Secure Financial Reporting through XBRL and electronic signatures

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Abstract

This paper will discuss where financial reporting is heading, how such financial reporting according to EU standards should be done in XML and XBRL technology, and why electronic signatures such as XMLDSIG and XAdES should secure this.

1 The business problem

Companies aim at effectively and efficiently playing a part in the overall value chain. In this context, they need capital to operate. The EU aims at an efficient and cost-effective functioning of the capital market. EC regulations want to enable Community companies to compete on an equal footing for financial resources available in the Community and in the world capital markets. Financial reporting is a cornerstone in the functioning of the capital market. A common example is the case of an IPO (Initial Purchase Offering), when a company decides to become registered on a stock exchange. Another typical example is the quarterly and annual reporting towards shareholders.

Confidence in financial reporting is typically considered a three tier-model:

- Tier One: A set of global generally accepted accounting principles;
- Tier Two: Industry-specific standards for measuring and reporting performance, consistently applied and developed by the industries themselves;

- Tier Three: Company-specific information including strategy, plans, risk-management practices, compensation policies, corporate governance and performance measurements unique to the company;

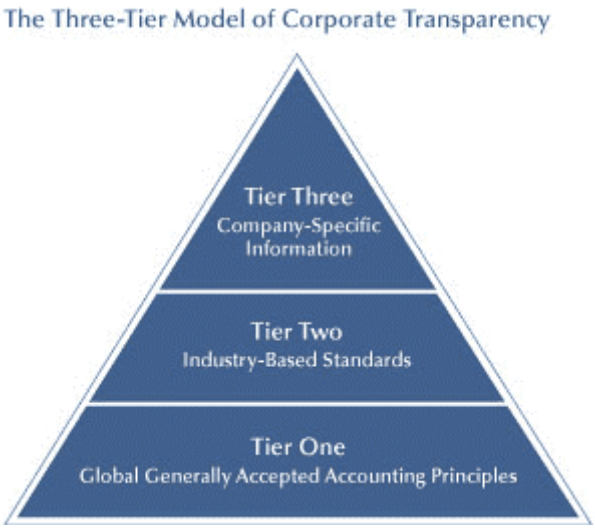

Fig. 1: The Three-Tier Model of Corporate Transparency

In this context, there is an objective of achieving a single set of global accounting standards, which is supported by the EU. A more transparent and unified accounting and financial reporting framework will facilitate good business practices and corporate governance, both in the public and private sector. On 13 June 2000, the Commission published its Communication on EU ‚Financial Reporting Strategy', which proposed that all publicly traded Community companies prepare their consolidated financial statements in accordance with a single set of accounting standards, namely International Accounting Standards (IAS), at the latest by 2005. This is important since it indicates there is no tendency to create a particular European version of such standards, which would lead to a significant administrative overhead for many companies. Rather, the Commission aims at a single set of globally accepted accounting standards.

The International Accounting Standards Board (IASB) sets these standards. The IASB issues the IFRS (International Financial Reporting Standards) - which were previously called IAS (International Accounting Standards). These standards define a common vocabulary, which will allow a unified interpretation and a comparison of financial reports such as balance sheets, cash-flow statements or similar across national borders. Today such comparisons are rather difficult to elaborate. Comparing Italian figures with Danish ones is not a trivial task.

Within the EU, the main body to endorse accounting standards is the Accounting Regulatory Committee (ARC). This summer (i.e. 2003), they voted unanimously in favour of adopting IAS, including the SIC (standard interpretations). Two IAS standards (IAS 32 and 39) were not endorsed since they are in the process of being revised. Their endorsement is expected later.

So starting January 2005 at the latest, publicly listed organisations will legally have to report according to the new IFRS. And since in many cases, historical data (e.g. on past valuations)

has to be included, the actual conversion needs to start one or two years earlier – which means today. It can be assumed that once the legal reporting has been converted, other reporting such as for the creation of the prospectus to become registered on the stock exchange will follow soon.

Another new wave of new financial reporting can be expected from the Basle II agreement. The BIS (Bank for International Settlements, based in Basel - Switzerland) issued a number of guidelines on how financial institutions should manage their risk, with a focus on capital requirements. Financial institutions should take into account market risk, credit risk, operational risk, … etc. The three pillars of Basle II are minimum capital requirements, supervisory reviews, and market discipline. Pillar 2 establishes a control environment for risk management addressing a. o. operational risk, for which the following definition is applied: *"Operational risk is the risk of loss resulting from inadequate or failed internal processes, people, and systems or from external events."* The better an institution manages all applicable risks (including operational risk), the lower their capital requirements will – which means the lower their basic costs will be.

The European Union thinks along comparable lines as the BIS, and issued directives such as the CAD ('Capital Adequacy Directive'). As such directives are translated into national legislation, they become legally binding. It is clear that Basle II and the EU CAD will exercise a widespread influence, covering banks, financial institutions, as well as their service providers such as SWIFT, Euroclear, Europay, etc. This will equally apply to the national service providers (e.g. payment services).

It is equally clear that operational risk will have a many different components, including organisational and technological aspects. We will now focus on one particular technological aspect, the use of XML to arrive at a unified 'language' for representing financial information - XBRL. This technology is taking up role in virtually all kinds of financial reporting, and is gradually being embraced by important vendors and a recent survey of XBRL US finds two-thirds of accounting software vendors have released or are in process of releasing XBRL-enabled products, XBRL being seen as 'de facto' Technology Standard for Reporting Financial Information (http://www.xbrl.org/newsandevents) . Subsequently we will discuss how to secure it. Here XBRL will significantly benefit from the concepts of electronic signatures, as introduced in the corresponding EC Directive and national legislation. The conceptual work that was done at the level of the Directive was (and still is being) complemented by technical work at the level of the three European standardisation bodies (CEN, CENELEC and ETSI). In this way, a true convergence is emerging where financial reporting needs to be done according to IAS standards, with XBRL as a technical instrument, and electronic signatures as a highly effective security solution.

2 XBRL – Business aspects

The IFRS standards describe financial concepts in plain terms, using English words. Computer programs cannot interpret such a description. One way to overcome this problem is to use a language such as XML, as developed through the W3C (World-Wide Web consortium). By mapping IFRS definitions onto a number of XML tags, the producers and consumers of this information can agree upon common meanings for data elements. This mapping takes place through an XLink reference linkbase. A group of corporate reporting supply chain participants gave rise to XBRL International, a consortium responsible for XBRL - eXtensible Business Reporting Language.

Consider the case when a company wants to act as a creditor towards a client. In most countries, national law prohibits making loan decisions without the paper documentation of the client's financial position. Obviously, a well-designed and adequately secured paper-less system would offer significant business benefits. XBRL is a strong facilitator for such systems.

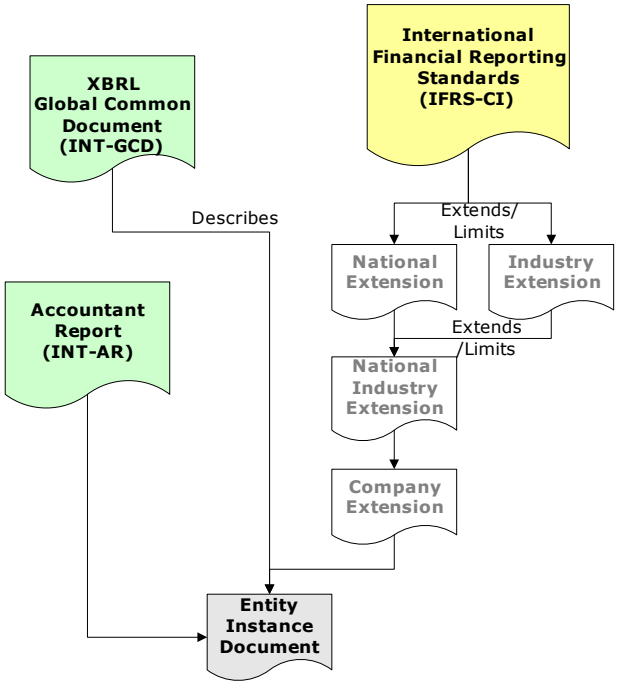

Fig. 2: The XBRL Taxonomy Model

As outlined in figure 2 above, the XBRL taxonomies define common data elements required for financial reporting under a specific set of accounting standards such as IFRS. These taxonomies can be further extended to meet specific needs of an industry group or a particular company. . A client's report is referred to as an instance document (Entity Instance), and can include all or a selection of elements from all the above. In this way, the three tiers of a corporate reporting framework can be implemented in practice (remember those three tiers were: 'globally accepted', 'industry based', and 'company specific').

Obviously, the definition of XBRL was a global activity. This was driven through the XBRL consortium (www.XBRL.org), via collaboration among all participants in the supply chain (preparers, software vendors, accountants and auditors, distributors and aggregators, bankers, and analysts) – over 220 organisations in total. The 2nd version of the XBRL specification was published in December 2001, and today many taxonomies including G/L (General Ledger – a general purpose format), IAS/IFRS and US GAAP are available.

Many large financial organisations are now going the XBRL-route, including the FDIC (the US Federal Deposit Insurance Corporation - www.fdic.gov). This is the US government agency that insures $3.1 trillion in bank deposits. They engaged a joint Unisys / Microsoft / PwC team to implement XBRL for purposes of collecting, managing and distributing reporting by its member banks. XBRL will be the information format for the monthly 'call' reports submitted from each of the 8500 member banks. There is also a significant interest from various tax authorities with the UK Inland Revenue and the Tokyo National Tax Agency already adopting XBRL for e-filing purposes.

3 XBRL – technical aspects

For reporting purposes, financial information is often structured into main categories such as balance sheet, income statement, cash flow statement and statement of changes in equity (ref IAS 1, paragraph 7 and IAS 34, paragraph 8).

If we take a balance sheet, which reflects the financial situation of a company at a certain point in time, we notice it is structured into two major categories, called 'assets' and 'liabilities and equities'. When a company is established, the shareholders bring in their part, which gets registered as equity. The company may obtain a loan, and hence becomes liable against the creditor. The "equity and liability" funds are put to use in the company. A building may be bought, raw material purchased and salaries paid. Some cash may remain in the bank. So while at the moment of establishing the opening balance the 'assets' and the 'liabilities and equities' will match, the balance will be upset when money gets made or lost. Historically, a new balance sheet was only calculated after twelve months because it involved so much work. However, today the tendency is towards closing the accounts and establishing a balance sheet much more often (quarterly, monthly, weekly or ultimately even daily).

XBRL is a great facilitator and allows to speed up the creation of a balance sheet to significant extent. It also facilitates data re-use. Of course the balance sheet is not the only mechanism to understand the financial position of a company. Even more important is the cash flow position. If you know that you will make a big profit 6 months from here but you cannot pay your salaries next month due to lack of cash and the impossibility to obtain a loan, you will go bankrupt nevertheless. Hence the cash flow statement is also an important document.

Let us now briefly describe how it works from a technical perspective. The most fundamental component of XBRL is XML as defined by W3C. This includes XML 1.0, XML Namespaces, XML Schema 1.0 and Xlink 1.0. XBRL is defined in the XBRL specification, which is written as 5 XML schemas plus some accompanying description. The specification defines a number of XBRL taxonomies and the schema for an instance document. XBRL taxonomies have names such as PFS (Primary Financial Statements), GL (General Ledger), etc. The PFS taxonomy is structured into balance sheet, income statement, statement of cash flows and statement of changes in equity. The PFS taxonomy does not contain definitions with regard to the meaning of its elements. Rather, it relies on IAS through a reference linkbase for these definitions.

Instance documents will contain actual company data such as the balance sheet of Novartis for 2003. Instance documents contain data expressed as XBRL elements: group, item, tuple, and context. Finally, an XBRL instance document can be represented under a style sheet, to make it accessible under a viewing or editing program. Here's a small XBRL code snippet of an instance document:

```
<?xml version="1.0"?>
<group xmlns="http://www.xbrl.org/2001/instance"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

```
    xmlns:link="http://www.xbrl.org/2001/XLink/xbrllinkbase"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:sample="http://www.sample.org/xbrl/2001-12-31"
    xsi:schemaLocation="http://www.sample.org/xbrl/2001-12-31 ..\sample_taxonomy.xsd">
<sample:assets.cash numericContext="numC1">52000</sample:assets.cash>
<sample:assets.netReceivables numericCon-
text="numC1">1800</sample:assets.netReceivables>
<numericContext id="numC1" precision="18" cwa="true">
<entity><identifier scheme="http://www.stockMarket.com/">SMPL</identifier>&lt;segment /&gt;
</entity>
<period><instant>2001-11-30</instant></period>
<unit><measure>ISO4217:USD</measure></unit>
<scenario name="Actual values">
<sample:scenarioType>actual</sample:scenarioType>
</scenario>
</numericContext>
</group>
```


The <group> statement is the XML root of the document. It establishes the namespaces and the schema location. The first namespace points to the XBRL instance namespace. The last namespace will resolve the <sample: assets.cash ...> statement. This statement carries the information value of „52000“. We then must use the numericContext „numC1“ to see it refers to a value in US dollars, and for the period „2001-11-30“.

Of course most of today's financial systems internally use other formats than XBRL. The production of XBRL documents could be addressed by the introduction of "converter" tools. However, the most recent versions of e.g. ERP systems (for example SAP) and of common tools such as MS-Office (Excel) are becoming XML and XBRL enabled.

4 XBRL security

As XBRL is based on XML, it is inherently vulnerable to many attacks. However, a significant effort has already been invested in making XML more secure. The same techniques that can secure XML, can be used to secure XBRL. The first and most relevant technology is electronic signatures. Of course it is equally possible to use encryption technology.

Within Europe, we have already witnessed the arrival of a single currency. We are now witnessing the arrival of electronic ID-cards, which greatly facilitate individual electronic signatures. The combination of XBRL and electronic signatures (e.g. based on electronic ID cards) can lead to fast and secure financial reporting. It will allow the publication of financial reports, statutory audit reports, analysis, etc with the joint benefits of the XML/XBRL format and the electronic signature security.

For the electronic signature technology, the use of XMLDSIG or XAdES is envisioned. This can be applied to XBRL. Creating a fully electronic and electronically signed report document can be done quite easily in technologies such as Java or .NET. The major steps involved are:

- The XML processing (e.g. element selection, link-base expansion, …);
- Optional style-sheet processing (e.g. if an html representation is also desired);
- Electronic signature creation – with the required canonicalisation etc;
- Electronic signature verification.

The W3C 'xmldsig-core' specification provides an XML schema for digital signatures. It defines three types of signatures:

- Enveloping signature (where the signature is the parent node of the XML document);
- Enveloped signature (where the signature is a child within the XML document);
- Detached signature (where the signature makes a reference to a separate document).

The XMLDSIG approach can be summarised as: signatures are applied to arbitrary digital contents (objects) via indirection, whereby the data objects are digested, the result is placed in an element (with other information) and that element is digested and signed.

In a European context, the basic format for the electronic signature in defined in ETSI's TS 101 733 specification document (ASN.1). For XML, there is the ETSI TS 101 903 XML Advanced Electronic Signatures (XAdES) specification. The XAdES specification essentially builds on XMLDSIG, but allows the inclusion of much more qualifying data such as timestamps or validation information.

The XMLDSIG or XadES implementations will handle the signing and verification in standard ways. For example in Belgium, as the Belgian Government started an Electronic Identity card pilot in March 2003, the signing can be performed with the private key on the national id card. PricewaterhouseCoopers Belgium already demonstrated in March 2003 how to create and sign a statutory audit report in XBRL, using a national Electronic ID card (for more information, feel free to contact marc.sel@pwc.be).

One prototype make use of an XML parser (Xerces), a processor (Xalan), an XMLDSIG toolkit (IAIK's IXSIL) and a PKCS11 provider (also from IAIK). The XBRL report is processed at XML level, taking into account the XBRL-specific namespaces, linkbases, references and the like. Visual mark-up can be applied through XML-stylesheets. The XMLDSIG toolkit builds the XMLSignature object, while the PKCS11 provider allows the actual signing to take place on the smart card. As the XBRL instance document is an XML file, it can easily be mapped onto a DOM-document. The signature is then applied to the DOM document, which is again serialised into a file. Another prototype is currently being constructed on the basis of .NET, with Microsoft's XAdES library.

Of course, many issues remain to be further addressed. When one considers the possible scenarios for reporting to the public at large, to the shareholders, to the central bank, to the stock exchange etc, many different expectations will have to be met. For example, who will store the instance documents, the taxonomy schemas, the linkbases etc – what goes where, and how will it be stored? And for how long? Also, what about style-sheets, canonicalization and "what-you-see-is-what-you-sign"? Finally, how about selective access to parts of the XBRL information?

5 Conclusion

The acceptance of XML technology on which XBRL is based, is still increasing. Deployments such as in the Estonian e-government portal illustrate how powerful XML architectures can be when combined with adequate security mechanisms. The fact that more applications become XML-enabled will facilitate the processing of XBRL. As governments and stakeholders require faster and better financial reporting, XBRL will most likely become more and more embedded in our software infrastructure.

The current initiatives and applications already demonstrate that combining the power and versatility of XML and electronic signatures with the work done in the XBRL field, lead to a new more effective platform for providing business information to management and stakeholders. This information will be provided in a more reusable and more secure manner than they experience today. It can be considered mandatory that sound cryptography-based security measures be applied to XBRL in order to make such information sufficiently trustworthy.

The adoption of secure XBRL can further help us make Europe a competitive player on the global field.

References

Information with regard to XML can be found at *www.w3c.org*

For all information with regard to XBRL, please visit *www.xbrl.org*

For accounting standards and how they come to fruition, visit *www.iasb.org.uk*

Visit PricewaterhouseCoopers' XBRL web site at *www.pwcglobal.com/xbrl*

To witness how XBRL can change the organization of a stock exchange, visit the NASDAQ demo at *www.nasdaq.com/xbrl*;

Also, many other demos can be found at *www.xbrl.org/demos/demos.htm*

Additional information with regard to financial reporting can be found at www.buildingpublictrust.com as well as at www.pwcglobal.com/xbrl .