EnviroInfo 2004 (Geneva)
Sh@ring – EnviroInfo 2004
 ISBN: 28 29 30 275-3

XML Schema for sustainability reports meeting the needs of the GRI guidelines

Jan Brosowski, Ralf Isenmann, Monika Beisel[1] and
Jorge Marx-Gomez[2]

Abstract

In this paper, an outline is given of how to develop a comprehensive XML Schema for corporate sustainability reports. In order to ensure methodological rigour, this development is based on prior experience in designing XML Document Type Definitions (DTDs) for environmental reports; further, it is embedded into an overall process with the goal to promote the standardisation of document structures for advanced environmental and sustainability reporting using internet technologies and services. The XML Schema in particular meets the "Sustainability Reporting Guidelines" of the Global Reporting Initiative (GRI), released in 2002, and a number of other reporting requirements, e.g. the revised European Eco-Management and Audit Scheme "EMAS II", the international standard ISO 14001 on "Environmental Management Systems", the German standard DIN 33922 "Environmental Reports for the Public", the early international guideline on "Company Environmental Reporting" proposed by the United Nations Environment Programme (UNEP) and SustainAbility, its German counterpart "Environmental Reports – Environmental Statements. Guidelines on Preparation and Distribution" recommended through future e.V. and the Institute for Ecological Economy Research (IÖW), and a recently published publicly available specification (PAS) on the "Data exchange between ERP Systems and Environmental Information Systems". The rationale why the XML Schema is explicitly focused on the GRI guidelines is that GRI represents the most forceful standard-setting organisation in the field of environmental and sustainability reporting, and thus its requirements will most likely become the de facto standard for sustainability reports, worldwide. Companies exactly meeting the needs of the GRI are reporting "in accordance with GRI" that is probably one of the highest levels of ensuring quality, rigour and utility within the field.

[1] University of Kaiserslautern, Department of Business Information Systems and Operations Research (BiOR), P.O. Box 3049, 67653 Kaiserslautern, Germany, email: brosowski@bior.de; isenmann@bior.de; beisel@bior.de; Internet: http://www.bior.de

[2] Otto-von-Guericke-Universität Magdeburg, Faculty of Computer Science, Institute for Technical and Business Information Systems, P.O. Box 4120, 39016 Magdeburg, Germany, email: gomez@iti.cs.uni-magdeburg.de, Internet: http://www-wi.cs.uni-magdeburg.de

1. Corporate sustainability reporting

Corporate sustainability reporting has its roots in environmental or non-financial reporting respectively. It describes a development path towards a concept of balanced reporting, communicating the three pillars of environmental, social, and economic performance and its mutual interrelations, what in business terms is also called the triple bottom line approach (Clarke 2001). Companies use such reports for disclosing sustainability issues. Sustainability reports often include the following contents: vision and strategy, profile of organisation, governance, policy, management systems, stakeholder relationships, and environmental, social, and economic performance indicators (GRI 2002).

In parallel with the emerging recognition of the concept of sustainability as a vital challenge for the business of companies entering the 21st century, sustainability reporting has evolved considerably. In recent years, an increasing number of companies is publishing sustainability reports (Kolk 2004). Particularly due to reporting initiatives, new forms of global governance, codes of conduct, and guidelines, e.g. OECD Guidelines for Multinational Enterprises and UN Global Compact, sustainability reports have been the preferred instruments for most companies to communicate to their target groups, stakeholders, and other interested parties.

Further, a number of governmental initiatives and other institutional programmes elevate sustainability reporting. Probably the most forceful project is the GRI, a non-governmental international organisation that was launched in 1997 as a joint project of the Coalition for Environmentally Responsible Economics (CERES) and UNEP. The goal of GRI is to enhance the quality, rigour, and utility of sustainability reporting, particularly by developing globally applicable guidelines. For that purpose, GRI (2002, 10) provides a family of documents, including the core document: sustainability reporting guidelines, and three additional sources, i.e.: sector supplements for certain industry sectors (e.g. automotive, mining, banking, telecommunication), issue guidance documents to offer help in details and interpretation, and technical protocols to assist companies on indicator measurement. A company preparing a GRI-based sustainability report may usually start with the sustainability reporting guidelines, and then use, if needed: technical protocols, if available: sector supplements, and, if preferred: issue guidance documents.

Despite its voluntary nature applying the GRI framework and using its documents, this organisation has a truly catalysing and outstanding 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 (2002, 32) argued, “its guideline will become the de facto standard for sustainability reporting worldwide”.

2. Internet-based sustainability reporting and the need for a suitable XML document structure

While the early sustainability reports in the late 1990s have been available predominantly on print media – usually prepared as "one size fits all" documents – today, as practice matured, the focus clearly becomes cross media and more target group tailored (Isenmann 2004): Sustainability online reporting has become part companies' daily affairs, and thus most reports are accessible on the WWW (Rikhardsson, Andersen and Bang 2002). The rationale that underlies the trend towards internet-based reporting can be seen in its unique capabilities in form and content and other technical benefits, e.g. opportunity to address multiple issues in flexible depth, ease of access, great potential to reach a wider audience, many opportunities to facilitate interactivity, ease of updating, great potential to support the whole workflow, and its outstanding opportunity to produce target group tailored, individualised or even personalised communication vehicles in an automated, effective and cost-saving manner (Isenmann and Marx Gómez 2004; Brosowski and Lenz 2004; Marx Gómez and Rautenstrauch 2001). In total, internet-based reporting, in particular available reports on the WWW, has become a rapidly increasingly popular method. Such a development may hardly be the "end of the corporate environmental report", rather "the advent of cybernetic sustainability reporting" (Wheeler and Elkington 2002).

More and more companies are going to benefit from advanced web applications and internet-based software tools for sustainability reporting. Key players of the field such as the GRI (2004) and the Sustainability Reporting Network (SRI 2004) are promoting this movement. Hence, there is growing interest to use a suitable document structure, perhaps in the form of a DTD or a Schema respectively, while exploiting the benefits of the eXtensible Markup Language (XML). An XML Schema often lies at the heart of ICT (information and communication) applications, particularly of sophisticated web content management systems. Employing such an XML Schema offers an impressive array of technical benefits and helps to improve a company's information management. Further, communication with target groups could be fine tuned. In total, on the basis of an XML Schema, companies are enabled to provide single source multiple media and multiple requirement reporting (Isenmann et al. 2004), offering sustainability reports at one's choice. In other words, reporting á la carte seems to be possible, prepared by machine processing, and generated in an automated manner.

3. Preliminary work: Standardisation of XML DTDs for advanced environmental reporting

The development of the XML Schema is embedded into an ongoing process with the goal to promote the standardisation of document structures for advanced environ-

mental and sustainability reporting while exploiting the full benefits of the internet. This effort is initiated by three German research groups:

- Department of Business Information Systems and Operations Research, University of Kaiserslautern,
- Institute for Technical and Business Information Systems, Otto-von-Guericke-Universität Magdeburg, and
- Institute of Information Systems, Humboldt University of Berlin.

Conceptually, the development of the XML Schema rests on experience gained from the process of standardising XML DTDs for environmental reports. These insights have been published in a sequence of papers, starting with an initial contribution presented in Vienna 2002 and its follow up in Stuttgart and Cottbus 2003:

- Vienna 2002 (Lenz et al. 2002): According to the initial contribution, it was argued to exploit the benefits using up to date ICT, in particular the internet and XML for environmental reporting. As a result, a basic approach on how to standardise different XML DTDs on top level was proposed (fig. 1).

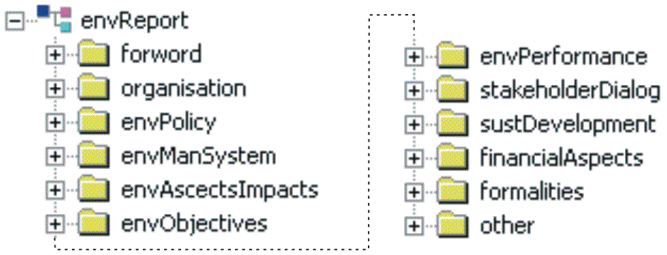

Figure 1
Proposal of a standardised DTD for environmental reporting on top level

- Stuttgart 2003 (Isenmann et al. 2003): Following this initial contribution, the aim was to find out proper ways how to elaborate the basic approach in a more detailed manner. Such an effort was considered crucially important for providing efficient, automated, and target group tailored reporting. As a result, it was clear that standardisation on the second level is a difficult enterprise because of different design profiles which have been used while developing the DTDs (fig. 2), perhaps which restrictions should be taken into account, and what procedure should be employed when selecting and arranging the relevant semantic components.

	Kaiserslautern	Magdeburg	Berlin
Main target	– Academic approach – Standardisation – Sustainability reporting – Stakeholder dialogue – Target group tailoring – Multiple media publishing	– Case study: Hasseröder brewery – Automation – Life cycle analysis – Target group tailoring – Integrated communications – Multiple media publishing	– Meeting EML-requirements – Using metadata
Restrictions to be considered	– EMAS II – EN ISO 14001 – DIN ISO 33922 – National guideline of future e.V. – International guideline of UNEP	– EMAS I – DIN ISO 33922	– DIN ISO 33922
Information needs taken into account	– Employees – Customers – Suppliers – Government/local authorities – Neighbours – Environmental pressure groups – Investors – Journalists – Public	– Customers – Employees – Government/local authorities – Neighbours	
Document instances	– Print media – Computer-based media	– Print media – Computer-based media	

Figure 2
Different design profiles underlying the DTDs for environmental reports

- Cottbus 2003 (Isenmann et al. 2003b): Based on insights of the methodical analysis, it was argued to make the underlying design profiles more transparent. As a minimum, two key criteria were identified that should be met: recommendations proposed by the Environmental Markup Language (EML) initiative and the need to analyse document instances both, on print media and on the WWW. Consequently, a standardised XML DTD for environmental reporting on the second level was proposed (fig. 3).

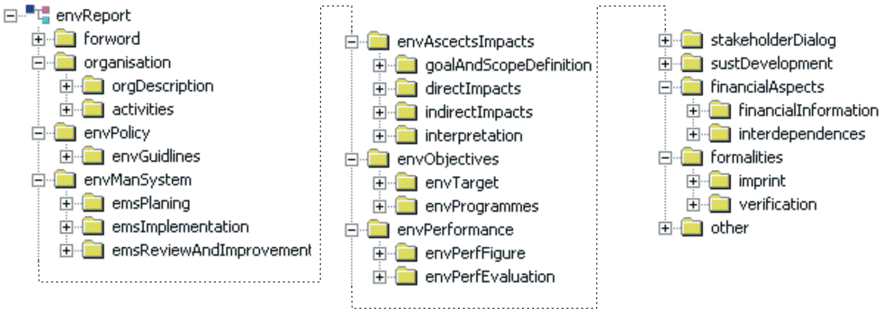

Figure 3
Proposal of a standardised DTD for environmental reports on second level

4. Development of an XML Schema for sustainability reports using the GRI guidelines

Since some pioneering reporters and forward-looking companies are going to benefit from advanced web applications and internet-based software tools for sustainability reporting there is a rapidly growing interest to use an XML DTD or an XML Schema respectively, and thus a need to develop such sophisticated document structures. Similar to a DTD, a Schema for sustainability reports describes the overall structure of this certain group of documents. In contrast to a DTD however, a Schema is written in XML. An XML Schema defines the legal building blocks of such documents, i.e. number, order and values of elements and attributes that could appear in these documents as well as the nature and default of data types. Compared to a DTD, a Schema provides a number of benefits so that a DTD most likely may be replaced in a number of web applications, at least in the near future.

In terms of its strengths compared to a DTD, a Schema is extensible to future additions, it is richer than a DTD could ever be, and it is an XML document. It supports data types, and – no less importantly – it improves data communication and facilitates exchange. These technical benefits enable new opportunities to improve sustainability reporting, especially in terms of automated production and administration. For example, using a Schema makes it much easier to describe sustainability reports in a more detailed fashion by specifying data facets and defining restrictions on data, to validate the correctness of data and to facilitate the use of databases. As a result, using a Schema ensures a mutual understanding of a report's content. Thus, Schemas contribute to secure data exchange, e.g. between reporters (companies) and report users (target groups).

Based on a model for the design of DTDs initially proposed by Schraml (1997) and then adapted by Lenz (2003), a refined approach for Schemas was developed. This approach describes a generic method that takes into account the nature of a Schema (fig. 4). In particular, the module structure of the GRI family of documents could be realised step by step. As the underlying model for DTDs is primarily focused on the selection of semantic components, some revisions and few modifications have to be made. All together, it becomes clear that the development of an XML Schema is much more than just a simple process of transforming a DTD. On the contrary, such a method which is based on a conceptual foundation could be a helpful instrument to ensure methodical rigour when developing a Schema:

1. Definition of the main target (step 1): The target is to develop an XML Schema for sustainability reports. The Schema should meet the GRI guidelines and a number of other reporting requirements, regulations, standards, and manuals.

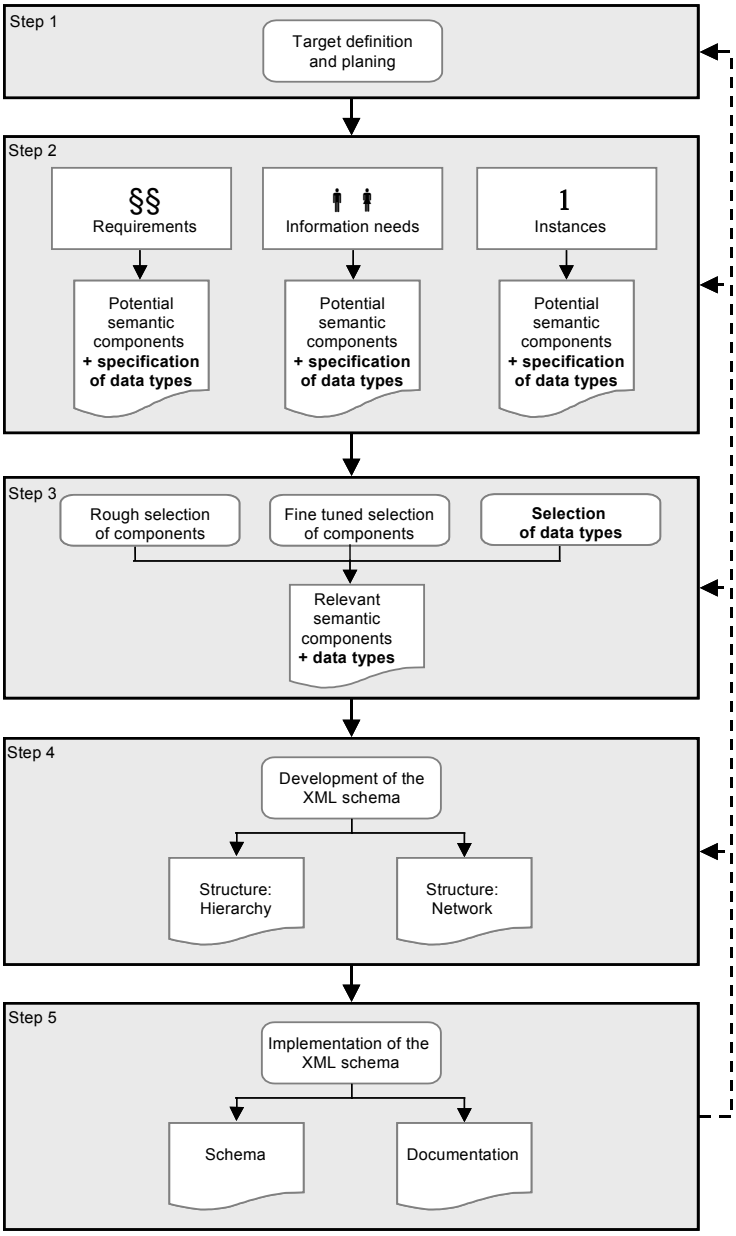

Figure 4 : Method to develop XML Schemas

2. Identification of possible semantic components (step 2): According to the target definition, a multitude of resources has to be analysed (e.g. GRI 2002, EC 2001,

DIN 1997, DIN 1997; UNEP and Sustainability 1994, future and IÖW 1994), to extract possible contents, in particular: restrictions, already available reports and users' needs and preferences. This analysis identifies the pool of possible semantic components the Schema may contain. Further, for all resources to be taken into account, the data types have to be identified and specified.

3. Selection of relevant semantic components (step 3): From the pool of possible semantic components, a catalogue of actually relevant contents needs to be developed through a verification procedure. Using the full GRI content, the result is a total of 395 semantic components. If any sector supplements may be included, then the total amount will increase up to 415-466, depending on the industry sector. All components incorporated are classified as "must be" (required) or "might be" (optional), and on which resource they are rooted. In addition, all data types used for a certain semantic component have to be determined and analysed through a verification procedure in terms of redundancy. The result is a catalogue of relevant contents specified by certain data types.
4. Design of the XML Schema (step 4): Based on the catalogue above, the Schema has to be designed. Therefore, it seems useful to arrange all selected components in a hierarchy typical for XML documents (fig. 5).

Figure 5: XML Schema for sustainability reports

5. Implementation of the XML Schema (step 5): Finally, the XML Schema needs to be implemented, i.e. noted according to XML and transformed into a XML Schema (XSD). Further, a documentation should be prepared.

5. Conclusions

Using an XML Schema offers an impressive array of benefits, e.g. it helps: to improve a company's information management, supports its reporting workflow, allocates its resources efficiently, exactly meets requirements proposed by emerging guidelines, and refines communication with its target groups in a meaningful way. When exploiting the full potential of such an XML Schema, it is argued here, the company will be in a position to make single source multiple media and multiple requirement reporting really work. Then, reporters could provide: a set of important contents (environmental, financial, social issues and mutual interrelations) that comprise the core themes for corporate sustainability, on different media (print media, internet, CD-ROM etc.), while using different distributing principles (push, pull) and in various presentation styles (fulfilling a number of reporting standards, guidelines and meeting the needs of certain target groups).

References

Brosowski J.; Lenz, C. (2004): Customised environmental reporting. International Journal of Environment and Sustainable Development, vol. 3, no. 1, pp. 18-33.

Clarke, T. (2001): Balancing the triple bottom line: Financial, social and environmental performance. Journal of General Management, vol. 26, no. 4, pp. 16-27.

European Communities (EC) (2001): Regulation (EC) No. 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS II). Official Journal of the European Communities. L 114.

Future e.V.; Institute for Ecological Economy Research (IÖW) (1994): Environmental reports – environmental statements. Guidelines on preparation and distribution. Osnabrück: future e.V.

German Institute for Standardisation e.V. (DIN) (1996): Environmental management systems – specifications with guidance for use. Berlin: Beuth.

German Institute for Standardisation e.V. (DIN) (1997): DIN 33922. Environmental reports for the public. Berlin: Beuth.

Global Reporting Initiative (GRI) (2002): Sustainability reporting guidelines. Boston: GRI.

Global Reporting Initiative (GRI) (2004): GRI software development. GRI enters digital age. In: <http://www.globalreporting.org/software, access 18.05.2004>.

Isenmann, R. et al. (2004): Software tool for single source multiple media and multiple requirement reporting. See this volume.

Isenmann, R. (2004): Internet-based sustainability reporting. International Journal of Environment and Sustainable Development, vol. 3, no. 2, pp. 145-167.

Isenmann, R. et al. (2003a): Standardisierung XML-basierter DTDs zur betrieblichen Umweltberichterstattung. In: Integration von

Umweltinformationen in betriebliche Informationssysteme, ed. by D. Heubach; U. Rey. Aachen: Shaker, pp. 69-83.

Isenmann, R. et al. (2003b): Going ahead in harmonising XML-based DTDs for corporate environmental reporting. In: The Information Society and Enlargement of the European Union, ed. by A. Gnauck; R. Heinrich. Marburg: Metropolis, pp. 550-557.

Isenmann, R.; Marx Gómez, J. (2004): How to provide customized environmental reports properly. In: Environmental Online Communication, ed. by A. Scharl. London: Springer, pp. 173-182.

Kolk, A. (2004): A decade of sustainability reporting: Developments and significance. International Journal of Environment and Sustainable Development, vol. 3, no. 1, pp. 51–64.

Lenz, C. (2003): Empfängerorientierte Unternehmenskommunikation – Einsatz der Internet-Technologie am Beispiel der Umweltberichterstattung. Köln: Eul.

Lenz, C. et al. (2002): Standardisation of XML-based DTDs for corporate environmental reporting: Towards an EML. In: Environmental Communication in the Information Society, ed. by W. Pillmann; K. Tochtermann. Vienna: International Society for Environmental Protection, pp. 416-423.

Marx Gómez, J.; Rautenstrauch, C. (Eds.) (2001): Von der Ökobilanzierung bis zur automatisierten Umweltberichterstattung mit Stoffstrommanagementsystemen – eine Fallstudie. Aachen: Shaker.

Morhardt, E.J. (2002): Clean, green, and read all over. Ten rules for effective corporate environmental and sustainability reporting. Milwaukee: ASQ Quality Press.

Rikhardsson, P.; Andersen, A.J.R.; Bang, H. (2002): Sustainability Reporting on the Internet. A Study of the Global Fortune 500. Greener Management International, issue 40, pp. 57-75.

Schraml, T. (1997): Operationalisierung der ökologieorientierten Berichterstattung aus Sicht des Informationsmanagements. Technical University Dresden.

The Sustainability Reporting Network (SRI) (2004): One report. In: <http://www.one-report.com/about_onereport.html>, access 26.04.2004.

United Nations Environment Programme Industry and Environment (UNEP), SustainAbility (1994): Company environmental reporting. A measure of the progress of business & industry towards sustainable development. Technical Report 24. Paris: UNEP.

Wheeler, D.; 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.