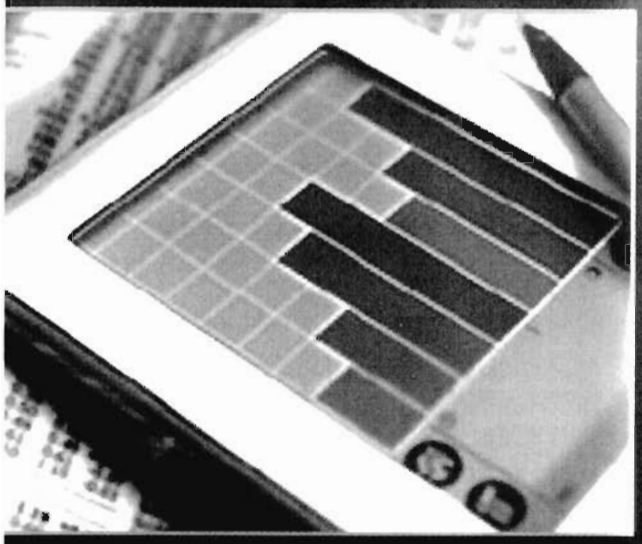

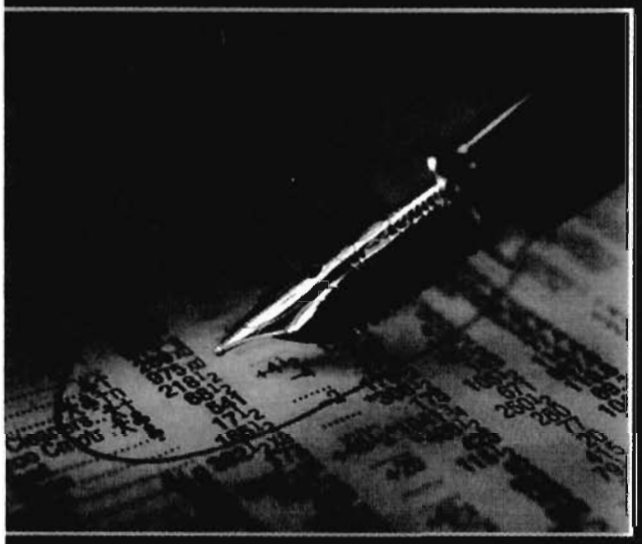

XBRL

Emerging Language in Business Reporting

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IMPLEMENTATION AND CHALLENGES

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Overview of XBRL Technologies for Decision Making in Accounting Information Systems

Eva Reyes, Daniel Rodríguez and Javier Dolado

XBRL (eXtensible Business Reporting Language) is a language for the electronic communication of business and financial data based on XML (eXtensible Markup Language). Compared with paper based or other previous ad-hoc EDI (Electronic Data Interchange) technologies, XBRL provides major benefits in the preparation, analysis and communication of business information. Those benefits include cost savings, greater efficiency, accuracy and reliability to all activities involved in supplying or using financial data. This paper provides an overview of XBRL technologies and how it is applied to decision making in several financial areas. It also covers some possible extensions with the semantic Web and Web services as future challenges.

1. Introduction

Since the inception of the Internet, many technologies have been proposed as EDI (Electronic Data Interchange) enablers to move information between systems. Currently, how quickly and how much information a company can obtain improves the decision making process to achieve greater efficiency or advantageous position against competitors. For example, investors wanting to use their own tools using data providers or accumulators as Bloomberg need to copy/paste such information manually, moving information manually from organization systems to authorized systems; manager compiling information from different departments into a spreadsheet in a consistent format for decision making. However, the format of the information was different among the different systems. As a result, in the financial domain far more time was needed producing the information and getting it ready for analysis than the actual analysis. With the creation of XBRL (eXtensible Business Reporting Language), there is another way.

XBRL is a language for the electronic communication of business and financial data. XBRL is an open and freely available standard language based on XML (eXtensible Markup Language)[1] for creating business reports. As a language, it does not intend to modify any of the GAAP (Generally Accepted Accounting Practices) but to represent them. It can contain both financial information (e.g., balance sheets, income statements or cash flows) and non-financial information (e.g., performance measurements and statistics, loan applications or regulatory reporting forms). The XBRL is an open standard which can facilitate many of the activities in the Corporate Reporting Supply Chain (CRSC) that need financial or statistical data to be stored, exchanged and analysed such as reporting about company's financial status to all types of regulators and tax authorities, applications to banks and governments, risk assessments, etc. Mayor benefits include: faster time and cost of producing and accessing reports, elimination of need for porting, translating or mapping data, enable search and comparison of business data.

From the technical point of view, XBRL is replacing other previously defined XML standards for describing financial contents and business processes during the past few years such as FpML, RIXML, or ebXML. A reason for this, is its wide support. XBRL International[2], a not-for-profit consortium of around 450

1 *http://www.w3.org/XML/*

2 *http://www.xbrl.org/*

companies and agencies, is responsible for advancing this technology. Many regulatory authorities are recommending its use, for example, the US SEC (Securities and Exchange Commission) has modernised its database, called EDGAR, to support XBRL provides. EDGAR provides access to global company information from over 13,000 companies. Spanish CNMV (Spanish's national market supervisor), UK Inland Revenue, Australia Tax Office, Japan's Tax Agency and many others accept XBRL reports or will make it compulsory. Therefore, many companies and stock exchanges use XBRL in their databases and as part of their external reporting systems. Also, it is supported by major software vendors such as SAP, Microsoft, Oracle, etc.

Furthermore, in the European Union, the Committee of European Banking Supervisors[3] considers the development of XBRL as utterly important with the development of two taxonomies: the COREP[4] (Common solvency ratio Reporting) and FINREP (Financial Reporting) taxonomy which serves as a common reporting framework for financial data.

This paper is organized as follows. Section 1 provides an overview of XBRL. Section 2 describes how XBRL capabilities are being used in projects or tools to support decision making. Next, related technologies for XBRL are described. Finally, conclusions and future work are outlined.

2. XBRL (eXtensible Business Reporting Language) in a Nutshell

As stated previously, XBRL is an open standard based on XML and related standards (XML Schema, XML Namespaces and XLink) designed to share financial information and avoid previously problems with incompatibles types. It is, therefore, independent of any hardware or software platform.

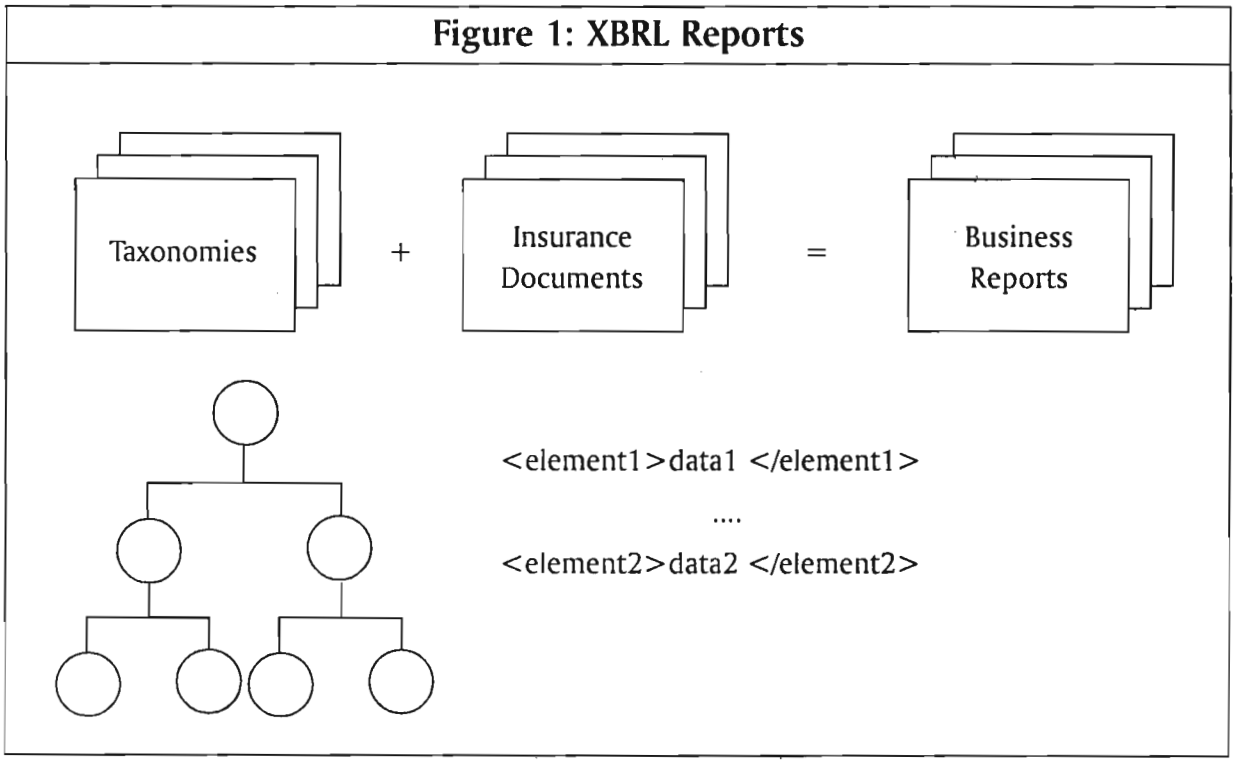
XBRL is composed of a specification about how to structure business data and a common framework for structuring and naming business information. XML provides the structure for the data and different taxonomies created name, define, relate and classify different business concepts using tag lists. As an example, XBRL GL, the *journal taxonomy,* offers the representation of data for the general ledger and sub-ledger. It is worth noting that the taxonomy does not include actual

3 *http://www.c-ebs.org/*

4 *http://www.corep.info*

data for the concepts, data is included in the XML instance documents as shown in Figure 1. XBRL taxonomies are created using XML Schema which is used to described the meaning of XML elements. The reason to create the different taxonomies is that different companies from various industry sectors describe terms differently; groups or task forces are agreeing on the most relevant and useful vocabulary specific to their sector.

Figure 1: XBRL Reports



We briefly explain the different technologies in the following items.

- XML (eXtensible Markup Language) describes data as elements between tags in plain text. For example, the balance of an account can be represented as <balance>545</balance>; element names are embraced by angle brackets (<...>), and the content (545) is between the opening element tag and the closing tag. Elements enclose other elements in a hierarchical way following a tree structure with a single root.
- XML Schema[5] documents define the structure of XML documents, i.e., its vocabulary. It defines which elements can appear, order in the hierarchy of the elements, its order and number, data type, default values and fix values. XML Schemas also make use of XML Namespaces to differentiate

[5] *http://www.w3.org/XML/Schema*

equal tag names with different meanings. For example, <title> can be prefixed with a namespace to differentiate book <book:title> or CD <cd:title>. A XBRL taxonomy is XML Schema that defines the concepts for a business reports and their relationships, for example, commonly used data types defined include: monetaryI temType, sharesItemType, decimalItemType, stringItemType, uriItemType, dateTimeItemType and tupleType.

- XML Linking (XLink)[6]. XBRL makes use of Linkbases to provide further meaning to concepts and to define relationships between concepts. With the Schema we defined concepts but balance sheets, assets, current assets, non-current assets, liabilities, etc. but we also need how know that current assets is a kind of asset, how to calculate assets from current and non-current assets or how to report these concepts. XBRL uses XLinks for 5 different purposes: (i) definition links, (ii) calculation links, (iii) presentation links, (iv) labels and (v) references. Definition links are used to describe relationships between concepts in a taxonomy; calculation links describe how elements are calculated; presentation links define relations needed for presentation, for example parent-child relationships. Labels and references do not define relationships but are for *human* consumption. Labels are used to relate readable text with concepts and references to any kind of authoritative literature. The last two may be given in English, giving support for other languages.

- Instance Documents. They contain the actual facts for business reports, i.e., they represent the set of values of a taxonomy at one instance. There are usually several instances for one taxonomy. For example, there is one taxonomy for balance sheets but a company could have a balance sheet instance for every year. Concepts defined in the taxonomies are organised either as *items* or *tuples.* Items are basic data to be reported (e.g., <assets ...>124</assets>); XRML taxonomies reference XML Schema – simple and complex types, and define the set of possible data an item can hold. On the other hand, *tuples* are concepts that are used to contain other concepts, i.e., items or other tuples; for instance, the *address* can be composed of *street, city* and *postal code.* In addition to actual fact, instance documents contain other elements that represent contextual information

[6] *http://www.w3.org/XML/Linking*

(context elements) such as dates, duration or periods. Finally, other possible elements include *Unit* which represent units of measured items, *scenarios* to indicate circumstances of reported items, *precision* indicates how many digits can be trusted, footnotes, CWA (Closed World Assumption) to indicate whether the report is complete and if the information is valid, and *groups* to arrange items in instance documents.

Sometimes, it is necessary to create new taxonomies extending existing ones. For example, if a government or accounting standard has developed a taxonomy, a company would probably like to extend the jurisdictional taxonomy by adding its specific elements modifying relationships to the company financial reporting taxonomy. For example, jurisdictional taxonomy defines assets but a company may want to distinguish between cash in the bank and cash in the stock market.

3. Decision Making with XBRL

Tools used for improving the decision making processes in the financial domain include: Business Activity Monitoring, Digital Dashboard (also known as balanced scorecard systems), Portals, Business Intelligence tools and Data Warehousing and Data Mining. New generation of these tools are adopting XBRL as a result of a great variety of projects and organizations supporting it.

An important improvement is for auditors, as XBRL enables continuous auditing. XBRL allows auditors to generate reports within a much shorter timeframe than under the traditional model, which is called continuous auditing. As stated previously, one of the requirements when designing XBRL is its ability to collect organize, analyse and maintain information about business entities. Short timeframes when auditing can potentially trigger corrective actions in a much more useful way than traditional audits with longer time span between the analysis of the data and the reports. A project at the Emporia State University provides an on-line demonstration of such capabilities[7].

An example of project, the MUSING project[8], as stated in their Web site, delivers next-generation knowledge management solutions and services to enable perceptive business intelligence activities, directly at the End-Users premises.

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7 *http://xbrl.emporia.edu/*

8 *http://www.musing.eu/*

MUSING provides services for three application areas: (i) financial risk management, (ii) internationalization, and (iii) IT operational risk and business continuity. To do so, the aim of this project is to develop Business Intelligence tools and modules based on the semantic Web and content systems for decision-making. The technologies needed for these types or tools are described in the next sections.

The Dutch National XBRL project[9] (Het Nerlandse Taxonomie Project), which is supported by Dutch ministries of Justice and Fianance, also provides on-line examples of capabilities of XBRL[10].

The Enhanced Business Reporting Consortium (EBR)[11] is an independent organization whose mission is to improve the quality, integrity, and transparency of information used for decisionmaking. XBRL International is collaborating with the EBR Consortium so that XBRL enables the improvements in business reporting content over time.

4. XBRL Support Technologies for Decision Making

This section presents technologies that integrate with XBRL to create accounting systems which in turn, can be used for decision making. Current tools are been upgraded to support XBRL, from tools that just support for taxonomy and instance creation and validation, packages like Microsoft Office and ERP (Enterprise Resource Planning) tools such as SAP. In the next subsection we present the technologies that support or will support XBRL to its full capability.

4.1. Web Services and XBRL

Web services are defined as a software application identified by a URI, whose interfaces and binding are capable of being defined, described and discovered by XML artifacts and supports direct interactions with other software applications using XML based messages via Internet-based protocols.

The reason why Web services are the natural technology for deploying XBRL accounting system include: interoperability among different technologies and

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9 *http://www.xbrl-ntp.nl/*

10 *http://xbrl.rienks.biz/*

11 *http://www.ebr360.org/*

programming languages, i.e., platform neutral and they can connect across heterogeneous networks using ubiquitous Web-based standards and heterogeneous applications; reusability of components, no installation and tight integration of software; accessibility as legacy assets and internal applications can exposed and accessible on the Web and furthermore, they could to be accessible on any device, anywhere, anytime. In the same way XBRL are open standards developed by a consortium of companies, Web services are also openly developed mainly by the World Wide Web Consortium (W3C)[12] and other industry standard organizations (Oasis[13], WS-I[14]). Also, as we have seen previously, XBRL is based on most of the technologies used by Web services such as XML and XML Schema.

The typical use of Web services in conjunction with XBRL for a company would be to retrieve financial reports in XBRL format automatically by financial analysis programs, eliminating the need to first locate and download the information (one of the properties of the definition of Web services is its ability to being discovered in transparent way).

Currently, there are several examples of Web tools for analyzing companies reports:

- The Danish Commerce and Companies Agency (DCCA)[15] has created a tool, called Digiregn web, for creating and analyzing documents in XBRL. It allows users to create, modify and validate documents according to selected taxonomies. Documents are presented to users as forms to edit and modify.
- The SEC is providing a drive test for a drive for a Web tool, Interactive Financial Report Viewer[16], for companies that have submitted their fillings in the currently voluntary program.

It is worth noting that these tools are not still taking advantage of full Web services capabilities.

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12 *http://www.w3.org/*

13 *http://www.oasis-open.org/*

14 *http://www.ws-i.org/*

15 *http://www.eogs.dk/*

16 *http://www.sec.gov/spotlight/xbrl/xbrlwebapp.htm*

4.2. XBRL Taxonomies and Ontologies

There are several similarities between defining XBRL taxonomies and creating ontologies. Ontologies can be seen as part of the knowledge engineering domain. In fact, ontologies are engineered artifacts aimed at representing a shared, consensual conceptualization of the knowledge of a given domain [Gruber, 95]. The use of *ontologies* [7] has been a recourse used in other fields in order to *integrate* the information, to *communicate* what people have achieved, to *adapt* the goals of the organization and to *support* the efficiency of the processes. Therefore, it means that ontologies help achieving some desirable qualities such as reusability providing formal representations, searchability providing meta-data as an index into information, reliability performing consistency checking, etc. Therefore, ontologies allow us to add semantics to data so that different software components can share information in a homogeneous way. Common uses of ontologies include communication between people and organizations and interoperability between systems, i.e., translation of modelling methods, paradigms, languages and software tools.

Ontologies can be used a way to formalize concepts in financial domains to create better taxonomies, i.e., to model data, concepts, terms and relationships, processes and activities of the financial reporting supply chain. One advantage of using ontologies that there is a lot of work performed and tools such as Protégé that can be used in conjunction with XBRL technologies. The major benefit of using ontologies would be the transparent integration of different financial systems. An example could be the use of different names for the same concept in different departments of the same organization such as personnel and personnel expenses; instead of manually merging those accounts, a possibility is to access them through ontologies.

On the other hand, ontological engineering refers encompasses a set of activities conducted during conceptualization, design, implementation and deployment of ontologies [3]. Previous works in ontological engineering processes can be adapted to processes for XBRL engineering, i.e., processes for defining and extending taxonomies. In this respect, Piechocki *et al.* [6] have defined a process model for engineering XBRL taxonomies based on software and ontology engineering. The problem is that the creation of ontologies is not straight forward and there are several modelling methodologies and guidelines to do so.

The use of ontologies is highly related to the semantic Web and make use of the technologies described with Web services in addition to further standards such as OWL (Ontology Web Language)[17] and the RDF (Resource Description Framework)[18]. As before, all these standards are open and developed by the W3C.

5. Conclusions and Future Work

XBRL (eXtensible Business Reporting Language) is becoming the standard for reporting financial data since gained support from mayor regulators like SEC in the US and in Europe with the Basel II framework.

XBRL itself is just a language that enables preparation, analysis and communication of business information. Those benefits include cost savings, greater efficiency, accuracy and reliability to all activities involved in supplying or using financial data. The popularity of XBRL as an open standard is the great support achieved by XBRL International,a not-for-profit consortium consisting of about 450 members around the world by the major accounting firms, software vendors like Microsoft, IBM or SAP, stock exchanges, banks, data providers accounting bodies, etc.

This paper provided an overview of XBRL and related technologies including some extension such as the semantic Web and Web services as future challenges when implementing XBRL capable tools.

Future work will be to analyse and tackle problems that are still not solved with the implementation of XBRL technologies. For example, one problem that remains is that does not completely resolve the problem of diverse accounting practices in different countries. We briefly described how XBRL ontologies could be used to tackle this problem.

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17 *http://www.w3.org/TR/owl-features/*

18 *http://www.w3.org/RDF/*

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