Software tool for single source multiple media and multiple requirement sustainability reporting

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Abstract

In this paper, the development of a software tool is described. This software tool provides single source multiple media and multiple requirement sustainability reporting, and thus makes the concept of internet-based sustainability reporting actually work. The software development is a joint project carried out by the Department of Business Information Systems and Operations Research (BiOR) at the University of Kaiserslautern, Germany, and the Institute for Technical and Business Information Systems at the Otto-von-Guericke-Universität Magdeburg, Germany. Single source multiple media and multiple requirement sustainability reporting is considered as the cutting edge approach in the rapidly developing field of advanced environmental and sustainability reporting using the internet. Such a comprehensive and forward-looking approach offers a variety of added value creating features compared with early environmental and sustainability reporting stages. For example, it provides a set of relevant contents (environmental, economic, social issues and mutual interrelations) that comprise the core themes for corporate sustainability, different media (print media, internet, CD-ROM etc.), it uses corresponding distributing principles (push, pull), it enables different views on the report contents, and it offers various presentation styles (media-specific, target group tailored). In technical terms, such a software tool is fully supported by an underlying ICT infrastructure that has its basis in using the internet and employing XML. As a practical application, this reporting approach is currently implemented as a software prototype. At the heart of its ICT architecture lies Cocoon, a Java-based, modular structured open source publishing framework, able to process XML documents, XML DTDs and XML Schemas, and thus suitable to perform single source multiple media and multiple requirement sustainability reporting.

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1. Introduction: Development of environmental and sustainability reporting

In the early years – in the late 1980s and early 1990s – companies started to report on non-financial issues. They often prepared smartly polished brochures and documents focused on environmental issues. As the field matured, however, it then became apparent that a narrow perspective exclusively concentrated on environmental issues ignores its peril important interrelations with economic indicators and social aspects. While the early communication vehicles have been solely available on print media, today most companies make reports and other instruments available on the WWW: The internet has rapidly become the popular reporting medium because of technological progress in ICT applications, software tools and internet technologies in line with their overall penetration in corporate business as well as increasing internet access of the public. Today, many companies produce hard copy reports and electronic versions available on the WWW as supplements or replacements.

In any case, companies realised that the early “honeymoon period” (DTTI, IISD and SustainAbility 1993, 9) in which environmental reports received public attention just for existing rather than for what was disclosed in them is over. The provision of “green glossy brochures” does not seem to be sufficient any longer; a substantial amount of information and quality in communication are required (Marx Gómez and Isenmann 2004). Reporting is only successful if the underlying (information) management systems are appropriate and the workflows are effective and operational.

Companies realising the benefit of reporting and stakeholder communication are going to make more use of reports, and thus a great number is moving away from obviously outdated, very early stages towards an advanced reporting approach, perhaps according to the triple bottom line (TBL). This TBL approach covers environmental, economic, and social aspects, and is often referred to as sustainability reporting. The rapid development underlying in this emerging field could be described along a path in terms of a five-stage-model (fig. 1).

![Figure 1: Development of environmental and sustainability reporting](after UNEP and SustainAbility 1994, illustration)
At stage 1, companies produced brochures, newsletters and magazines primarily with an ecological touch. At stage 2, reporting practice improved and thus companies published more substantial environmental reports as one-off-projects, but not on a regular timeline. These reports are mainly focused on environmental policies and principles. At stage 3, companies were used to prepare environmental reports on an annual basis. These reports are descriptive in their nature, covering large amount of text, but very little graphical explanations and measurable indicators. One step beyond, companies are providing environmental reports with more detailed information on their overall environmental activities and performance. Reports characteristic to stage 4 are published as hard copies, and are available as electronic versions on the WWW (online documents and downloads) and few on CD-ROM. Approaching stage 5, companies are in a position to disclose reports based on a balanced approach, demonstrating how environmental issues are linked with economic and social issues, as stipulated by the TBL approach: sustainability reporting.

2. Internet-based sustainability reporting

The cutting edge approach in this rapidly developing field seems to be internet-based sustainability reporting. Recent studies suggest that the field is now entering a new phase of reporting, characterised by the emergence of sustainability reports and a growing trend of using the Internet. For example, in “The 2001 Benchmark Survey of the State of Global Environmental and Social Reporting” carried out by the CSR network (Line, Hawley and Krut 2002, 71), internet-based reporting and a more balanced reporting approach are seen as the top reporting priorities.

Such a comprehensive and fully ICT supported approach offers a variety of added-value creating features compared with early environmental reporting stages. The concept of internet-based sustainability reporting and its incarnation in the form of a software tool:

- Provide a set of relevant contents (environmental, economic, social issues and mutual interrelations) that comprise the core themes for corporate sustainability.
- The report could be published on different media at one’s choice (print media, internet, CD-ROM etc.).
- Corresponding distributing principles (push, pull) could be used.
- Different views on the report contents are offered and various presentation styles are provided (media-specific, target group tailored).

In the following, the development of a software tool that provides internet-based sustainability reporting is described. In a more detailed manner, this software tool offers single source multiple media and multiple requirement sustainability reporting. Using such a software tool elevates companies to a position to move away from early environmental reporting stages towards the sophisticated one of sustainability reporting.
reporting, while fully exploiting the benefits of an underlying ICT architecture based on using the internet and employing XML. Without the direct link to ICT, progressing toward such a forward-looking approach of sustainability reporting is seen as quite difficult.

3. **Challenge to use software tools for internet-based sustainability reporting**

Corporate sustainability reporting is a multi-faceted, rapidly developing field that is influenced by a number of driving forces: liabilities by national governments and international community regulations with a legal or standard setting basis like the ISO globally applicable (environmental) management systems, or the revised European eco-management and audit scheme (EMAS II), several guidelines recommended by management initiatives and non-governmental institutions, frameworks prepared by professionals for sustainable business and environmental auditors, award schemes and other proposals from researchers and rating organisations. Due to the rapidly increasing number of restrictions, for companies it becomes more and more difficult to meet all the different requirements to its full extent. As it is laborious and cost-intensive to produce a number of reports, choosing the relevant restrictions and following the important guidelines becomes a process of major relevance.

Since such non-financial reporting practice has become part of business commonplace and hence more sophisticated, companies – especially global players, stock-quoted enterprises, sector pioneers and firms in environmentally sensitive industries – have been paying increasing attention to alternative reporting formats, presentation styles and availability on various media. Despite a process of experimenting, the rapidly emerging medium through which reports are more and more disclosed and on which a growing number is available is the internet, particularly the WWW as one of its most common services. At present, the internet is already used by many companies and target groups as the pivotal platform to provide or to access information on environmental performance and other related sustainability issues.

Further, greater internet use is promoted through a variety of ICT-specific challenges that are facing companies in addition to general reporting requirements (Isenmann and Lenz 2002): For example, according to EMAS II companies are encouraged explicitly to use all electronic methods for distributing environmental statements, particularly the internet. Moreover, companies can implicitly select and prefer expedient computer-based media for making environmental statements publicly available. In this light, computer-based media like internet and CD-ROM become crucially relevant. Dialogue, interactivity and stakeholder communication as well as fine tuned reports meeting different information needs can hardly be realised just through print media. In total, these ICT-specific challenges are urging compa-
nies to make greater use of software tools, intended to meet increasing reporting requirements in a productive manner.

Despite the emerging challenge to use software tools however, current practice reveals that there is significant room for improvements in sustainability online reporting, even for the best reporters:

- For example, a number of companies still use the internet as yet another channel for dissemination (Lober 1997), perhaps as a platform with public access just for providing reports available as PDF files.

- Today, many environmental and sustainability reports put on the internet still have a clear print media focus, representing mere electronic duplicates of hard copies. In the words of Elkington and Priddey (1997, 52), some companies “seem to have got stuck in the rut of thinking in terms of the printed page”. In some cases, one can see this print fixation in the note “printed on recycled paper”, e.g. in the 1999 sustainability report of Dresdner Bank (2000).

- Further, a number of reports initially prepared for hard copy are then translated by multimedia agencies or internet service companies into HTML, the common formatting language used by the WWW, and then directly transferred to the internet but without providing much added value. Such an orthodox practice is confirmed through empirical findings (e.g. Isenmann and Lenz 2002, ACCA 2001).

- More recently but closely linked to the above, a study surveying sustainability reporting on the internet by the Global Fortune 500 found that companies are likely aware of the internet-specific benefits but most reporters do not exploit the full potential by far that this computer-based medium could actually offer for interactive reporting (Rikhardsson et al 2002).

- Likewise Andrew (2003) found in a study surveying 64 Australian stock-listed companies from 2001-2002 that the type of environmental disclosure does not vary significantly from that of hard copies, and that computer-based-media is still far from being utilised to its full potential.

Resulting from this, orthodox approaches and traditional practice seem to be outdated, nowadays. It does not seem to be sufficient any longer that reports still are directly translated and uploaded to the WWW without creating more added value. An increasing number of target groups will probably no longer be satisfied when provided solely with hard copies or mere electronic duplicates of them. Especially professional users in the financial community such as financial analysts, investment consultants, brokers, private and institutional investors, banks, and insurance companies as well as ranking or rating organizations need updated and fine tuned reports, preferably available online and prepared for machine processing without any need to capture the data in an electronic form once again. In total, among the difficulties reporters and report users are struggling at present, there are three crucial
trends facing companies at present and in the near future (Isenmann 2004): flexible integration of environmental, economic, and social issues into reports, provision of reports on various media, and fine tuning reports according to users’ preferences and fulfilling the needs of guidelines and other recommendations.

4. Concept and design profile: Single source multiple media and multiple requirement software tool

Based on the challenge, companies are faced today, it is argued here to develop suitable software tools, intended to provide single source multiple media and multiple requirement sustainability reporting. All in all, it is a multiple media and multiple requirements reporting approach that seems to be needed, but an approach supported by proper software tools, preferably using internet technologies and employing XML. Such an approach enables companies to offer sustainability 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 while expending great effort to adapt to other media. Instead, the question in fact should be how to create a multiple media and multiple requirement reporting system containing relevant content to produce different reporting instruments on various media on demand.

In terms of the potential value of software tools, the benefits for reporters include the following issues (GRI 2004; SRI 2004): the value of reporting could be increased by greater ease of reporting, the ease of internal data gathering, reduced “questionnaire fatigue”, improved information for strategic decision-making and management, and possibly reducing the need for consultant services. Complementary, on the report user side, benefits include e.g.: more publicly available information, more accessible and assessable information, more issue specific information, more consistent and comparable information, more potential to use data in own data systems, and lower transaction costs for both reporters and report readers.

The features and capabilities of the software tool rest on an underlying classification for sophisticated reporting (fig. 2), illustrated along two dimensions (Brosowski and Lenz 2004; Lenz 2003):

- 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 specific user profiles. Here, it seems useful to distinguish between stereotyping, individualisation and personalisation.

- Degree of system adaptation, representing the capabilities to adapt the reporting system to users’ needs, and corresponding to the extent of a system’s facilities for customisation. Here, it makes sense to distinguish between an adapted, adaptable and adaptive approach.
Figure 2: Classification for sophisticated reporting, illustrated in terms of user modelling and system adaptation

The classification above is considered as a proper conceptual basis to develop a software tool, especially when moving away from outdated, very early environmental reporting stages simply publishing “one size fits all documents” towards a more fashionable and fully ICT supported sustainability reporting system that truly provides tailored reports on different media and in various presentation styles.

5. Development and implementation of a software tool for internet-based sustainability reporting

In order to describe benefits and use of the software tool thoroughly, the former conceptual considerations are put into practice and illustrated through an ICT architecture, focused on (IV). This case (IV) indicates an adaptable reporting system producing individual sustainability reports: Users could modify and interact with the system, at least, to a certain extent, e.g. every single user may create his own sustainability report “on the fly” and à la carte, while choosing contents, structure, layout, media of presentation and distribution channel according to his individual needs and specific preferences. For every user, an anonymous user model is stored, but the user always may control the system behaviour through changing the user profile. The software tool consists of a three-tier-web-application:

- The basic data layer contains several sources where the XML Schema, XML stylesheets, user profiles and a number of other XML-documents are stored.
These sources include relevant data, metadata and thesauri. The data layer is managed through a database server.

- The application layer (Cocoon) contains different services and applications to generate and distribute reports in an automated manner by machine processing. This complex layer is used as a data integrator responsible for system management and performed through an application server.

- The presentation layer represents an interactive user interface that is used for submitting users’ information needs as well as for presenting reports. The presentation layer provides easy access via a standard internet browser, e.g. Netscape Navigator or Microsoft Internet Explorer.

The ICT architecture discussed above has been implemented and tested in a software prototype. At the heart of its ICT architecture (application layer) lies Cocoon, a Java-based, modular structured, open source publishing software, able to process XML Schemas (Brosowski et al. 2004), in particular to transform and format XML documents and thus it seems suitable to perform single source multiple media and multiple requirement sustainability reporting. The rationale why Cocoon has been chosen, lies – among other advantages and benefits – in its powerful and sophisticated application capabilities. The modular application components could be arranged flexibly, serially grouped in so-called pipelines where different reports are then created dynamically on the basis of an XML Schema, exactly meeting a user’s individual needs. For database connectivity, Cocoon uses the JDBC (Java Database Connectivity), implemented as a pool of drivers for connectivity to different types of databases. A major benefit of using Cocoon is that arrangement, transformation, and layout procedures are all controlled through XML documents. This makes it possible to start several pipelines (fig. 3), finally to produce individualised sustainability reports, exactly meeting the users’ preferences or the needs of certain reporting requirements (Brosowski and Lenz 2004).

6. Conclusions

Undeniably, software tools may have significant potential to facilitate and add value to sustainability reporting, internally and externally, finally to the benefit of all groups involved in or affected by the field, be they managers, accountants, employees, key target groups like members of the financial community, standard setting institutions and organisations focused on benchmarking, rating and ranking. Companies implementing such software tools will be in a position to carry out its tasks of information management well, using its human and organisational resources more efficiently, and communicating on sustainability issues in a meaningful way. They could provide tailor-made reports that respond precisely to the information needs of
the users and fulfils the needs of certain reporting requirements – perhaps a report in accordance with the GRI guidelines – at one’s fingertips.
References


Brosowski et al. (2004): XML Schema for sustainability reports meeting the needs of the GRI guidelines. See this volume.


