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## XBRL

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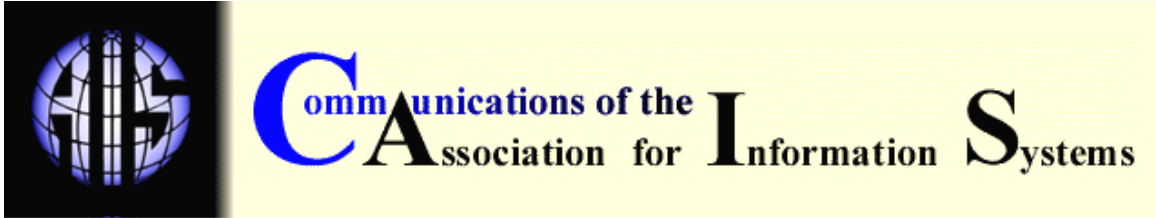
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## XBRL

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### ABSTRACT

XML (eXtensible Markup Language), with wide-ranging applications in business and other applications, is hailed as a revolutionary advance in data transfer and information identification on the Internet. This tutorial explores XML applications in business transactions and then focuses on XBRL (eXtensible Business Reporting Language). XBRL is an application of XML in financial reporting. XBRL uses accepted financial reporting standards, and allows automatic exchange and reliable extraction of financial statements across all software and technologies. XBRL includes a well-defined dictionary of markups and is supported by many supplementary technologies. This tutorial explores the following aspects of XBRL: markups, documents and schemas; transformation and processing technologies that support XBRL; tools and software that enable real-world implementation of the language; and audit and control issues associated with XBRL.

**Keywords:** XBRL, XML, markup languages

### I. INTRODUCTION TO XML-BASED LANGUAGES IN BUSINESS

The Internet spins a vast web of information across the globe. Data and information flow freely – available to anyone for learning, understanding, and analysis. Organizations can cooperate across departments, regions, and countries. ERP and ERP II herald the era of intra- and inter-business collaboration. Although data can move freely, it is not standardized. Data streams have no universal meanings. As such, data are not understood by all systems, analyzed easily, translated across different languages, and human readable, among other things. Specialized hardware and software is needed for data decoding. If the required tools are not available, then the user is out of luck. This problem is not confined to the Internet.

A great deal of money, by one estimate almost 20% of US GNP, is spent on generating new information, and over 90% of this information is in documents, not in databases [Anonymous, 2003]. Businesses in the US produce approximately 100 billion documents per year [Anonymous, 1995]. This information is stored in various formats across a range of computer systems. Disparate storage formats cause severe problems in accessing, searching, and distributing information.

Any combination of IT products and services that manages information across diverse software and hardware platforms (i.e., a solution) must address the following key requirements:

1. These solutions should be transparent to the users. The technical details should not be handled by the users.

2. Users should be able to save data and information in the desired format, such as databases, text files, or proprietary formats.
3. A solution must retrieve data and information intelligently. The solution should be knowledgeable regarding meaning of the information itself.
4. The solution should be capable of providing the desired output – print, screen, web, or CD/DVD format.

XML (eXtensible Markup Language) is designed to meet these requirements. Needless to say, XML will not solve all information management problems and certainly not in a short time. XML, the first step, is hailed [Ray, 2001] as a revolutionary advance in data transfer and information identification on the Internet.

XML specification 1.0 (<http://www.xml.com/axml/testaxml.htm>) establishes rules for creating XML. Over time, a large number of XML business applications were developed. A representative set of these developments are shown in Table 1.

Table 1. Typical XML-Based Specifications for Business Transactions

<b>Business Activities</b>	<b>Transaction Type</b>	<b>XML Application</b>
Revenue Activities	<ul style="list-style-type: none"> <li>• Sales Order</li> <li>• Credit Approval</li> <li>• Shipping</li> <li>• Billing</li> <li>• Payment</li> </ul>	ebXML BASDA e-Business XML BizCodes cXML ECML IOPT VISA XML Specification XML Voucher BIPS
Expenditure Activities	<ul style="list-style-type: none"> <li>• Review of Inventory</li> <li>• Choosing a Supplier</li> <li>• Purchase Order</li> <li>• Receipt of Goods</li> <li>• Receipt and Payment of the Bill</li> </ul>	cXML eCX XML XML-EDI ECML IOPT VISA XML Specification XML Voucher BIPS XML UPS Tracking
Production Activities	<ul style="list-style-type: none"> <li>• Product Design</li> <li>• Production Planning and Control</li> <li>• Manufacturing</li> <li>• Inventory Control</li> </ul>	PDML PDX
Finance	<ul style="list-style-type: none"> <li>• Derivatives, Interest Rate Swaps</li> <li>• Capital Markets</li> <li>• Transfer of Financial Data</li> </ul>	fpML FinXML FIXML RIXML MDML IFX OFX
Financial Reporting	<ul style="list-style-type: none"> <li>• Source Journals</li> <li>• General Ledger</li> <li>• Financial Reporting</li> </ul>	XBRL

Source: <http://www.xml.org>

XBRL (eXtensible Business Reporting Language), an application of XML, is an electronic format for simplifying the flow of financial statements, performance reports, accounting records, and other financial information between software programs. XBRL is the accounting industry's method of taking standard business reporting data and transforming it into digital form [Willis, Tesniere, and Jones, 2002]. Financial data consists of financial statements, cost accounting data, and tax information. Prior to XBRL, it was not possible to transfer, analyze, and understand this data in a standard way. XBRL standardizes financial data transfer and enables preparation and publication of that information in a desired format. XBRL is finding worldwide acceptance. It is backed by major businesses, accounting institutes, and governmental agencies world-wide.

## II. WHAT IS XBRL?

XBRL (eXtensible Business Reporting Language) was formerly known as XFRML (eXtensible Financial Reporting Modeling Language). The XBRL initiative started in 1998 under the auspices of AICPA (American Institute of Certified Public Accountants). The potential of this project soon became clear and XBRL.org was formed to coordinate efforts. XBRL.org is now an independent organization called XBRL International (<http://www.xbrl.org/>) that supports XBRL standards. This organization is a non-profit consortium with more than 170 members at the beginning of 2004 (<http://www.xbrl.org/aboutus/index.asp?sid=18>). XBRL International sets XBRL specifications. These specifications and the other ancillary specifications are royalty-free, in the public domain, and freely licensed to any user. The timeline for the development of XBRL is presented in Table 2.

Table 2. Timeline for XBRL

Year	Developments
1997	Charlie Hoffman, (CPA, Knight Vale & Gregory, Washington, US) proposes using XML for financial reporting
1998	AICPA conducted a pilot study to build a prototype – called XFRML (eXtensible Financial Reporting Modeling Language)
1999	AICPA forms a steering committee – XBRL.org. About a dozen companies join the effort
2000	XFRML becomes XBRL First specification released US CI (Commercial and Industrial Firms) taxonomy released APRA (Australian Prudential Regulatory Authority) is the first company to implement XBRL 1.0
2001	Specification 2.0 for XBRL released Core requirements for General Ledger released
2002-03	Draft of taxonomy for IASC (International Accounting Standards Committee) released Several International Symposia held More than 170 organizations joined the effort under the umbrella of <i>XBRL International</i>
2004	XBRL Specification 2.1 approved.

XBRL uses accepted financial reporting standards, and allows automatic exchange and reliable extraction of financial statements across all software and technologies. This definition is inclusive and not exhaustive. XBRL is financial reporting oriented and not transaction oriented. It aims to streamline the financial supply chain: companies, the accounting profession, the data aggregators, the investment community, the accounting software vendors, and other users [Hoffman and Strand, 2001]. The properties of XBRL are shown in Table 3.

Table 3. XBRL PROPERTIES

<p><b>XBRL IS</b></p> <ul style="list-style-type: none"><li>▪ XML based standard format for financial reporting</li><li>▪ XBRL facilitates drill down of information</li><li>▪ XBRL is extensible, users can increase its applicability</li><li>▪ XBRL can be used transfer a single item of financial data or a financial database</li><li>▪ XBRL standards are in the public domain</li></ul> <p><b>XBRL is NOT</b></p> <ul style="list-style-type: none"><li>▪ XBRL does not set new accounting standards</li><li>▪ XBRL does not create a generic chart of accounts</li><li>▪ XBRL does not translate GAAP (Generally Accepted Accounting Principles)</li><li>▪ XBRL is not a privately owned standard</li><li>▪ XBRL does not capture data at the transaction level</li></ul>
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## MARKUPS

XBRL is a markup language. As such we need to understand specified markups, definitions of markups, and existing mechanisms to validate those markups<sup>1</sup>.

Markups (also referred to as tags) are all notations in a document that are not content. Content refers to information contained in the document, such as financial data, product specifications, news, catalogs, and contracts. Markups can be any sequence of characters or symbols that is inserted in the document to provide information concerning formatting, printing, appearance, or most importantly providing information about the content. Markups are not unique to electronic documents; for example, headings, punctuation, and paragraphs provide information about content of a paper document and help human reader navigate the document. Also, markups such as annotations, wavy underlines, or special symbols are used to guide the printer or compositor. Markups for electronic documents perform a similar function by providing information about content, format, printing, and processing of a document.

Markups can be of two types – procedural and descriptive (also known as generic markups). Procedural markups specify how to process the text and primarily deal with formatting and presentation of the document and not with the content. These are software specific, for example, formatting markups, codes, or tags used by Word or WordPerfect. Move right margin by ¼<sup>th</sup> inch, skip the line, and go to new page are instances of the procedural markups used by word processing software. Since procedural markups do not contain information regarding content and are proprietary; they cannot be communicated between software packages and operating systems. Organizations store content in various formats across various departments and computer systems such as word processor files, spreadsheet files, and database files. These formats mostly use procedural markups and do not talk to each other. They cause difficulties in content management.

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<sup>1</sup> [www.xml.org](http://www.xml.org) provides a thorough description of markups.

Descriptive markups, on the other hand, contain information about the logical structure of text and content in the document. The basic premise behind descriptive markup is to keep the content separate from the style of the document. Descriptive markups can help in identifying elements of the document structure such as chapter, section, or a table of contents. For example, descriptive markup `<para>` tells us that either the following item is a paragraph or it is the end of the previous paragraph. These markups can also be used for presentation of content in different data formats such as HTML, PDF, or relational data tables. Descriptive markups are human and machine-readable and are in the public domain; some of the procedural markups are also human readable. However, human readability does not ensure complete understanding of the markups; some markups may make sense to machines only. Descriptive markups form the basis of markup languages.

*Markups should describe a document's structure and other attributes and should completely divorce structure from appearance while facilitating indexing and generation of selective views.* Charles Goldfarb, one of the inventors of markup languages.

## **MARKUP LANGUAGES**

Markup languages are not programming languages but they basically allow for representation of text in electronic form. Markup languages specify the following rules:

- A dictionary of markups allowed
- Meaning of markups
- When and where the markup is required
- Distinguishing a markup from the text

Markup languages deal with the problem of content management by providing a set of conventions that can be used for encoding texts. SGML (Standard Generalized Markup Language) is one of the first standardized markup languages. Most of today's markup languages, including XML and XBRL descended from SGML. Markup languages also require supplementary technologies to create, process, and transfer documents containing markups.

## **METALANGUAGE**

XBRL, similar to XML and SGML, is a markup language and metalanguage [XBRL Specifications 2.0 and 2.1, 2001 and 2004]. A metalanguage does not define a language but allows us to create a consistent markup language by providing the mechanics of a formal description of markup language (similar to providing grammar for the language). XBRL developers in national and international accounting bodies developed a well-defined dictionary of markups using the metalanguage abilities of XBRL. XBRL is also supported by a host of supplementary technologies.

This tutorial now explores the following aspects of XBRL:

- XBRL markups, XBRL documents and XBRL schemas that validate these documents.
- Transformation and processing technologies that support XBRL.
- XBRL tools and software that enable real-world implementation of the language.
- Audit and control issues associated with XBRL.

### III. STRUCTURE OF XBRL

#### XBRL Taxonomies

Because XBRL handles financial data, markups or tags that describe financial statement items such as inventory, receivables, and net income are required. Remember, these financial statement elements are related; for example, current assets can be calculated from cash, accounts receivable, and inventory, among other things. The problem is that neither a standard definition of individual items nor an internationally acceptable format for financial statements exists. Furthermore some terminology is industry and/or firm-specific; banks use different terms than say an automobile manufacturer. Within banks, different levels of voluntary disclosures are bank-specific. Comprehensive definitions are needed that take care of differences in the GAAP, differences in industry and firm terminology, and also factor in relationships between the financial statement elements.. A great deal is being asked of a markup language.

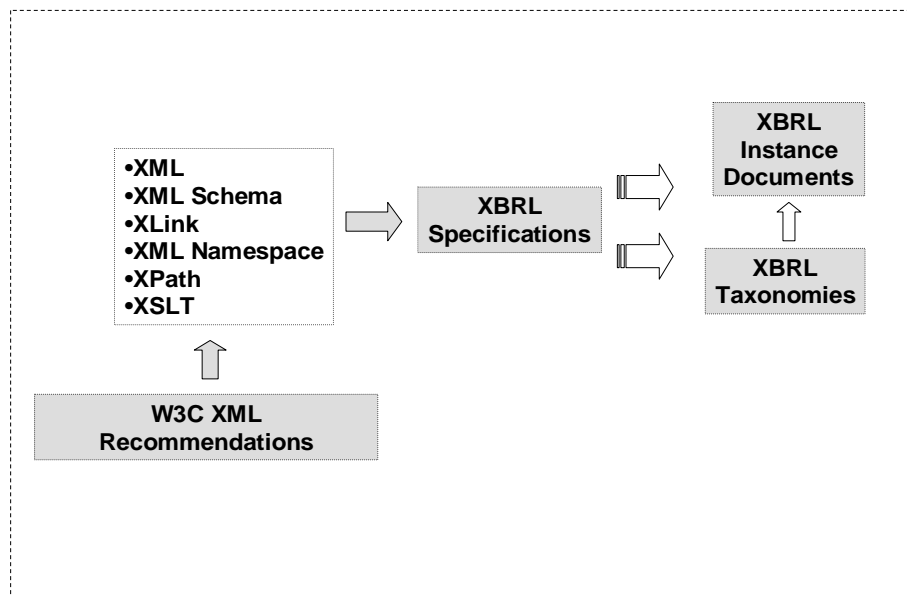


Figure 1. XBRL Taxonomies I

As shown in Figure 1, the XML specifications XML Schema, XLink, XML Namespace, XPath, and XSLT are used to develop XBRL specifications.<sup>2</sup> An XBRL specification such as 2.0 is a set of normative rules that tells the coder how to develop valid XBRL instance documents and taxonomies needed to markup financial reports [XBRL Specifications 2.0 and 2.1, 2001 and 2004].

**Instance Document.** Conceptually, an instance document is a collection of marked up financial facts and a taxonomy document provides meanings, definitions, and interrelationships among those facts. The XBRL specification defines XML elements and attributes that are used to create XBRL instance documents. The taxonomies are developed by the concerned users; they may be national accounting bodies, specific industry groups, or individual firms. The XML metamodel in

<sup>2</sup> Please refer to <http://www.xml.org/> for detailed description of these terms.

the XBRL specification provides a language that can be used to define new elements and taxonomies of elements as desired by the users.

**Taxonomy.** Taxonomy refers to a particular classification system. A taxonomy document, in XML terms, is a dictionary of markups. Taxonomies define content of the document and in essence are XML schemas. The XBRL taxonomy is a dictionary or a classification system for financial facts that come from standard accounting practices [XBRL FAQ, 2003]. The taxonomy also provides relationship between those concepts and can even supply calculations to express those relationships.

No single taxonomy can cover the world's diverse need for financial reporting (Figure 2).

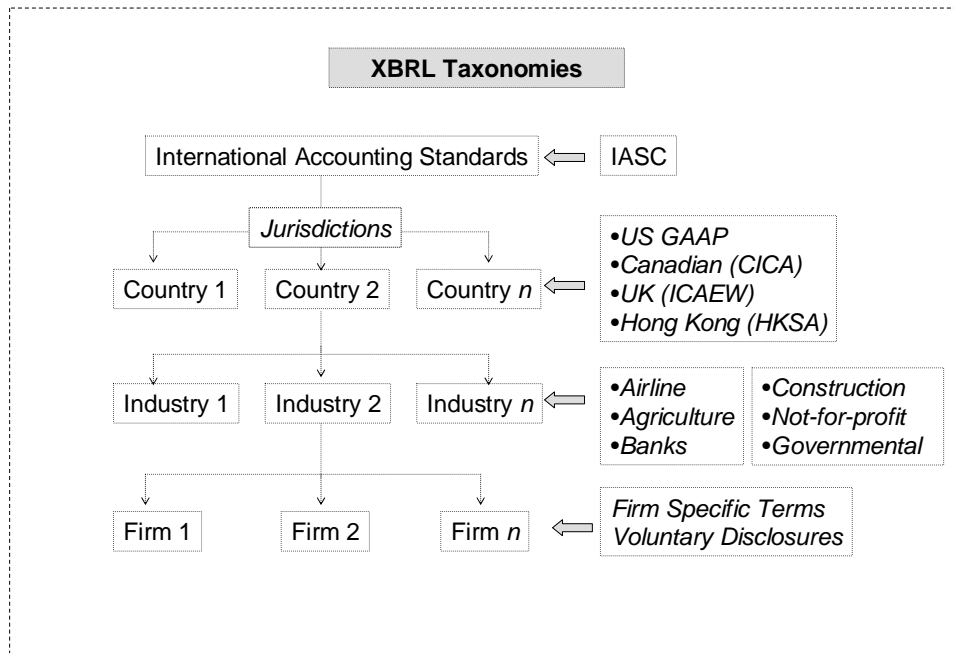


Figure 2. XBRL Taxonomies II

### SIDEBAR 1. THE WORLD WIDE XBRL EFFORT

Outside the United States, initial emphasis was on developing the taxonomy for IAS (International Accounting Standards). Not all countries adopted IAS. The concurrent efforts focus on developing taxonomies for each country. This effort is ongoing, with different countries at different levels of development. Almost all major industrial countries have initial taxonomies for country-specific GAAP in place. The next level is to develop taxonomies for each industry within the country. The requirements and terminology for each industry is different and we need taxonomy to cover each industry. The IAS, country-specific GAAP, and industry-specific terminology taxonomies will be in the public domain. Finally, taxonomies to cover firm-specific terminology and voluntary disclosures by individual firms are also needed. A firm may also develop taxonomy for internal reporting and/or consolidations, which may not be in the public domain.

XBRL is extensible and allows development of new markups, which are compatible with the existing framework as long as the rules of XBRL are followed. The illustrative examples of the



following taxonomies in the United States indicate extensive efforts and wide range of applications in this area:

- XBRL for Financial Statements
- XBRL for Management Reporting
- XBRL for General Ledger
- XBRL for Tax Returns
- XBRL for EDGAR Filings
- XBRL for Assurance Services (Audit Schedules)
- XBRL for Authoritative Literature
- XBRL for Business Reporting
- Industry Specific Taxonomies
- Taxonomies created by private parties for internal reporting purposes

Taxonomy creation is a complex, multidisciplinary task. People involved must know both relevant accounting principles and XBRL specifications. Financial facts can be collected by reviewing, financial statements, annual reports, and relevant accounting standards. These facts need to be formatted according to XBRL specification to create XBRL compliant taxonomy. Once created, taxonomies undergo several levels of review to ensure accuracy and completeness.

Table 4. US GAAP Commercial and Industrial Taxonomy (US GAAP CI)Directory Detail

<i>ID</i>	22
<i>PreferredNamespace Prefix</i>	us-gaap-ci
<i>Official Name</i>	US GAAP CI Taxonomy
<i>Namespace Identifier</i>	<a href="http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15">http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15</a>
<i>Description</i>	This financial reporting taxonomy is intended to provide detail level accounting terms that will allow commercial and industrial-type companies that conform to US GAAP to tag financial statements in XBRL.
<i>Taxonomy Date</i>	2002-10-30
<i>XBRL Version</i>	XBRL V2
<i>Current Location</i>	<a href="http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15/us-gaap-ci-2002-10-15.xsd">http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15/us-gaap-ci-2002-10-15.xsd</a>
<i>Status</i>	Public Working Draft
<i>Home page or printout of Taxonomy</i>	<a href="http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15/default.htm">http://www.xbrl.org/taxonomy/us/fr/gaap/ci/2002-10-15/default.htm</a>

### The US GAAP CI Taxonomy.

The taxonomy directory details for US GAAP CI are shown in Table 4 [XBRL US Domain Working Group, 2003]. This directory can be used by commercial and industrial firms in the US to develop financial statements using XBRL. This taxonomy is in a public working draft stage and is a work in progress [Bovee, Ettredge, Srivastava, and Vasarhelyi, 2002]. It combines different taxonomies for delivering financial statements. These different taxonomies are: XBRL International's INT-GCD (Global Common Document) and INT-AR (Accountant's Report); XBRL US taxonomies USFR-NAMDA (Notes and Management Discussion Analysis), USFR-GFC

(General Concepts), USFR-PT (Primary Terms), USFR-SEC-CERT (SEC Officers Certification, mandated by Sarbanes-Oxley Act of 2002), and USFR-MR (Management Reports). These taxonomies together meet the financial reporting needs of companies that follow FASB (Financial Accounting Standards Board) standards. They can be roughly grouped under commercial and industrial categories, and provide commonalities in reporting elements in their financial statements.

Table 5. Partial Description of Elements in the US GAAP CI Taxonomy

ID	Weight	Balance	Type	NS	Label	Description	Reference
303	0	Debit	Monetary	usfr-gc	Assets (usfr-gc: Assets)	Probable future economic benefit obtained or controlled by an entity.	Statements on Financial Accounting Concepts 6
304	1	Debit	Monetary	usfr-pt	Current Assets (usfr-pt: TotalCurrentAssets)	Sum of all current assets - those assets that are reasonably expected to be realized in cash or sold or consumed within a year or within the normal operating cycle of the entity	
305	1	Debit	Monetary	usfr-pt	Cash, Cash Equivalents and Short Term Investments	Cash and short term investments with an original maturity less than one year, including restricted cash.	
306	1	Debit	Monetary	usfr-pt	Cash and Cash Equivalents (usfr-pt: CashCashEquivalents)	Cash and short term, highly liquid investments that are readily convertible to known amounts of cash and are so near their maturity that they present negligible risk of changes in value due to changes in interest rates - usually with an original maturity less than 90 days, This includes restricted cash, treasury bills, commercial paper and money market funds and other operating cash balances	SFAS (Statements on Financial Accounting Standards) 6; ARB (Accounting Research Bulletin) 43 6
307	1	Debit	Monetary	usfr-pt	Cash (usfr-pt: Unrestricted Cash)	Unrestricted cash available for day-to-day operating needs	SFAS 95 7
318	-1	Credit	Monetary	usfr-pt	Allowance for Doubtful Accounts (usfr-pt: AllowanceDoubtfulAccounts)	Estimate of uncollectible trade A/R that reduces the gross receivable to the amount expected to be collected	

A taxonomy consists of elements, attributes, or datatype definitions. The taxonomy may also include relationship between elements or relationship of elements in one taxonomy with elements of another taxonomy. Table 5 shows partial entries for current assets in the US GAAP CI taxonomy. Each row corresponds to one element. The taxonomy contains the following details:

- ID: The unique number of the element in the taxonomy.
- Weight: The relationship with the parent elements. A weight of 1 indicates that all the child elements values are multiplied by 1 and added up or rolled up. This summation or rolling up gives us the value of parent element. For example, parent element *Current Assets* can be derived by adding child elements such as cash and AR, inventory. The account Allowance for Doubtful Accounts needs to be subtracted (indicated by -1) from Accounts Receivable Trade to obtain Net Receivables. The term Assets indicates a weight of 0 meaning no further roll up is involved.
- Balance: Indicates whether the balance is debit or credit.
- Type: The data type such as monetary, text, shares, or decimals.
- NS (Namespace): Refers to the taxonomy to which the element belongs. Since US GAAP CI taxonomy combines various taxonomies we see references to different taxonomies in this column.
- Label/Description: A name of the financial elements is provided with a description of that element. There can be multiple labels in different languages.
- References: This column refers to the authoritative literature used to obtain a description of the financial element. The reference mentioned can include reference name of the literature, reference number of the literature, reference chapters, and reference paragraphs and subparagraphs. The description for the term *Assets* comes from Statement of Financial Concepts 6; if desired more details can be accommodated.

There are two views of the taxonomy; the first one shows the taxonomy in a tree view, which is shown in Table 6. This view starts with *Document and Entity Information* that deals with name of the company and the author(s) of the document. Then Table 6 shows sequential elements of the financial statements, for example, assets followed by details of assets such as current assets and noncurrent or long-term assets.

Table 7, on the other hand, shows the dictionary form taxonomy elements, which provides definitions of cash related elements are highlighted. Note that element numbers are different in the dictionary view.

This entire taxonomy contains 1,460 elements that are required to describe the core financial statements under US GAAP CI. These elements can be used to create Income Statement, Balance Sheet, Statement of Cash Flows, Statement of Stockholder's Equity, Notes and Management Discussion and Analysis, Auditor's Report, Management Report, and SEC Officers Certification.

Table 6. Taxonomy Elements: Tree and Dictionary View

Table 7. Dictionary View

Technically, a XBRL taxonomy document is a valid instance of XML Schema document and generally consists of a package of six interrelated XML files. The contents of each row shown in Figure 3 on the next page are stored in this package of XML files. These files are: XML Schema File (.XSD file) and XML Linkbases (.XML files). The XML Linkbases further consist of five files: references, presentation information, calculation relationship between elements, labels, and definitional relationship between elements. The reference file provides references to the authoritative literature. These references can be detailed and drill down up to paragraphs and subparagraphs of the relevant literature. The presentation file contains an order in which elements described in the taxonomy appear in the financial statements. The order presented is not applicable in every circumstance; however, it represents the most common way to present the information. The calculation file contains the information about weights. A weight of 1 indicates that this particular element will be added with other child elements to derive a parent element. A weight of -1 indicates that this element will be subtracted to derive the value of parent element. The labels file provides a complete description of each element in the taxonomy. The description can be in different languages such as Japanese or German. The definition file creates the parent-child relationships that are required to generate financial statements. These Linkbases are connected to each other to facilitate data retrieval.

Figure 3 shows how the element *Cash* is stored in these different files. A beginning of the XML Schema and the description of the element *Cash* is shown in the XML format. The .XML files are complicated and contain several entries for accuracy and completeness. Figure 4 shows the partial representation of *usfr-pt-2002-10-15.XSD* file for the element *Cash*.

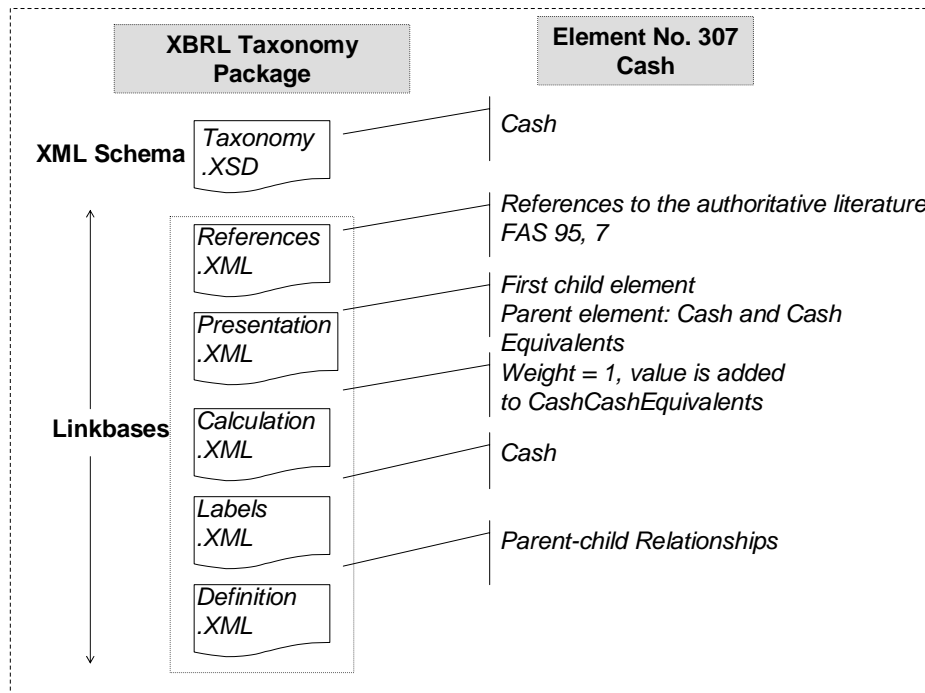


Figure 3. Taxonomy Files

```

<?xml version="1.0" encoding="utf-8" ?>
- <!-- Taxonomy based on XBRL standard v.2. Created by UBmatrix Taxonomy Builder
5.0.80. Contact www.ubmatrix.com -->

<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:xbrli="http://www.xbrl.org/2001/instance"
xmlns:link="http://www.xbrl.org/2001/XLink/xbrlinkbase"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xhtml="http://www.w3.org/1999/xhtml" xmlns:usfr-
pt="http://www.xbrl.org/taxonomy/us/fr/common/pt/2002-10-15"
targetNamespace="http://www.xbrl.org/taxonomy/us/fr/common/pt/2002-10-15"
elementFormDefault="qualified">

</element>

<element id="usfr-pt_UnrestrictedCash" name="UnrestrictedCash"
type="xbrli:monetaryItemType" substitutionGroup="xbrli:item" xbrli:balance="debit">

<annotation>
<documentation>Unrestricted cash available for day-to-day operating
needs</documentation>
</annotation>
</element>

```

Figure 4. Partial Representation of usfr-pt-2002-10-15.XSD File

### XBRL INSTANCE DOCUMENTS

Once the taxonomies are in place, users can create XBRL instance documents. XBRL instance documents describe financial facts; from a single item such as Current Assets to a complete Annual Report. To create these instance documents we need taxonomies since taxonomies provide definitions and XBRL formats for these financial facts. The process as shown in upper half of Figure 5 involves of the following steps:

1. Generate financial data using accounting software. XBRL compliant software can create instance documents without any intervention. If not, data can be entered manually or exported to the third-party XBRL software.
2. Use the appropriate taxonomy. For example, in preparing financial statements of commercial and industrial companies under US GAAP, the US GAAP CI taxonomy discussed in the previous subsection will be required. No single taxonomy is adequate to cover all financial reporting needs of corporations. Software for creating extensions to XBRL is required before XBRL is widely adopted and used. Currently, most of the major accounting software vendors are working on creating those tools. A detailed discussion of existing state-of-the art of these tools is in Section IV.
3. Map the data generated by the accounting software to the taxonomy. Most of today's software provides manual drag and drop to map the data to taxonomies. This method is available in Word and Excel in Microsoft Office 2003.
4. Create an instance document.

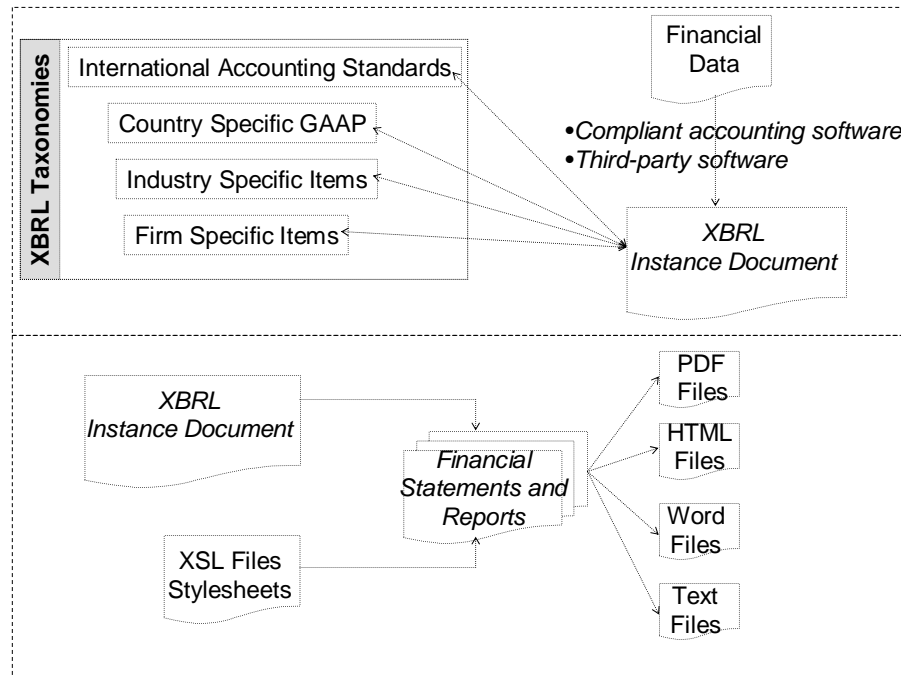


Figure 5. XBRL Instance Documents I

5. Map the data generated by the accounting software to the taxonomy. Most of today's software provides manual drag and drop to map the data to taxonomies. This method is available in Word and Excel in Microsoft Office 2003.
6. Create an instance document.

In summary,

- The instance document is XML and XBRL compliant
- The instance document contains company financial data
- The instance document uses both industry created taxonomies and company-specific extensions to XBRL taxonomy
- The instance document can now be transformed into report format or can be processed by other software programs

### HUMAN INTERFACE

XBRL facilitates data transfer not data formatting. XBRL does not create reports in a WYSIWYG formats. The XBRL instance documents require a stylesheet that formats an XBRL document properly. This process is shown in the lower half of Figure 5. XBRL files use separate XML style sheets files (.XSL files). These files can format documents in the required format, for example, as a PDF file, HTML file, or Word file. These style sheets can be developed using several software languages; however, XML tools are rapidly being developed to standardize and simplify the process.

The typical structure of XBRL instance documents is shown in Figure 6.

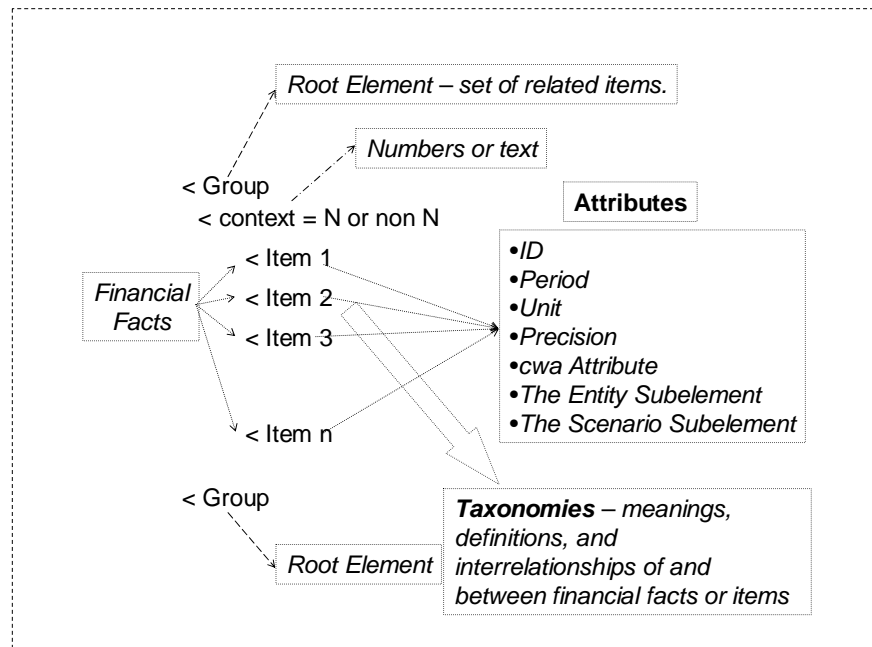


Figure 6. XBRL Instance Documents II

Technically, XBRL instance documents follow the syntax defined by XBRL. This syntax enables software applications that process instance documents to find, extract, and analyze financial facts efficiently and effectively. Syntax is defined using an XML Schema that defines the following elements:

- item,
- context,
- tuple (one row or one record), and
- group.

An item represents a single financial fact or business measurement. Financial facts can be numbers or text such as notes to the financial statements. The context elements (numeric context or non numeric context) hold the necessary information for providing proper context to the financial facts. The context elements contain the following attributes (or characteristics):

- ID: This attribute identifies the context – numeric or non numeric.
- Period: This attribute provides chronological background to the item. For example, *instant* refers to a specific point in time and is useful for balance sheet and statement of cash flows. Another description *duration, endDate* means a period of given length of time, ending as specified, and is useful for describing income statement.
- Unit: Unit specifies a relevant standard for measurement. For monetary measurements we use standard currency designations such as dollars..
- Precision: Precision shows the arithmetic precision of the measurement. For example, precision="10" means numbers can be expressed up to ten significant decimal digits.
- cwa Attribute: cwa refers to closed world assumption. If this condition is true then the information in the document is complete and new values can be calculated based on



data in the document. If false, don't attempt to calculate new values. This attribute is applicable only in the numeric context.

- The Entity Sub-element: This sub-element identifies the organization (name of the company, department, individual, etc.) to which the document pertains.
- The Scenario Sub-element: This sub-element enables handling of actual, reported, budgeted, restated, and pro-forma formats. Additional valid markups for internal reporting purposes can be designed and used because of this sub-element.

The tuple element allows management of interdependent business facts. For example, a manager's name can be associated with the manager's title and a set of facts – manger's title/manager's name – can be used in multiple occurrences. The last element in this series is the group element. This element 'group' is a general mechanism that helps in combining related items. It is the designated root element for XBRL instance documents.

### EXAMPLE XBRL INSTANCE DOCUMENT

Figure 7 shows the XBRL instance document for Microsoft Corporation's Cash Flow Statement as on June 30, 2002. The line numbers were added to the instance document to provide easy reference in the following explanations. This explanation is modeled after Richard, 2002 working paper series. Because the document is simple, not all lines are explained.

Line 1 indicates that this document is an XML document based on XML recommendation 1.0. The encoding employed is utf-8 (UCS Transformation Format 8) as defined by the ISO standards.

Line 2 is a comment indicating that this document was written at University of Kansas in XBRL version 2.0.

Line 3 starts with <group, which is a root element. In this XBRL instance document, we are combining statements of cash flow related items.

The xmlns in line 3 implies that a namespace declaration is being made, followed by a colon that separates xmlns and the namespace prefix. This namespace declaration allows software applications to detect XBRL documents and/or to differentiate taxonomies in the same document. After the equal sign, the location for the namespace, in this case web address, is shown in the double quotations. Line 3 associates the taxonomy for XBRL instance to the default namespace. Note that group element also occurs on the last line 73 following XML conventions.

Lines 4-6. The namespaces used in lines 4, 5, and 6 are ci, KU, and ku. These namespaces are for taxonomies, we know the taxonomy is US GAAP CI; two other taxonomies at Kansas University (KU and ku) are also being used.

Lines 7 and 8 define the link namespace and the xsi namespace.

Line 9 identifies the schema file (xbrl-instance.xsd) defining the taxonomy referred to in Line 8.

Line 10 refers to the attributes that apply to all items in the group. Numeric context refers to type of data required to provide context for a financial fact; in this case the data type is numeric since we are dealing with the cash flow statement. The maximum number of digits that will be used by any item in the group is ten, which is defined by precision. The term cwa refers to a closed world assumption; this condition is false which means that processing application should not calculate new values based on the information given in this instance document. If the cwa assumption is false, then the XBRL document does not hold all the facts necessary to perform further computations.

Line 11, 12, and 13 identify the entity to which the information relates, in this case Microsoft. Entities can also describe the subsidiary of a company, departments, or cost/revenue centers.

```

01 <?xml version="1.0" encoding="utf-8" ?>
02 - <!-- KU: XBRL v.2 -->
03 - <group xmlns="http://www.xbrl.org/2001/instance"
04 xmlns:ci="http://www.xbrl.org/us/gaap/ci/2001/us-gaap-ci-2001"
05 xmlns:KU="http://www.fraank.eycarat.ukans.edu/taxon"
06 xmlns:ku="http://www.fraank.eycarat.ukans.edu/taxon"
07 xmlns:link="http://www.xbrl.org/2001/XLink/xbrllinkbase"
08 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemalocation="http://www.xbrl.org/2001/instance
09 xbrl-instance.xsd">
10 - <numericContext id="NC1" precision="10" cwa="false">
11 - <entity>
12 <identifier scheme="www.sec.gov">Microsoft</identifier>
13 </entity>
14 - <unit>
15 <measure>ISO4217:USD</measure>
16 </unit>
17 - <period>
18 <instant>2002-06-30</instant>
19 </period>
20 </numericContext>
21 <ci:netCashFlowsOperatingActivitiesIndirect.netIncome numericContext="NC1" label="Net
22 < income">7.829E9</ci:netCashFlowsOperatingActivitiesIndirect.netIncome>
23 <ci:adjustmentsToReconcileCashFlows.depreciationAmortizationCashFlowsReconciliation numericContext="NC1"
24 label="Depreciation amortization and other noncash
25 items">1.084E9</ci:adjustmentsToReconcileCashFlows.depreciationAmortizationCashFlowsReconciliation>
26 <KU:unknown numericContext="NC1" label="Net recognized (gains)/losses on
27 investments">2.424E9</KU:unknown>
28 <ci:adjustmentsToReconcileCashFlows.otherAdjustments numericContext="NC1" label="Stock option income tax
29 benefits">1.596E9</ci:adjustmentsToReconcileCashFlows.otherAdjustments>
30 <ci:adjustmentsToReconcileCashFlows.changesInDeferredIncomeTaxes numericContext="NC1" label="Deferred
31 income taxes">-4.16E8</ci:adjustmentsToReconcileCashFlows.changesInDeferredIncomeTaxes>
32 ci:adjustmentsToReconcileCashFlows.otherAdjustments numericContext="NC1" label="Unearned
33 < revenue">1.1152E10</ci:adjustmentsToReconcileCashFlows.otherAdjustments>
34 <KU:unknown numericContext="NC1" label="Recognition of unearned revenue">-8.929E9</KU:unknown>
35 <ci:changeInWorkingCapitalIndirect.changeInReceivables numericContext="NC1" label="Accounts receivable">-
36 1.623E9</ci:changeInWorkingCapitalIndirect.changeInReceivables>
37 <ci:changeInWorkingCapitalIndirect.changeInOtherCurrentAssets numericContext="NC1" label="Other current

```

Figure 7 (continued). XBRL Instance Document

```

38 assets">-2.64E8</ci:changeInWorkingCapitalIndirect.changeInOtherCurrentAssets>
39 <ci:changeInWorkingCapitalIndirect.otherChanges numericContext="NC1" label="Other long-term assets">-
40 9000000.0</ci:changeInWorkingCapitalIndirect.otherChanges>
41 <ci:changeInWorkingCapitalIndirect.changeInOtherCurrentLiabilities numericContext="NC1" label="Other current
42 liabilities">1.449E9</ci:changeInWorkingCapitalIndirect.changeInOtherCurrentLiabilities>
43 <ci:changeInWorkingCapitalIndirect.otherChanges numericContext="NC1" label="Other long-term
44 liabilities">2.16E8</ci:changeInWorkingCapitalIndirect.otherChanges>
45 <ci:netCashFlowsOperatingActivities.netCashFlowsOperatingActivitiesIndirect numericContext="NC1" label="Net
46 cash from
47 operations">1.4509E10</ci:netCashFlowsOperatingActivities.netCashFlowsOperatingActivitiesIndirect>
48 <ci:proceedsFromIssuanceOfEquity.commonStock numericContext="NC1" label="Common stock
49 issued">1.497E9</ci:proceedsFromIssuanceOfEquity.commonStock>
50 <ci:paymentForRepurchasesOfEquity.commonStock numericContext="NC1" label="Common stock repurchased">-
51 6.069E9</ci:paymentForRepurchasesOfEquity.commonStock>
52 <ci:netCashFlows.netCashFlowsFinancingActivities numericContext="NC1" label="Net cash used for financing">-
53 4.572E9</ci:netCashFlows.netCashFlowsFinancingActivities>
54 <ci:paymentsForAssets.propertyPlantAndEquipment numericContext="NC1" label="Additions to property and
55 equipment">-7.7E8</ci:paymentsForAssets.propertyPlantAndEquipment>
56 <ci:paymentsForAssets.purchasesPaymentsForInvestments numericContext="NC1" label="Purchases of
57 investments">-8.9386E10</ci:paymentsForAssets.purchasesPaymentsForInvestments>
58 <ci:proceedsFromSalesMaturityOfAssets.investmentProceeds numericContext="NC1" label="Maturities of
59 investments">8654000.0</ci:proceedsFromSalesMaturityOfAssets.investmentProceeds>
60 <ci:proceedsFromSalesMaturityOfAssets.investmentProceeds numericContext="NC1" label="Sales of
61 investments">7.0657E10</ci:proceedsFromSalesMaturityOfAssets.investmentProceeds>
62 <ci:netCashFlows.netCashFlowsInvestingActivities numericContext="NC1" label="Net cash used for investing">-
63 1.0845E10</ci:netCashFlows.netCashFlowsInvestingActivities>
64 <ci:endOfPeriodCashAndCashEquivalents.netCashFlows numericContext="NC1" label="Net change in cash and
65 equivalents">-9.08E8</ci:endOfPeriodCashAndCashEquivalents.netCashFlows>
66 <ci:netCashFlows.effectOfExchangeRateOnCash numericContext="NC1" label="Effect of exchange rates on cash
67 and equivalents">2000000.0</ci:netCashFlows.effectOfExchangeRateOnCash>
68 <ci:endOfPeriodCashAndCashEquivalents.beginningOfPeriodCashAndCashEquivalents numericContext="NC1"
69 label="Cash and equivalents beginning of
70 year">3.922E9</ci:endOfPeriodCashAndCashEquivalents.beginningOfPeriodCashAndCashEquivalents>
71 <ci:cashFlows.endOfPeriodCashAndCashEquivalents numericContext="NC1" label="Cash and equivalents end of
72 year">3.016E9</ci:cashFlows.endOfPeriodCashAndCashEquivalents>
73 </group>

```

Figure 7(cont.). XBRL Instance Document

Lines 14 through 16 describe the unit of measurement, US dollars for our document.

Lines 17 through 19 identify the period for the statement of cash flows. It is a date or an instant; in this case 2002-06-30. XBRL can accommodate different date formats.

Lines 21 to 72 describe various items that constitute statement of cash flows.

In line 21, ci refers to the taxonomy namespace defined in line 4, then the item or element name is given.

The name in line 23 indicates that the program is calculating net cash flows from operating activities using the indirect method. The label for the first item is net income. The numeric context is defined earlier and labeled as NC1. The amount is mentioned between greater than and less than signs. The lines numbers up to 72 describe various items in the statement of cash flows.

Note that negative numbers such as in line 31 have a negative sign.

<b>Microsoft Cash Flow Statement</b>	
<b>Label</b>	<b>2002-06-30</b>
Net income	7829.00
Depreciation amortization and other noncash items	1084.00
Net recognized (gains)/losses on investments	2424.00
Stock option income tax benefits	1596.00
Deferred income taxes	-416.00
Unearned revenue	11152.00
Recognition of unearned revenue	-8929.00
Accounts receivable	-1623.00
Other current assets	-264.00
Other long-term assets	-9000000.00*
Other current liabilities	1449.00
Other long-term liabilities	216.00
Net cash from operations	14509.00
Common stock issued	1497.00
Common stock repurchased	-6069.00
Net cash used for financing	-4572.00
Additions to property and equipment	-770.00
Purchases of investments	-89385.99
Maturities of investments	8654000.00*
Net cash used for investing	-10845.00
Net change in cash and equivalents	-908.00
Effect of exchange rates on cash and equivalents	2000000.00*
Cash and equivalents beginning of year	3922.00
Cash and equivalents end of year	3016.00

Note: \* All values except this are in millions

Figure 8. XBRL Instance Documents IV<sup>3</sup>

<sup>3</sup> Figures 8 and 9 taken from: <http://www.fraank.eycarat.ukans.edu/dev/Version2/V2Demo.html>. Used by permission.

This statement of cash flows is a good example of instance document, though this document does not cover all the components of XBRL syntax. It is a simple document. Adding more details increases the complexity of the XBRL instance document. The XBRL instance document in Figure 7 can be used to create the statement of cash flows in a variety of formats by creating appropriate XSL files. For example, Figure 8 shows the approximate HTML output of this XBRL instance document. Different style sheets are required for different types of output. For example, a PDF file, a Word file, and a text file will require different style sheets.

#### **IV. XBRL Tools and Software**

Because XBRL is a markup language and, in itself, does not do anything, a large number of supplementary tools are required to bring the language to life. The XBRL tools can be broadly classified into following categories:

- Taxonomy related tools
- Document instance related tools
- Programmatic tools
- XBRL repositories

Taxonomy related tools enable (1) viewing, (2) editing, and (2) building taxonomies. These tools are important because extending taxonomies are necessary for company specific financial statements.

- The XBRL viewing tools allow viewing and printing of taxonomies.
- The editing tools allow adding, deleting, or changing the existing taxonomy.
- The taxonomy building tools can be used build or create taxonomies, if necessary from scratch. These tools can also help in preparing documentation for taxonomies.

Many accounting software packages are planning to support mapping of the accounting system to the XBRL taxonomy, thereby partially automating creation of XBRL instance documents. Some tools even map data warehouses to reporting taxonomies. Third-party software packages allow creation of instance documents from scratch or editing of imported instance documents. A few software packages even process instance documents to produce generic output. Instance documents need to be validated to confirm that they match the schema specified by the XBRL specification. Some software tools can take XBRL file and check its validity against the relevant taxonomy file<sup>4</sup>.

#### **OTHER XBRL TOOLS**

The instance documents need to be accessed by the software and processed. The programmatic access to structure and data in the XBRL document is facilitated by XBRL DOM (Document Object Model). XBRL DOM is technically a software application (an API component) that is embedded in the application software such as Microsoft Excel or UB Matrix Studio. XBRL DOM makes working with XBRL instance documents user friendly, insulating the user by taking care of validating and linking tasks. XBRL DOM changes with changes in XBRL Schema specification and XBRL specification. Thus, users need not be conversant with the latest changes to validate and edit instance documents.

---

<sup>4</sup>XBRL International maintains an extensive list of tools at <http://www.xbrl.org/resourcecenter/>.

XBRL extractor tools help to extract XBRL data from web pages and other sources. Microsoft released an XBRL tool, Microsoft Investor Analyst that works with Excel and imports XBRL-formatted documents in the spreadsheet for further analysis.

### **XBRL REPOSITORIES**

XBRL repositories refer to a consolidated collection of financial statements and reports in XBRL for various companies. Currently, <http://www.edger-online.com> contains an extensive collection of SEC filings in the XBRL format. Other web-based solutions are available to convert non-XBRL documents into XBRL format. For example, the Ernst & Young research center at the University of Kansas uses an intelligent agent to extract SEC filings and convert them into XBRL format, among other things. XBRL search engines that search for XBRL on the Internet and intranets, though not yet developed, can be expected to be useful for both the financial and research communities.

### **V. Audit and Control Issues in XBRL**

The audit and control issues in XBRL are just beginning to be analyzed. XBRL applications span the entire spectrum of financial and managerial reporting. As such, these applications have the potential to affect audit and control mechanisms profoundly [The Canadian Institute of Chartered Accountants, Information Advisory Technology Committee, 2002]. The purpose of this section is not to cover all these areas; it is to briefly identify areas that are immediately affected by the introduction of XBRL. Conceptually, the simple questions are:

- How will XBRL financial statements be used? They carry all the same challenges that paper based reports contain but add the extra dimension of divisibility.
  - Will companies and auditors give assurance on XBRL instance documents as a whole?
  - What about a small piece of the whole, such as earnings per share calculation?
- How do you know if appropriate taxonomy is being used?
- How do you know if the taxonomy is correct, especially if it is internally developed?
- How do you know XBRL instance documents are properly marked up?
- How do you ensure the integrity of tagged data?
- How do you assure accuracy and integrity of stylesheets to ensure proper output?
- What are the appropriate auditing and sampling procedures to audit these control issues?

### **AUDIT ISSUES**

XBRL-tagged financial statements in the web environment, or even in a non-web environment, can be used either as a whole or in part. A financial statement can provide a hyperlink that can take user to a different analysis, presentation, or calculation. These tags may be integral to the financial statements or addenda. The audited parts of financial statements are not distinguishable from non-audited parts. The question is how far does the auditing assurance go? What are the different ways to let the user know of the audited and non-audited information? What are the auditor's duties and what type of disclosures are needed in such a case? These global questions demand answers before we even look at the mechanics of taxonomy creation and use.

## TAXONOMY APPROPRIATENESS

Numerous taxonomies can be used to create XBRL instance documents. The next area of concern is the appropriateness of the taxonomy being used, the version of taxonomy being used, the match between requirements of a financial report and taxonomies, and the accuracy of mapping financial data with the taxonomies used. If the taxonomy is internally developed it needs to be validated and vetted for accuracy and completeness. The controls over taxonomy choice, creation, and editing need to be installed and monitored. Accounting software automates many of these functions. However, the automated output needs to be evaluated on a sample basis. In addition, controls over creation, viewing and editing instance documents are required.

## MARKUP ISSUES

The XBRL instance document contains markups and these markups need to be accurate. If the document is not correctly marked up then it may not be processed correctly. Automated controls over error correction, isolation of incorrect files, and appropriate computer messages should be in place. These controls need to be validated and tested. Once the accuracy of instance documents is ensured then questions of tracking changes in those documents arise. The standardized procedures for change and maintenance of these documents need to be in place, especially if documents are displayed on the web in real-time. The issues of authorization and authentication in the networked environment need to be analyzed carefully.

The actual auditing procedures are being discussed by the profession. However, these auditing procedures are not new. Many auditing techniques are already in place for similar applications such as EDI (Electronic Data Interchange). Many standard auditing procedures in computer-based information systems are probably applicable in these areas. Accountants and auditors should be aware that the promise of XBRL carries with it some control perils.

## VI. CONCLUSION

XBRL is backed by major accounting bodies, professional accounting firms, software vendors, and even governments. It is the only XML-based initiative in the financial reporting area. XBRL taxonomies are being developed in a wide range of areas from financial statement to tax and assurance services. No doubt even more creative applications will come on line. XBRL tools are being deployed rapidly and the basic software infrastructure is in place. XBRL promises a seamless transfer of financial data across different information technologies and to overcome lingual and national barriers.

However, to fulfill these promises, substantial upfront investments are required. The richness and variations in financial reporting will probably result in complex taxonomies. Developing, validating, and maintaining these taxonomies are major tasks. Since XBRL is based on XML specifications, as XML changes XBRL needs to be updated. This task will probably be an ongoing one. The accounting software, analytical tools, skill sets for accountants, and nature of auditing and internal controls will certainly change.

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*Editor's Note:* The following bibliography contains the address of World Wide Web pages. Readers who have the ability to access the Web directly from their computer or are reading the paper on the Web, can gain direct access to these references. Readers are warned, however, that

1. these links existed as of the date of publication but are not guaranteed to be working thereafter.

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  3. the authors of the Web pages, not CAIS, are responsible for the accuracy of their content.
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#### **LIST OF ABBREVIATIONS AND TERMS**

AICPA – American Association of Certified Public Accountants

API – Application Programming Interface



AR – Accountant's Report  
ARB – Accounting Research Bulletins  
CI – Commercial and Industrial  
CICA – Canadian Institute of Chartered Accountants  
DOM – Document Object Model  
EDGAR – Electronic Data Gathering, Analysis, and Retrieval system  
EDI – Electronic Data Interchange  
ERP – Enterprise Resource Planning  
FAS – Financial Accounting Standards  
FASB – Financial Accounting Standards Board  
GAAP – Generally Accepted Accounting Principles  
GCD – Global Common Document  
GFC – General Financial Concepts  
HKSA – Hong Kong Society of Accountants  
IAS – International Accounting Standards  
IASC – International Accounting Standards Committee  
ICAEW – Institute of Chartered Accountants of England and Wales  
INT – International  
MR – Management Reports  
NAMDA – Notes and Management Discussion Analysis  
PT – Primary Terms  
SEC – Securities Exchange Commission  
SEC CERT – SEC Officers Certification  
SGML – Standard Generalized Markup Language  
US GAAP CI – United States Generally Accepted Accounting Principles Commercial and industrial  
XBRL – Extensible Business Reporting Language  
XFRML – Extensible Financial Reporting Modeling Language  
XML – Extensible Markup Language

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