profiles so that in the course of increasing use and the number of users incoming suggestions contribute towards a refine the quality of recommendations.

- The 2007 KeldaGroup annual report shows some early efforts towards user integration. Beyond just viewing and searching the report's content, at any time the current section can be downloaded separately, and even be forwarded to a friend. Further feedback loops are offered as users can submit comments to the company. Despite using straightforward traditional instruments like standard forms and e-mail notifications, these attempts could be seen as early movements of considering and including users into the whole reporting process.
- Georg Fischer, a famous company has been awarded for its online reporting system. The content is clearly arranged in different sections. All can be separately selected for later downloads. Recommendations for friends are possible via a standard web form, and via e-mail users can send feedback. Further, users can choose personal preferences (favourites), i.e. they can define specific web pages and RSS (really simple syndication) for automated updates. The website is an example on how new web 2.0 technologies like RSS could be used to ease access to sustainability information. Moreover, the websites attracts users to personalize and share content.

Figure 6: Network effects on Amazon, illustration

Frequently Bought Together



- ✓ **This item:** Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental and Financial Performance by Marc J. Epstein
- ✓ [Sustainable Value: How the World's Leading Companies Are Doing Well by Doing Good](#) by Chris Laszlo
- ✓ [Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage](#) by Daniel C. Esty

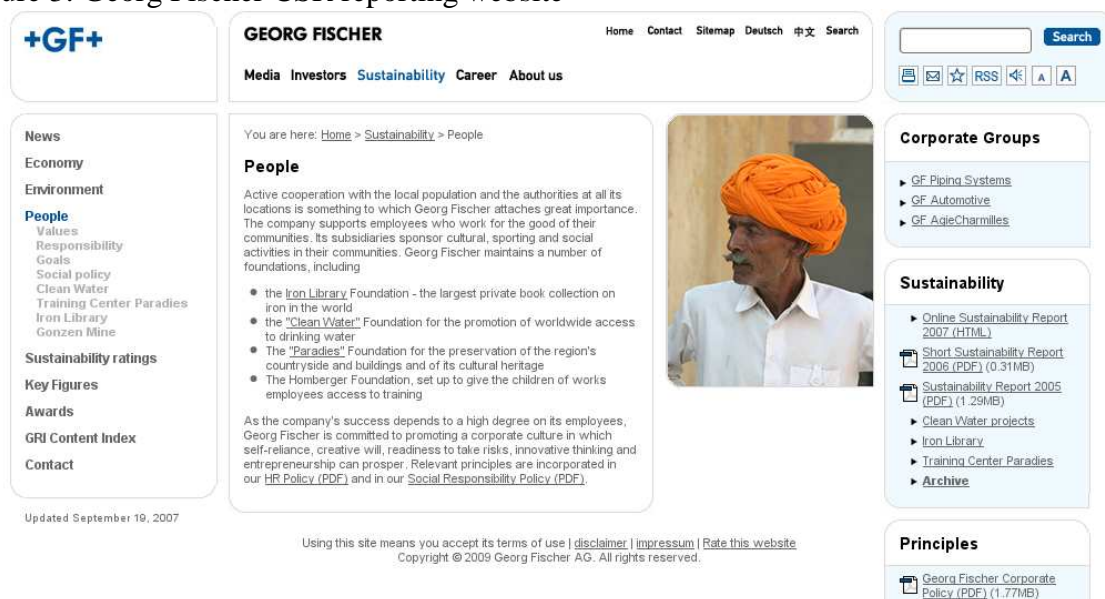
Customers Who Bought This Item Also Bought



Figure 7: 2007 KeldaGroup annual report



Figure 3: Georg Fischer CSR reporting website



Together, web 2.0 technologies allow users to do more than just pull down or retrieve information accessible on websites. In contrast, they can build on traditional interactive facilities to provide the world wide web as a comprehensive computing platform (tab. 1). This platform allows users to run software-applications entirely through a browser. Users can own the data on a web 2.0 sites and exercise control over that data. These web 2.0 sites may have a so-called architecture of participation that encourages users to add value to the application as they use it. This stands in contrast to traditional websites, the sort that limited users to viewing and whose content only the website's administrator could modify. Web 2.0 sites often feature

a rich, user-friendly interface based on Ajax and similar client-side interactivity frameworks, or full client-server application frameworks.

Table 1: Web 2.0 platforms and features for sustainability reporting

Web 2.0 platform	Uniform resource locator (URL)	Beneficial features for sustainability reporting
Amazon	www.amazon.com	Recommender engine; automated profile creation; user generated favorite lists, comments, evaluation
Blogger	www.blogger.com	Enriched content by articles from employees'; exchange of comments; automated linking of content; tagging
Craigslist	www.craigslist.org	Self-regulation of user content by flagging
eBay	www.ebay.com	Evaluation by users; user-created discussion channels
Facebook	www.facebook.com	Linking users with similar interests; creating interest groups; providing inter-user communication platforms
Flickr	www.flickr.com	Geotagging; commenting
Friendster	www.friendster.com	See FaceBook
Google	www.google.com	Ranking of features according to number and quality of links ^{1*}
Hi5	www.hi5.com	See FaceBook
ImageShack	www.imageshack.us	Evaluation of content lists and commenting
MySpace	www.myspace.com	See FaceBook
Orkut	www.orkut.com	See FaceBook
Photobucket	www.photobucket.com	Clustering users to groups created by users
The Internet Movie Database	www.imdb.com	Evaluation and reviewing by users; possibility to suggest improvements and corrections; recommender engine
Wikipedia	www.wikipedia.org	Clustering users; (limited) editing possibilities
Windows Live	www.live.com	*
Wordpress	www.wordpress.com	Collaborative editing
Yahoo	www.yahoo.com	*
YouTube	www.youtube.com	Per-content-evaluation and commenting; tagging; user defined lists

The sometimes complex and continually evolving technology infrastructure of web 2.0 includes server-software, content-syndication, messaging-protocols, standards-oriented browsers with plugins and extensions, and various client-applications. The differing, yet complementary approaches of such elements provide web 2.0 sites with information-storage, creation, and dissemination challenges and capabilities that go beyond what users formerly expected in the environment of the so-called traditional web-applications. Web 2.0 typically include some of the following features and techniques, among others:

- search (ease of finding information through keyword search which makes the platform valuable)
- links (guide to relevant information. The best pages are the most frequently linked to)
- authoring (opportunity to create constantly updating content over a platform that is shifted from being the creation of a few to being the constantly updated, interlinked work, e.g. wikis and blogs).
- tagging (categorization of content by creating tags that are simple, one-word descriptions to facilitate searching and avoid rigid, pre-made categories).

¹ The functionality of Google and other search engines is generally not disclosed; it is known in the case of Google however that the so-called page rank (value or position) of a website is based on network effects like the number of websites linking each other. As the underlying algorithms of various search engines are not transparent and publicly available the adapted features can neither be extracted completely nor systematically

- extensions (automation of some of the work and pattern matching by using algorithms)
- signals (use of RSS to notify users with any changes of the content by sending e-mails).

6 Conclusions

Since its first incarnations more than a decade ago, companies have made considerable progression in sustainability reporting. As the field matured and practice develops into a more sophisticated stage, issues of communication become of greater importance. Particularly interactivity, target group tailoring, and stakeholder dialogue are of increasing relevance, with considerable impact for corporate reputation. According to the guidebook on sustainability communication and stakeholder involvement (WBCSD 2002, 6), “disclosure is the new currency of corporate reputation”, especially communications with external stakeholders. Companies have to realise that the early “honeymoon period” (DTTI et al. 1993, 9) in which sustainability reports sometimes may have received media response, public attention, and awards just for existing rather than for what was disclosed in them and how it was communicated is over, definitely.

When improving sustainability reporting, various forms of feedback, interactivity, and – in a more detailed fashion – the core elements of target group tailoring and stakeholder dialogue may lay at its heart. Tailor-made reports, feedback mechanisms, individualised or even personalised communication vehicles exactly meeting users’ heterogeneous needs and fulfilling different requirements proposed by guidelines, as well as instruments providing even one-to one-communication are some of the media-specific opportunities, companies could use to improve current practice. Partnerships, participation, or any other form of stakeholder involvement, be it communication with interested parties or several possibilities for feedback and learning their issues and concerns, could be applied for building corporate trust and enhancing companies’ reputation. The increasing awareness of interactive (online) communication in general, together with the growing demand for fine tuned reports, and closely linked with the rising need in stakeholder communications seem to be converging trends pushing the field towards a more interactive sustainability reporting approach. All these efforts can surely be powered through web 2.0 technologies.

Web 2.0 technologies in particular help to break down barriers of information between companies and stakeholders. The bridge of latest web 2.0 technologies for reporting with minor boundaries however has positive and negative impacts on companies. On the one hand, growing sensitivity in the public for sustainability issues linked with increasing demand for corporate transparency and credibility could influence companies to think hard about their way of doing business and thus to provide more interactivity. On the other hand, more and more critical customers tend to give feedback when they miss companies’ commitment for environmental and social responsibility. In this respect, sustainability online reporting powered through web 2.0 technologies could also be a reasonable defensive action companies may take against being stigmatised as insensitive for rising environmental and social issues.

Moreover, online communities will play an increasing role in forcing companies to become more sensitive to sustainability issues. Here, web 2.0 technologies help bringing this about primarily by facilitating more effective and transparent communication (Ahmed and Hardaker 1999). While the focus of target group tailoring is more on information supply and of particular relevance when reports are to be published, stakeholder dialogue with feedback opportunities is understood as an element throughout the whole reporting processes. Nevertheless, the two core elements of interactive sustainability reporting are complements. For that reason, stakeholders’ heterogeneous needs could be best analysed through ongoing stakeholder dialogues.

At present, the internet is already being used by reporting companies and target groups as the pivotal platform to provide or access information on environmental, social, and economic performance and other related issues, in very few cases even in a tailor-made fashion. Its great potential for facilitating stakeholder dialogue and its outstanding opportunity for producing customised communication vehicles in an effective, automated, and cost-saving manner however, seems to be hardly exploited, yet. An analysis of research and literature in the field clearly shows that such an approach in sustainability reporting is still in a premature stage.

As the overall aim, the paper attempts to bridge the gap between the business-driven field of sustainability reporting and its different facets on the one hand and on the other, the technology-intensive area of online information systems, software tools and information management harnessing for web 2.0 technologies and semantics. Although research in both domains is still quite disparate, recent progress in social web evolution enables an array of unique capabilities to be employed for closing this gap. In particular semantic technologies, services, and markup languages like XML (eXtensible Markup Language, e.g. Glushko and McGrath, 2005), XBRL (eXtensible Business Reporting Language, e.g. DiPiazza and Eccles, 2002) and EML (Environmental Markup Language, e.g. Arndt and Günther, 2000) provide powerful tools, to the benefit of all groups involved in or affected by sustainability reporting (GRI, 2006), be they managers, accountants, employees, members of the financial community, customers, suppliers, local authorities, non-governmental institutions, pressure groups, or organisations focused on benchmarking, rating and ranking.

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