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Digitizing Financial Reports – Issues and Insights: A Viewpoint

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Abstract. The era of digital financial reporting has arrived. However, many questions persist relating to how digital financial reporting will actually work and what is necessary to make it work appropriately. Technologies such as XBRL must be well understood in order to harness their power. This paper is intended to provide a thought-provoking summary of the moving pieces that must be considered by accountants and other business professionals when evaluating how digital financial reporting will be best employed for financial reporting. The paper is intended to help these business professionals understand the issues related to digitizing financial reports and maximize the potential contribution the accounting profession can make to the achievement of successful and appropriate digital financial reporting. The end result will be well-thought-out digital financial reporting. Any expression of digital financial reports must be in a form that business people understand because they are the ones who create these reports and verify that they are a sensible, logical, faithful, true and fair representation of the reporting entity's financial information. The XBRL taxonomies have been the most serious effort thus far to formalize the business rules in XBRL implementations. The XBRL technical syntax interoperability is very good, but the semantics is still a challenge. To face this, effective communication between accounting professionals and IT professionals is key.
Keywords: Digital financial reporting, XBRL

1. INTRODUCTION

Digital technology has become an integral part of society and culture. Almost all intangible products of our civilization are becoming digital: from sciences to arts and from individual information to business and public sector data. Omnipresent

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hardware devices change the way in which citizens buy, enjoy, learn or invest. As a result of regulator mandates, corporate reporting and in particular financial statements are going digital too. Financial data from corporations are an essential element of modern economies. The Great Depression after 1929 was due, among other causes, to the lack of appropriate information about the companies in which members of the public were investing their savings. Since the creation of the U.S. Securities and Exchange Commission, and similar regulatory initiatives in other countries, financial reporting has been growing in relation to the amount of data available, and its format has been evolving too. However, to be used effectively, financial reports need to be processed in multiple ways. A mindful question at this point could be: is the power of the technology we are employing to produce and report financial data empowering us to control and otherwise work with it effectively? As accounting professionals evaluating this new technology, it is important also to be aware of how past financial reporting practices might influence positively or negatively how we think about employing these new technologies to meet our future needs.

This main question can be divided into several additional questions, many of which extend beyond technology into two different fields: on one hand, the role of regulation and regulators, and on the other, the way in which business and IT professionals communicate with each other to make financial reporting become digital:

- How will digital financial reporting work? How do we want digital financial reporting to work? What is appropriate, all things considered?
- Will digital financial reporting work? How will we know if digital financial reporting is working? How will "work" be evaluated?
- Is there a need for one global standard for digital financial reporting or will many different forms be employed around the world? Will these diverse forms be compatible? Do they need to be compatible?
- Is the accounting profession prepared to contribute to making digital financial reporting work effectively? Do accounting professionals understand the options they have available? Do accounting professionals have the skills necessary to determine whether digital financial reporting is appropriate to meet the needs of the financial reporting supply chain? How

will accountants know whether digital financial reporting is meeting those needs? What are the risks involved in going digital?

- What are the unanticipated consequences of going digital for financial reporting? Will employing this new medium change the message that is being communicated?

These are questions that remain unanswered. In order to harness and control the power of the technologies employed, it is critical to answer these sorts of questions. From a purely academic perspective, reporting has been widely treated by many authors. Especially in the fields of accounting, economics and finance, reporting has been seen, among other explanations, as a key element in reducing the so-called "agency problem", to allow investors and other stakeholders to trust companies and their managers in a turbulent global economy.

From a professional point of view, financial reporting is, in this digital era, a challenge for both accounting and IT professionals, in the sense that the main goal of financial reporting is to communicate, but the paradox is that these two groups do not yet have a definitively effective medium of communication. Do accountants creating digital financial reports truly understand what these reports are communicating? Do IT professionals even agree on the message that a digital financial report communicates? If IT professionals cannot agree then how can accountants understand or agree on what digital financial reports communicate?

The only way a meaningful exchange of information can occur is the prior existence of agreed-upon business rules, which must be appropriately integrated into the IT systems.

With respect to these business rules, we can differentiate between:

- Syntax: referring to the representation of the business information. It focuses on correctness grammatically and linguistically, as well as the message's format.
- Semantics: referring to a set of rules that give meaning to the business information. It focuses on the knowledge being communicated.

To the extent that a meaningful exchange occurs, the information exchanged can be effectively reused without human intervention. There is a direct correlation

between the "agreed-upon semantics and syntax rules" and the "meaningful exchange of information".

What can be said is that business professionals will never become interested in digital financial reporting or digital reporting in general unless there are solutions that are cost-effective, easy to use, robust, reliable, predictable, repeatable, scalable, secure, auditable, and so forth. For business professionals, digital reporting has to work and be an improvement of the existing practices.

The aim of this paper is to offer the viewpoint of the authors regarding several key issues related to the digitization of financial reports and to contribute to the process of making digital financial reporting work appropriately, consciously harnessed and controlled as needed and desired, and to its full potential power. The authors would like to contribute to re-activating debates in two different areas:

- academic: calling the attention of scholars to the main problem of generating precise semantics for financial facts;
- professional–regulatory: asking professional bodies to work with IT specialists in a more rigorous way in order to capture the full business complexity when making financial reporting digital.

XBRL (eXtensible Business Reporting Language) is the prominent protagonist in making corporate reporting digital, and it is the main area of expertise of the authors in both Europe and the United States. Following the evolution of XBRL implementation is a very illustrative way to observe how digitizing financial reports is a complex task when trying to obtain benefit from all its features. There are several challenges and options in XBRL implementation, in particular the evolution from syntax to a proper semantics, and the accounting profession needs to be empowered with key insights in order to have all the tools to participate and guide the discussion effectively. Some examples offered in this viewpoint come from the US and specifically from the Securities and Exchange Commission's (SEC) experience with reporting in general and XBRL in particular, but, in the opinion of the authors, these experiences are highly representative of what should be anticipated in other jurisdictions around the world. Others come from the EU experience, mainly related to the Eurofiling project. It was in these two scenarios that the authors developed their respective professional experiences.

2. CURRENT FINANCIAL REPORTING ENVIRONMENT

In 2008 both the global consultancy Gartner and the leading benchmark research and advisory services firm Ventana Research released white papers describing the inefficient corporate reporting process, which they predicted would change (Rayner & Chandler, 2008; Ventana Research, 2008).

This is Ventana's description of the process:

> Thus, the current close-to-file process is structurally prone to error. It poses a risk that mistakes and misstatements will occur. Most companies deal with this potential for errors and the risks they pose with a brute-force approach, using well-paid professionals (who could be doing more productive things) to check and double-check the documents. This might be a workable approach today, but it becomes increasingly difficult and costly as the amount of required tagging increases.

While being productive tools, spreadsheets, word processing documents and desktop databases are wreaking havoc in organizations. The large number of spreadsheets, word processing documents and desktop databases used make up the highly manual, time-consuming and error-prone process required by the approach of today. Therefore, using computers is not directly synonymous with being effectively digital. Paper-based reports have been being left behind, but not so the regular practices of working with papers.

2.1 Digital financial reports: actionable information

Information exchange between different systems, belonging or not to the same organization, is no easy task. Yet achieving this interoperability will result in new, meaningful, cost-effective, easy-to-use, robust, reliable, repeatable, predictable, scalable, secure and auditable business information exchange across business systems. Some business systems might be internal to a given organization; others might be external. Not only is this automated exchange of information between business systems desirable, it is necessary in today's fast-paced and complex society.

The volume and complexity of information are expanding at an exponential pace. In *The Value of Business Intelligence*, Chet Phillips points out that information is

growing at a rate of over 30% per year. Finding information takes more time than acting on information. The past practices fail to meet the current needs.

An article published by *Government Technology* (Hanson, 2009), *XBRL Ends Spreadsheet Hell*, explains how XBRL helped to improve processes for a department within the state of Nevada. Kim Wallin, Nevada's controller, says:

> The goals were timely and accurate data, stronger internal controls, reduced costs, a standardized system of seamless data exchange, business processes and data elements. XBRL met all of those goals.

The article discusses two projects in which XBRL was used to supplement what had previously been carried out with spreadsheets alone: one related to the tracking of grants and the other to debt collection. These are a clear example of how a digital format like XBRL allows companies to move beyond using computers for their processes. The information that is the protagonist of this change can be easily identified as what John Alber (2005) calls "actionable information". According to his view, actionable information is information from a trusted source about something that is important to the users and that drives them to take action.

Organizations are today facing the so-called "big data" challenge (Economist Intelligent Unit, 2011), which can be summarized by this set of questions: How does the mass of information that is available become actionable? Is that process as efficient and as effective as it could be? For many entities, the chances of achieving this high rate of actionable information involve a large amount of reports, spreadsheets, rekeying, etc.

Historically, 85% of financial reports were created by word processing and spreadsheet software. However, these tools are not designed to "understand" anything about what a financial report is or what it needs to look like.

Figure 1 represents how financial reports are created in word processing or spreadsheets by humans with extensive knowledge of creating a financial report by typing information into a software application that has no knowledge of financial reporting.

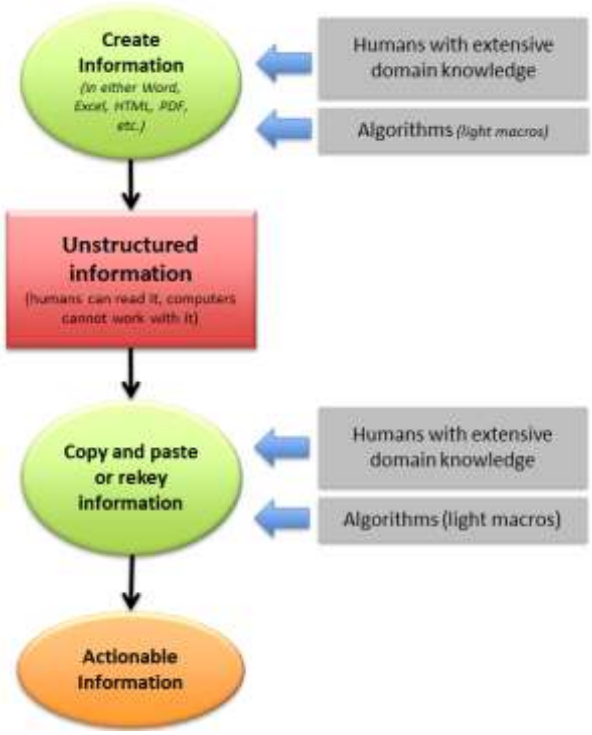


Figure 1. Only domain experts

On the other hand, Figure 2 shows how humans with extensive financial reporting domain knowledge build metadata and help to write algorithms (or computer programs) and how software applications are used to help guide a business user through the process of creating a financial report. One output is unstructured information, such as a PDF, HTML or Word document, but another output is structured information, such as XBRL, which can be filed with the regulators, read by software and meaningfully understood by that software for analysing public companies or read by other software used by analysts seeking good investments, etc.

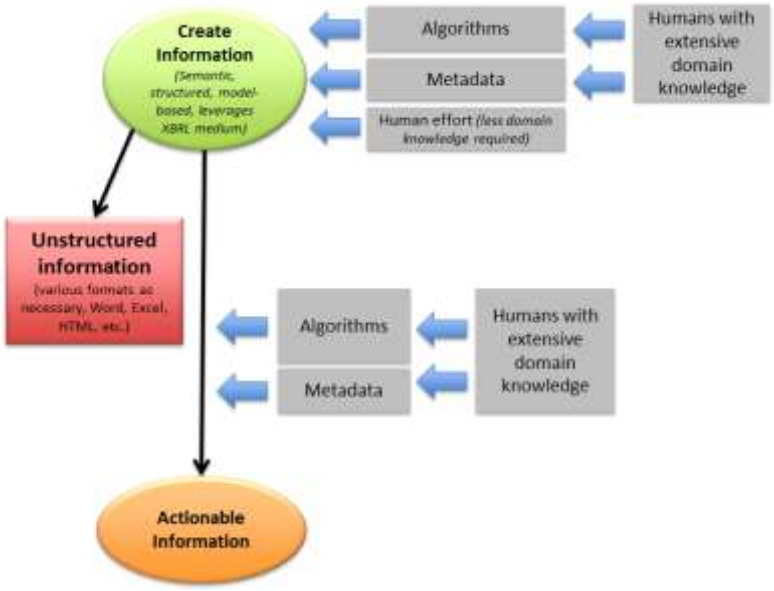


Figure 2. Domain and IT experts for a complete schema

Thus, the first result arises from this analysis: to be used effectively, information needs to be expressed in a digital way, leaving paper well behind, but this is not sufficient, as information, particularly financial information, should be supported by a format that also contains a clear definition of each concept and a comprehensive list of interrelationships, to minimize human intervention in data processing. This idea, which we wanted to collect from professional insights, is widely supported by the academic literature (surveyed by Baldwin and Trinckle, 2011; Valentinetti & Rea, 2011, among others). XBRL is definitively fighting in that battle.

2.2 Evolution of financial report mediums

Moving from paper to a smartphone screen was not so direct. Even paper was not the first medium for financial reports. Below is a summary of the evolution of financial reports. Each of these examples shows a balance sheet. Figure 3 shows the annual balance sheet of a state-owned farm in Mesopotamia, drawn up by the scribe responsible for artisans: a detailed account of raw materials and workdays for a basketry workshop. The medium is clay and this balance sheet was created in 2040 BC:

Figure 3. Balance sheet, 2040 BC

Figure 4 reproduces a twentieth-century balance sheet for Wachovia National Bank in 1906. The medium is paper.

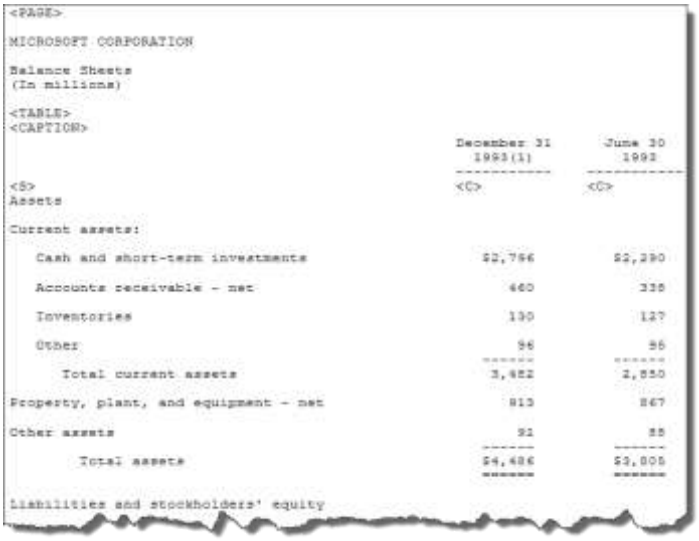
STATEMENT
—OF—
WACHOVIA NATIONAL BANK,
WINSTON, N. C.
JANUARY 29TH, 1906.
(CONDENSED FROM REPORT TO THE COMPTROLLER OF THE CURRENCY.)

RESOURCES.		LIABILITIES.	
Loans, including Overdrafts	$ 511,789.61	Capital	$ 150,000.00
U. S. Bonds and Premiums	52,300.00	Surplus and Undivided Profits	171,167.89
Real Estate, Furniture and Fixtures	4,500.00	Circulation	50,000.00
Redemption fund with U. S. Treasurer	2,500.00		
		Deposits	468,153.02
Cash and Due from Banks	268,231 30		
	$839,320.91		$839,320.91

W. A. LEMLY, President. JAS. A. GRAY, Cashier.

Figure 4. Twentieth-century balance sheet

Next, we see a Microsoft balance sheet (fragment) from 1994, using the EDGAR system. (See http://1.usa.gov/XfWKjW). This is from the early years of the SEC EDGAR system. The medium of this financial report is Structured Generalized Markup Language (SGML) (Figure 5).



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MICROSOFT CORPORATION

Balance Sheets
(In millions)

<TABLE>
<CAPTION>
                                                December 31    June 30
                                                   1993(1)       1993
                                                -----------   ----------
<S>                                             <C>           <C>
Assets

Current assets:

   Cash and short-term investments                  $2,796       $2,290

   Accounts receivable - net                           460          335

   Inventories                                         130          127

   Other                                                96           86
                                                    -------      -------
      Total current assets                           3,482        2,850

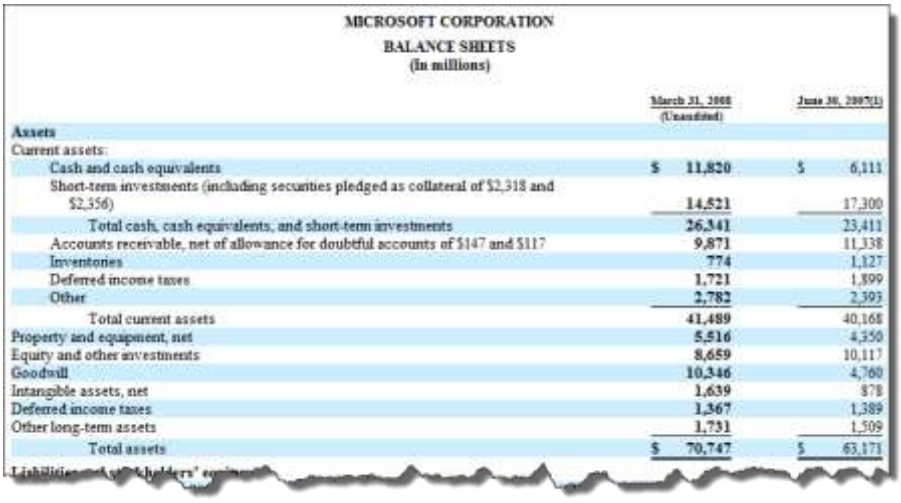
Property, plant, and equipment - net                   813          867

Other assets                                            91           88
                                                    -------      -------
       Total assets                                 $4,386       $3,805
                                                    =======      =======

Liabilities and stockholders' equity
```

Figure 5. A balance sheet in SGML

The next step in this evolution is the HTML format, which can be seen in this Microsoft balance sheet from an SEC filing in 2008 (see http://1.usa.gov/15nV76r) (Figure 6):

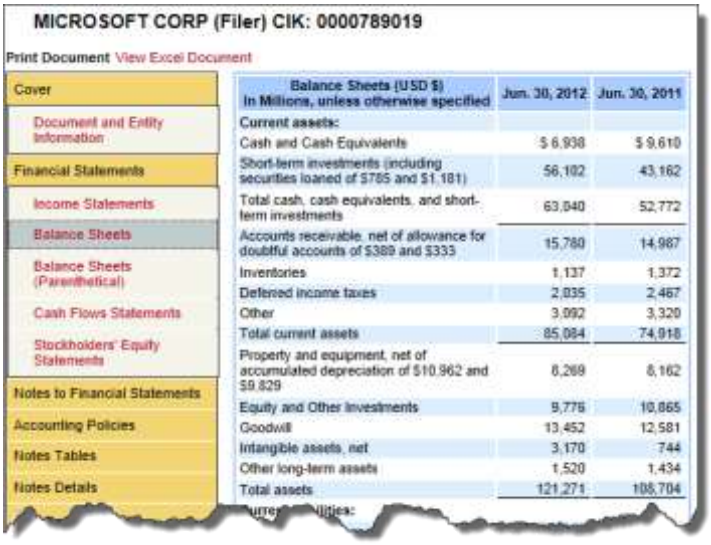


MICROSOFT CORPORATION
BALANCE SHEETS
(In millions)

	March 31, 2008 (Unaudited)	June 30, 2007(1)
Assets		
Current assets:		
Cash and cash equivalents	$ 11,820	$ 6,111
Short-term investments (including securities pledged as collateral of $2,318 and $2,356)	14,521	17,300
Total cash, cash equivalents, and short-term investments	26,341	23,411
Accounts receivable, net of allowance for doubtful accounts of $147 and $117	9,871	11,338
Inventories	774	1,127
Deferred income taxes	1,721	1,899
Other	2,782	2,393
Total current assets	41,489	40,168
Property and equipment, net	5,516	4,350
Equity and other investments	8,659	10,117
Goodwill	10,346	4,760
Intangible assets, net	1,639	878
Deferred income taxes	1,367	1,389
Other long-term assets	1,731	1,509
Total assets	$ 70,747	$ 63,171

Figure 6. HTML-based financial report

Next we see a twenty-first-century balance sheet from Microsoft generated by the SEC interactive information viewer in 2012. The medium used to express this financial information is XBRL. The XBRL technical syntax is rendered by the SEC viewer (see http://1.usa.gov/Y0vZxi) (Figure 7).



Balance Sheets (USD $) In Millions, unless otherwise specified	Jun. 30, 2012	Jun. 30, 2011
Current assets:		
Cash and Cash Equivalents	$ 6,938	$ 9,610
Short-term investments (including securities loaned of $785 and $1,181)	56,102	43,162
Total cash, cash equivalents, and short-term investments	63,040	52,772
Accounts receivable, net of allowance for doubtful accounts of $389 and $333	15,780	14,987
Inventories	1,137	1,372
Deferred income taxes	2,035	2,467
Other	3,092	3,320
Total current assets	85,084	74,918
Property and equipment, net of accumulated depreciation of $10,962 and $9,829	8,269	8,162
Equity and Other Investments	9,776	10,865
Goodwill	13,452	12,581
Intangible assets, net	3,170	744
Other long-term assets	1,520	1,434
Total assets	121,271	108,704

Figure 7. Interactive data

Further, what the SEC calls "interactive data" and its full potential can be seen in this free XBRL viewing software shown in Figure 8 (http://goo.gl/ffFy7).

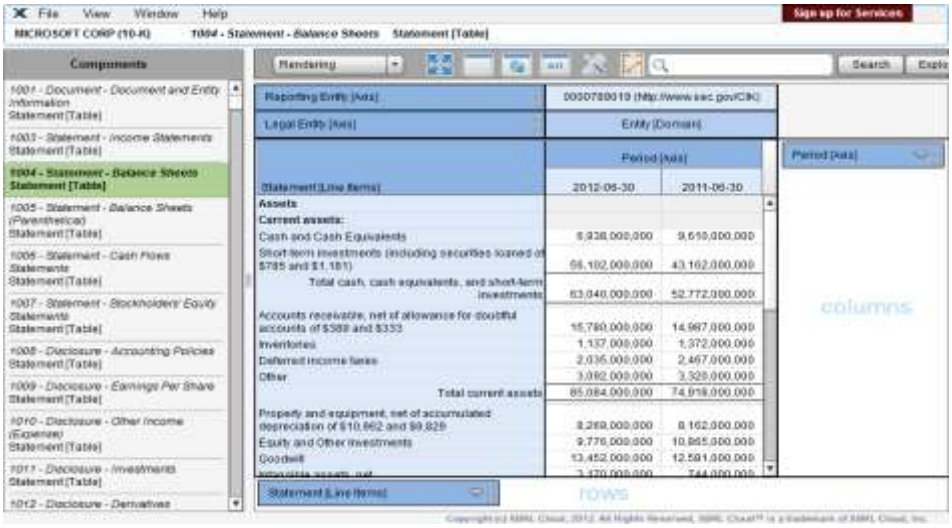
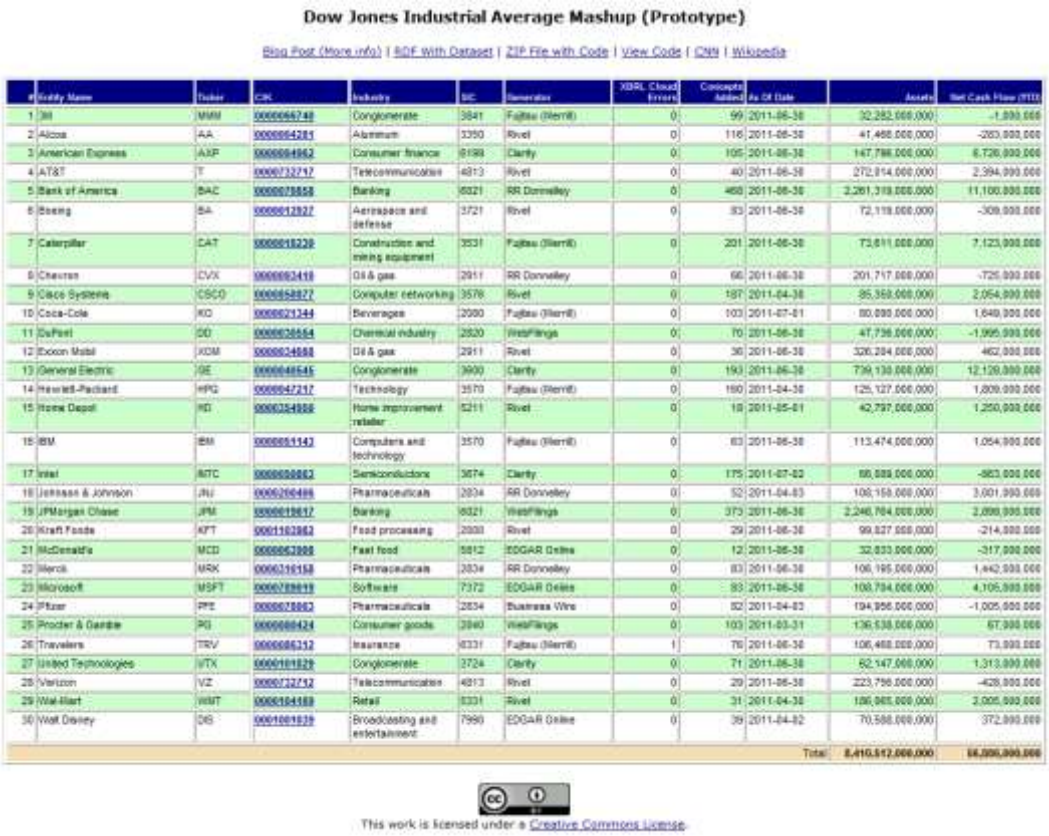


Figure 8. Dynamic information

As the reader will have the opportunity to experience by visiting the link above, the information is dynamic and can be pivoted, connections between the sections of the financial report can be navigated, and so forth.

Something that was impossible with prior financial reporting formats but is, if implemented correctly, easy using structured information such as XBRL is cross-financial report queries. Figure 9 shows the results of a query of total assets and net cash flows for the 30 companies that make up the Dow Jones Industrial Average.

There is a significant difference between the earlier financial reports and the new XBRL-based one. All versions prior to XBRL were only readable by humans. However, the XBRL-based financial report is readable by humans when rendered as above, but also readable by computer software applications. That means that, for instance, a potential investor could download these reports for each of 100 companies and select one of them based on his/her own criteria using a simple piece of software. Only a few years ago, the same investors needed to download unprocessable reports, rekey spreadsheets and try to perform all the calculations almost manually, which is not so different from having a paper or a piece of rock.



Dow Jones Industrial Average Mashup (Prototype)

Blog Post (More info) | RDF With Dataset | ZIP File with Code | View Code | CNN | Wikipedia

#	Entity Name	Ticker	CIK	Industry	SIC	Generator	XBRL Cloud Errors	Concepts Added	As Of Date	Assets	Net Cash Flow (TTM)
1	3M	MMM	0000066740	Conglomerate	3841	Fujitsu (Merrill)	0	99	2011-06-30	32,282,000,000	-1,000,000
2	Alcoa	AA	0000004281	Aluminum	3350	Rivet	0	116	2011-06-30	41,468,000,000	-283,000,000
3	American Express	AXP	0000004962	Consumer finance	6199	Clarity	0	105	2011-06-30	147,786,000,000	6,726,000,000
4	AT&T	T	0000732717	Telecommunications	4813	Rivet	0	40	2011-06-30	272,814,000,000	2,394,000,000
5	Bank of America	BAC	0000070858	Banking	6021	RR Donnelley	0	468	2011-06-30	2,261,319,000,000	11,100,000,000
6	Boeing	BA	0000012927	Aerospace and defense	3721	Rivet	0	83	2011-06-30	72,119,000,000	-309,000,000
7	Caterpillar	CAT	0000018230	Construction and mining equipment	3531	Fujitsu (Merrill)	0	201	2011-06-30	73,611,000,000	7,123,000,000
8	Chevron	CVX	0000093410	Oil & gas	2911	RR Donnelley	0	66	2011-06-30	201,717,000,000	-725,000,000
9	Cisco Systems	CSCO	0000858877	Computer networking	3576	Rivet	0	187	2011-04-30	85,359,000,000	2,054,000,000
10	Coca-Cola	KO	0000021344	Beverages	2080	Fujitsu (Merrill)	0	103	2011-07-01	80,000,000,000	1,649,000,000
11	DuPont	DD	0000030554	Chemical industry	2820	WebFilings	0	70	2011-06-30	47,736,000,000	-1,995,000,000
12	Exxon Mobil	XOM	0000034088	Oil & gas	2911	Rivet	0	36	2011-06-30	320,294,000,000	462,000,000
13	General Electric	GE	0000040545	Conglomerate	3900	Clarity	0	193	2011-06-30	739,130,000,000	12,129,000,000
14	Hewlett-Packard	HPQ	0000047217	Technology	3570	Fujitsu (Merrill)	0	160	2011-04-30	125,127,000,000	1,809,000,000
15	Home Depot	HD	0000354950	Home improvement retailer	5211	Rivet	0	18	2011-05-01	42,797,000,000	1,250,000,000
16	IBM	IBM	0000051143	Computers and technology	3570	Fujitsu (Merrill)	0	63	2011-06-30	113,474,000,000	1,054,000,000
17	Intel	INTC	0000050863	Semiconductors	3674	Clarity	0	175	2011-07-02	68,089,000,000	-983,000,000
18	Johnson & Johnson	JNJ	0000200406	Pharmaceuticals	2834	RR Donnelley	0	52	2011-04-03	109,159,000,000	3,001,000,000
19	JPMorgan Chase	JPM	0000019617	Banking	6021	WebFilings	0	373	2011-06-30	2,246,764,000,000	2,000,000,000
20	Kraft Foods	KFT	0001103982	Food processing	2000	Rivet	0	29	2011-06-30	99,527,000,000	-214,000,000
21	McDonald's	MCD	0000063908	Fast food	5812	EDGAR Online	0	12	2011-06-30	32,633,000,000	-317,000,000
22	Merck	MRK	0000310158	Pharmaceuticals	2834	RR Donnelley	0	83	2011-06-30	106,195,000,000	1,442,000,000
23	Microsoft	MSFT	0000789019	Software	7372	EDGAR Online	0	83	2011-06-30	109,704,000,000	4,105,000,000
24	Pfizer	PFE	0000078003	Pharmaceuticals	2834	Business Wire	0	82	2011-04-03	194,956,000,000	-1,005,000,000
25	Procter & Gamble	PG	0000080424	Consumer goods	2840	WebFilings	0	103	2011-03-31	136,536,000,000	67,000,000
26	Travelers	TRV	0000086312	Insurance	6331	Fujitsu (Merrill)	1	76	2011-06-30	106,468,000,000	73,000,000
27	United Technologies	UTX	0000101829	Conglomerate	3724	Clarity	0	71	2011-06-30	62,147,000,000	1,313,000,000
28	Verizon	VZ	0000732712	Telecommunications	4813	Rivet	0	29	2011-06-30	223,756,000,000	-428,000,000
29	Wal-Mart	WMT	0000104169	Retail	5331	Rivet	0	31	2011-04-30	186,965,000,000	2,005,000,000
30	Walt Disney	DIS	0001001039	Broadcasting and entertainment	7990	EDGAR Online	0	39	2011-04-02	70,588,000,000	372,000,000
									Total:	8,410,512,000,000	66,000,000,000

Figure 9. Enhanced analysis

To work, the information exchanged must be meaningful, reliable and correct; additionally, the process must be robust, reliable and predictable. What does it take to make this type of functionality work effectively and reliably for all the information contained within a digital financial report?

3. UNDERSTANDING *GUIDANCE-BASED, SEMANTIC-ORIENTED, MODEL-DRIVEN* DIGITAL FINANCIAL REPORTING

Guidance-based, semantic-oriented, model-driven digital financial reporting is an approach to financial reporting that employs technology both to improve the functionality of financial reports and, at the same time, to reduce the costs of creating them and to improve their quality. Further, guidance-based, semantic-oriented, model-driven digital financial reporting reduces the costs and increases

the functionality of analysis of the financial and non-financial information contained in those reports.

An understanding of what a guidance-based, semantic-oriented, model-driven digital financial report is can be obtained by looking at the evolution in the last two stages of a financial report.

Electronic/networked computer. Taking computer-generated financial reports a step further, the output formats can be standardized using HTML or PDF and, leveraging the Internet, the information distributed to anyone on the planet for pennies. While significant benefit can be gained from the electronic distribution of business information, because the information is still unstructured (or more correctly, again, structured for presentation and not meaning), the information contained within the reports still cannot be reliably reused or analysed without intensive human involvement.

Digital. By digital we mean that the unstructured information is structured for meaning (as opposed to presentation), often using a global standard format such as XBRL, in a format that gives the information meaning. Because the information has meaning associated with it, three things are possible. First, when the information is created, software applications can assist, or help guide, the user in that process because the computer can read the structure. Second, when the information is analysed, humans are not needed to move the information from its creation form into the form used for analysis, computers can use the structure to do that too. Third, rather than locking the created information into one form in the way that paper, computer or electronic formats do, the information can be rendered in any number of forms or used within software to create dynamic reports that overcome the limitations of paper. Further, within a software application, the information becomes more interactive, much like a pivot table of an electronic spreadsheet.

In the context of XBRL, the role of adding syntax rules is the one of the XBRL taxonomy. XML provides additional information (meta-information) on the precise nature of the datum in question. However, many XML initiatives have been put into operation for vertical or horizontal business-to-business (B2B) transmission, such as ebXML, RosettaNet, HL7 and cXML. The diversity of XML formats causes difficulty in facilitating exchanges of XML-based data. For this reason, a new language based on XML has been created specifically for use in

the area of financial management and communication. XBRL is the digital mark-up language successor to XML and serves as the nexus between different entities when transmitting business information. XBRL is based on the production of different XBRL taxonomies, which are generated and agreed by consensus in various working groups formed by specialists in computer software, systems and business. The principal mission of these groups is to generate a specific taxonomy; that is, the group analyses the model of business reporting that XBRL is intended to support and facilitate, and identifies univocally a dictionary of terms for utilizing these labels in the subsequent generation of reports in XBRL containing real data that will be transmitted. Thus, the working group generates the taxonomy, which is made available for free on the Internet, and this allows users to generate various types of reports and validate them correctly. The taxonomy thus represents the best "substratum" for expressing business information of all kinds for utilization by the numerous applications that companies and other organizations must use to manage this information. When the XBRL taxonomy is generated, much care is taken to introduce different business rules into it. These rules take material form by way of standards of presentation, labels in different languages, rules of calculation and logical relationships. These are standards and rules with which the real data "hosted" by the digital labels in the various XBRL reports must comply. The taxonomy can then be understood as a "digital version" of the business rules (i.e. GAAPs), written in a language that software applications can understand (Figure 10). Nevertheless, of course, attaining full functionality depends on the quality of the corresponding taxonomy, and hence on the quality of communication between the domain–business and the IT members of the corresponding working groups that created it. It also depends on how far these XBRL working groups could go in introducing business rules with the existing XBRL specifications, that is, how far they could go with XBRL from syntax towards semantics.

To the extent that the meaning of these business terms, rules and other relations between business terms are effectively and accurately captured, information can be meaningfully exchanged. To the extent that the information is meaningful and the syntax is consistent, software applications will interoperate effectively.

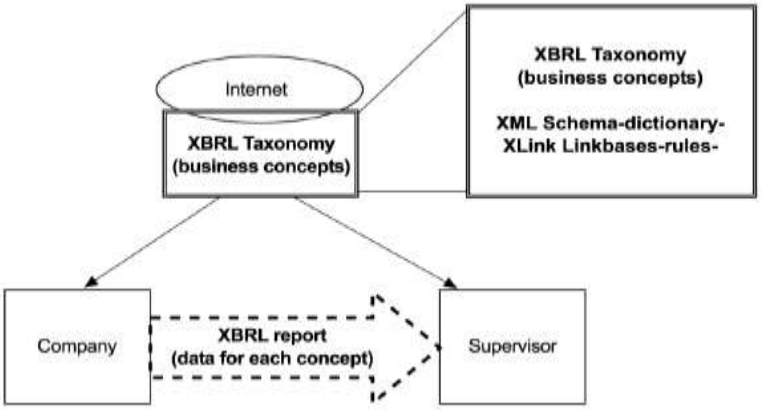


Figure 10: Schema of how XBRL works

4. DIGITAL FINANCIAL REPORTING MEANS CHANGE, BUT TO WHAT?

The previous section pointed out the issues that must be considered when going digital. Are enough accountants engaged in this conversion process, thinking through the many relevant issues and risks involved with such a change? Do enough accountants understand the moving pieces well enough to have sound views with regard to these sorts of issues? Should changes be made without complete understanding of the moving pieces and then issues reacted to when they eventually become understood, or is a proactive approach better, with rigorous and perhaps extreme and even violent testing of the moving pieces of any digital financial reporting system?

Accountants understand how to verify and prove to themselves that they have created a quality paper-based financial report, but how do they prove to themselves that the digital financial report they have created is appropriate and communicates the story that they desired to tell about their organization? What evidence do they have proving that the digital financial report is verifiably correct? What formal verification process exists to repeat this process?

A financial report can be said to be valid if it possesses certain traits that can be defined in general terms; for clarity, these are listed below to bring them into the reader's mind. (These terms are highlighted in the AICPA *Statement of Position 09-1 Performing Agreed-Upon Procedures Engagements That Address the Completeness, Accuracy, or Consistency of XBRL-Tagged Data*, http://bit.ly/XIoqxv)

Assurance on XBRL instance document: A conceptual framework of assertions (see http://bit.ly/VjHwdG) points out the need for a framework to verify the appropriateness of a digital financial report.

Looking at the verification process in more specific terms, arguably the following would hold to be true:

- Comply with financial reporting standards: (i.e., IFRS, US GAAP).
- Full inclusion/false inclusion: Everything that should be disclosed has been disclosed as deemed appropriate by the rules and the reporting entity choices.
- Foots, cross casts, ticks and ties: All mathematical relations must be intact. All non-numeric relations must be sensible and logical.
- All financial report formats convey the same message: A financial report can be articulated using paper and pencil, PDF, HTML, XBRL or other computer readable formats. While the format may change, the message communicated and the story told should not change.
- Justifiable/defensible report characteristics: The facts reported and the characteristics that describe those reported facts should be both justifiable and defensible by the reporting entity.
- Consistency between periods.
- Consistency with the peer group. Useful, sensible, logical renderings: Renderings of facts, characteristics that describe facts, parenthetical explanations that further describe such facts and other such model structures should make sense, be logical and ultimately be useful in understanding the information.
- Unambiguous business meaning: A financial report should be unambiguous to an informed reader. The business meaning of a financial report should be clear/unambiguous to the creator of the financial report and likewise clear/unambiguous to the users of that financial report. Both the creator and the users should be left with the same message or story.

The success of XBRL and financial reports expressed using XBRL entails accountants being able to perform the same tasks effectively using these new digital mediums as they did for a hundred years using the old mediums. The processes must be reliable, repeatable and predictable.

5. US SEC AND EUROPE PRIME THE PUMP

About 12,000 companies submit their financial to the U.S. Securities and Exchange Commission (SEC) using the structured digital format XBRL (eXtensible Business Reporting Language). Over 5,000 mutual funds submit their financial reports to the SEC digitally. Approximately 9,000 banks submit their financial statements to the Federal Deposit Insurance Corporation (FDIC) digitally.

The FDIC published a summary of the benefits derived from XBRL in this document: http://xbrl.org/us/us/ffiec%20White%20Paper%2031Jan06.pdf. The FDIC achieved these results by creating literally thousands of business rules.

In Europe, the Eurofiling initiative is the most relevant and comprehensive project. The Eurofiling project is an open joint initiative of the European Banking Authority (EBA) and the European Insurance and Occupational Pensions Authority (EIOPA) in collaboration with XBRL Europe, as well as stakeholders such as banks, solutions providers, academics and individuals. XBRL documents and taxonomies, know-how and materials for supervisory frameworks have been produced: COREP, FINREP and Solvency II. As a result of the Eurofiling work since 2005, a new initiative is arising now: CEN (*Comité Européen de Normalisation*/European Committee for Standardization), the intention of which is to prepare a series of agreements that promulgate XBRL deliverables on a wider and standardized basis in Europe. The CEN initiative is a result of the inefficiencies obtained with different approaches using XBRL. A similar lack of efficiency has been detected in SEC filings. XBRL taxonomies are being created, but are still not reaching full semantics.

This trend toward digital financial reporting is gaining momentum as the XBRL digital financial reporting format is being adopted by many different financial reporting channels around the world, in Europe, India, China, Japan, Australia, South America, Canada and many other locations. While the number of digital filers is not known, it is in the millions and rapidly rising.

The undeniable reality is that financial reporting is going digital. However, despite these developments, we still do not have a semantic reporting model with a full implication for the accounting profession.

Now, improved versions of business reporting are being proposed. The International Integrated Reporting Council (IIRC), Carbon Disclosure Project (CDP), Global Reporting Initiative (GRI) and other similar projects on sustainability and/or non-financial reporting are all focusing on the question of what business reporting should be.

However, again, the only impact on digital financial reporting is the facts that must be reported. Adding new facts or different facts does not impact in any way on the process necessary to make digital financial reporting actually "work".

When analysing in depth how XBRL could be implemented, several alternatives could be considered. A general overview of these implementation options should be considered by accountants. Mora and Mora (2012) offer a comprehensive view of these technologies, summarized in Table 1.

Level	**Former status**	**New status**
General architecture	Intuitive	Formalized with **Data Point Model**
Taxonomy	Definition Linkbase	**Dimensions**
	Calculation Linkbase	***Formulae*** Linkbase
	Presentation Linkbase	**Table** Linkbase
Instance	XML coded, machine-readable	**iXBRL**, HTML-friendly view

Table 1. New protocols and standards in XBRL projects

XBRL evolved over time as a response to corporate and regulatory challenges. As a result, new approaches have been developed. The first one of these described in this article, the *Data Points Model* (DPM) or *Data Points Modelling*, is the first attempt to involve domain experts in IT architecture developments, by means of .xls matrices or similar resources, in order to start formalizing all the requirements of the new reporting and regulatory framework. References for this initiative can be found in working drafts and documentations of COREP and other Eurofiling projects.

The other advances, *dimensions*, *tables*, *formulae* and *iXBRL*, represent the way in which the XBRL 2.1 specification has been extended to cover real business complexities, and each one of these corresponds to specific recommendations published by XBRL International. As DPM is not yet an XBRL specification, it can be seen as an external development. DPM is a form of representation of information requirements by the identification of reportable information as data points that have a specified nature and can be characterized using consistently applied breakdowns.

The XBRL Abstract Model 2.0 represents, in a similar way to DPM, a high level of guidance on how to try to introduce semantics into XBRL taxonomy or into taxonomy design and architecture. However, while DPM can be understood as a bottom-up approach, perhaps the XBRL Abstract Model can be perceived as a top-down approach.

6. TOP-DOWN AND BOTTOM-UP APPROACHES

6.1 Top-down or bottom-up identification of information?

There are two general approaches to enabling a comparison of information:

- **Top down**. In a top-down approach, high-level structures are used as the basis for comparison. For example, networks, tables or components could be used as identifiers that enable comparison. In essence, these "handles" allow analysts to identify and then work with pieces of information in a digital financial report. For example, an analyst might compare all the balance sheets by referring to a specific piece of metadata that identifies something as being a balance sheet.
- **Bottom up**. Following a bottom-up approach, the characteristics or concepts contained within a component are used to define the structure being compared. Another term for this approach is prototype theory. For example, if you know that a piece of a financial report has assets, liabilities and equity, it is highly likely that it is a balance sheet.

Either the top-down or the bottom-up approach could work. The top-down approach is easier, but it is less flexible. The bottom-up approach is harder to employ because it entails more work, but it is much more flexible.

The point once again is that it does not matter which of these approaches is employed; if the information provided is not forced to be correct using business rules, neither the top-down nor the bottom-up approach will be helpful in retrieving information.

6.2 XBRL, OWL OR BOTH?

Regretfully, there are many technical, business and political issues related to XBRL International and the W3C. XBRL uses many technical standards published by the W3C: XML, XML Schema, XLink, XPath. XBRL does not make use of others, such as OWL – Web Ontology Language (W3C). Due to the rise of the Internet, a common language for creating ontologies is emerging, the Web Ontology Language (OWL) by the World Wide Web Consortium (W3C). OWL is significantly more expressive than XBRL. While XBRL could express everything that can be expressed via OWL, the question is whether XBRL should be used to express this required information.

XBRL, OWL or some other technology might help make XBRL work. Is XBRL plus OWL sufficient? The point is, regardless of the technology employed, it actually needs to work and enable a meaningful information exchange or digital financial reporting can never really work. It is necessary to put whichever pieces together that, in fact, make everything work as required.

The reason for bringing OWL into this discussion has also been pointed out before: as long as the accounting profession would like to have more and more automated processes in their software applications, the way in which it includes business rules in the system is becoming more complex. Suddenly, XBRL taxonomies are insufficient as syntax containers and we need to move beyond them into semantics. The Web Ontology Language (OWL) is a W3C language to provide support to semantics via ontology creation. An ontology is an explicit formal specification of the terms in the domain, such as financial reporting (common controlled vocabulary), but it is also a common controlled logical structure between the terms (and the relations among them) of the controlled vocabulary. To the extent that the terms and structure are sensible and logical, the information expressed using the controlled vocabulary will be usable. It is really as simple as that.

Ontologies are not models; ontologies express how reality works. Building a formal, controlled, structured, logical vocabulary is hard work even for the experts who create these ontologies. Nevertheless, ontologies are becoming very important to society. If created properly, ontologies will spur secondary uses that drive additional utility.

For example, the SEC has stated that it is creating an "Accounting Quality Model" and the media are using the term "RoboCop" to describe the capabilities of this new weapon against fraud.

XBRL already leverages various other global standards, such as XML, XML Schema, XLink (which seems to be falling out of favour) and other XML-based technologies. OWL and its companion technologies RDF, RDFS and SKOS are also XML based. Can XBRL leverage these technologies effectively? Should XBRL leverage these technologies? It makes a great deal of sense to do so because of XBRL's requirements, and rather than reinventing something that already exists, OWL would provide leverage.

On the other hand, the robust business rules for verifying both mathematical computations and other relations between reported facts are something that XBRL via XBRL Formula does and OWL does not. The W3C has a proposed standard, SPARQL Inferencing Notation (SPIN), which seemingly can provide the functionality that XBRL Formula provides. Other W3C standards, such as SWRL and RIF, may provide utility (SPIN: http://www.w3.org/Submission/spin-overview/; SWRL: http://www.w3.org/Submission/SWRL/; RIF: http://www.w3.org/2005/rules/wiki/RIF_FAQ).

These decisions are incredibly complicated even for technical people, let alone for professional accountants. The reason for pointing out this information is not to pass judgement regarding the pros and cons of any technology, but to help understand the deficiencies in the expressiveness of XBRL in order to overcome those deficiencies and provide digital financial reporting with all that is necessary to succeed.

OWL is making possible the representation of the so-called semantic web, adding a high degree of formalization to digitalized information. Although, as stated, XBRL provides quite rich information (Debreceny & Gray, 2001), García *et al.* (2007) have undertaken a detailed analysis of the characteristics that XBRL

possesses in comparison with OWL. These authors report the following as the most important:

- Neither XML Schema nor XLink, which are pillars of XBRL, were originally conceived to support the representation of semantic information by way of ontologies, and when they are utilized to this end, the expressive capacity offered is insufficient.
- OWL explicitly enables the inclusion of relationships of belonging/ownership, cardinality and equivalence that would be very difficult to implement by means of the linkbases of XBRL.
- The semantic structures in OWL serve to ease the maintenance of the system in which they are implanted, a functionality that is not available with XBRL.
- XBRL is designed for the submission of information – if more complex functionalities are added to a system, such as a website, it is necessary to implement the OWL ontology.
- It is possible to map XBRL taxonomies onto a body of the OWL ontology to enable users to exploit the potentialities of XBRL in the activities of data submission and those of OWL in respect of data processing at the destination.

In this respect, consideration should be given to the convenience of a possible mapping of XBRL onto OWL, or of its complete substitution as a format for submission.

The bottom line, however, is this: XBRL's expressiveness is limited and for digital financial reporting to succeed a solution to the problem of expressing the missing semantics must be created or the data quality will suffer and information exchange will not be meaningful.

There is a need for agreement on financial report semantics. While at the technical syntax level XBRL is interoperable globally, at the semantics level this is far less true. Adding semantic interoperability to the existing syntactic landscape makes possible the interoperability for meaningful information exchange. Business users will never master the XBRL technical syntax, nor do they need to. Easier to

understand layers of meaning can be, and should be, created to make the XBRL technical syntax disappear into the background.

Defining common, precise terms both hides technical syntax and gives possibilities to software vendors to hide complexity from business users.

6. CONCLUSIONS

Digital financial reporting is not only inevitable, it is imminent. With the ever-increasing complexity of financial reporting and the increasing volume of information, digital financial reporting serves an important need.

Any meaningful exchange of information depends upon the prior existence of an agreed-upon set of syntax and semantics rules. Workflow and process rules are likewise important. It is these rules that force quality into digital financial information. To the extent that these rules exist, digital financial reporting will enable the desired outcomes to be realized. If the required rules do not exist, the meaningful exchange of information will be impeded by errors within the information and the benefits offered by digital financial reporting will not be realized.

Business users define these rules. Accounting professionals lack the freedom to do whatever they want. For example, balance sheets balance. XBRL taxonomies have been the most serious effort thus far to formalize business rules within XBRL implementations. The XBRL technical syntax interoperability is very good, but semantics is still a challenge. XBRL's expressive power is lacking in the area of expressing the required semantics. The big question is whether XBRL, as standard, and as it has just happened in the recent past, will evolve more and more to move from syntax to semantics, or whether the financial community will decide to use XBRL in combination with OWL to satisfy the semantic needs. Other technologies might also be employed.

Ontologies restrict freedom. Restrictions force data quality. Controlled vocabularies or taxonomies of financial reporting concepts are insufficient. Relations between concepts, enforced by business rules, are necessary. Expressions of financial reporting concepts and business rules must be in a form that business people understand so that they can determine whether the expression is correct. The restrictions and freedom must be properly balanced.

Rigorously testing a complete system before implementation is the only way to prove that the system is reliable, repeatable, predictable and robust. A digital financial report must be a true and fair representation of a reporting entity and must communicate what the management of that company chooses to communicate, given the reporting requirements that exist. An accountant creating such a report must be able to prove to him- or herself, through formal verification processes, that it meets that objective: that the information is sensible, consistent, correct, accurate and complete and that the integrity and fidelity of the digital financial report are otherwise sound.

The best way, and perhaps the only way, to prove that the IT professionals and accounting professionals creating digital financial reporting are communicating is by defining a robust set of tests and ensuring that any implementation of digital financial reporting passes those tests. Accountants and IT professionals working together as a team to help an organization move towards modelling the "digital financial reporting" of today and tomorrow are the solution.

Multiple options exist for implementing digital financial reporting. The best way to determine which approach should be used is to see how each option performs against a defined set of tests that exercises business requirements.

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