Digital Financial Reporting Manifesto

by

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This *Digital Financial Reporting Manifesto*[1] is intended to help professional accountants and other business professionals to contemplate, discuss, otherwise think about, and ultimately understand why and that **an option should exist to express a general purpose financial report digitally**.

The digital general purpose financial report is an improvement that helps move the institution of accountancy forward, providing an enhancement to that institution. Given today's increasing volume, complexity, and importance of financial information it makes sense to provide such a digital option.

A digital general purpose financial report is readable by humans and also readable by machines such as the computer. A digital financial report is structured so that a computer can effectively address and work with the individual pieces of such a report. This structured nature enables computer software to provide enhanced functionality to the users of the report such as dynamic presentation of information within the report, automated comparisons of information between periods for an economic entity, or comparisons across different economic entities. Enhancements for creators of digital financial reports include the possibility to automate certain financial report creation tasks and the use of expert systems in the process of creating such reports.

Other names that digital financial reports go by include *interactive data* used by the U.S. Securities and Exchange Commission[2], *structured digital reporting* used by the IFRS Foundation[3], *structured data* used by the CFA Institute[4], disclosure management used by PWC[5], or *Extensible Business Reporting Language (XBRL)* as

[1] *Digital Financial Reporting Manifesto* home page, http://xbrl.squarespace.com/digital-financial-reporting-ma/

[2] *The Benefits of Structured Data for Investors*, Rick A. Fleming, Investor Advocate, SEC, http://www.sec.gov/news/speech/032415-spch-rf.html

[3] *Structured digital reporting = Digital financial reporting*, http://xbrl.squarespace.com/journal/2015/8/20/structured-digital-reporting-digital-financial-reporting.html

[4] CFA Institute, *Data and Technology: Transforming the Financial Information Landscape, Data and Technology: Transforming the Financial Information Landscape*, http://www.cfapubs.org/doi/pdf/10.2469/ccb.v2016.n7.1

[5] *Disclosure Management: Streamlining the Last Mile*, Mike Willis, PWC; http://www.pwc.com/gx/en/xbrl/pdf/pwc-streamlining-last-mile-report.pdf

used by XBRL International[6].

This manifesto provides helpful information that shows that a digital format of a general purpose financial report can be created, what contributes to its successful creation, and other important information related to finding the path that eventually will lead to success in such an endeavor.

Ultimately, the responsibility for creating and the opportunity to get a digital financial report to work as accounting and other business professionals might desire it to work rests with accounting and other business professionals. Exactly how a digital financial report should work must be a conscious choice based on well-thought-out ideas of accounting and business professionals who understand precisely what they desire and why they desire it. Then, information technology professionals and knowledge engineering professionals apply sound architectural and engineering principles and choices to implement those well-thought-out ideas. Unconsciously delegating important responsibilities related to what accounting and business professionals want from digital financial reporting to information technology professionals simply by neglecting these responsibilities is not an appropriate course of action.

This document creates no new information really. The value this document adds is accumulating important information scattered in many places, organizing that information, summarizing it, and synthesizing the information into a form that is useable by business professionals. This information is also helpful to information technology professionals and knowledge engineering professionals.

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[6] *Financial Statements in XBRL*, XBRL International, Retrieved November 7, 2015; https://www.xbrl.org/the-standard/what/financial-statement-data/

Preamble

> *"I am enough of an artist to draw freely upon my imagination. Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution."*
>
> *--Albert Einstein*

A manifesto[7] is a clear statement of the views, intensions, and motives of the issuer of the manifesto.

The *Digital Financial Reporting Manifesto* proposes to the global community of professional accountants that a digital version of a general purpose financial report can and ought to exist.

This manifesto points out the obvious when it explains that such digital financial report must work correctly, the meaning conveyed by such a digital financial report should be no different than historical non-digital forms of the same information, and that using information from such a digital financial report should not be a complicated guessing game.

Software for creating and using digital financial reports and the information they contain can, and will, be simple and easy for professional accountants and other business professionals to use without such professionals understanding the many times complex technical issues and details related to the inner workings of such digital financial reports. Properly communicating how digital financial reports must work to information technology professionals and knowledge engineering professionals will contribute to the creation of simple and easy to use software. There is no need to "dumb down" financial reporting what-so-ever to make digital financial reporting work.

This manifesto is intended to help professional accountants and financial analysts in particular and other business professionals in general contemplate, discuss, otherwise think about, and ultimately that an option can exist and should exist to express a general purpose financial report digitally; and also to help professional accountants and financial analysts think through how they choose digital general purpose financial reports to work.

[7] *Wikipedia* defines manifesto as: A manifesto is a published verbal declaration of the intentions, motives, or views of the issuer, be it an individual, group, political party or government. A manifesto usually accepts a previously published opinion or public consensus and/or promotes a new idea with prescriptive notions for carrying out changes the author believes should be made. See, https://en.wikipedia.org/wiki/Manifesto

Ultimately, the responsibility for creating and the opportunity to get a digital financial report to work as specified, as accounting and other business professionals might desire such reports to work, rests with those professionals.

Exactly how a digital financial report works should be a conscious choice based on sound and rigorously tested, well-thought-out ideas of accounting and business professionals who understand exactly what they desire. Then information technology professionals and knowledge engineering professionals can apply sound architectural and engineering principles and choices to implement those well-thought-out ideas.

Unconsciously delegating important responsibilities related to what accounting and business professionals want from digital financial reporting to information technology professionals and/or knowledge engineering professionals by neglecting these responsibilities is not appropriate.

The point is that technology professionals without a strong background and understanding of accounting principles and practices may make less than optimum choices as they attempt to convert business reports into usable digital financial reports.

Empirical evidence exists today that supports that digital financial reporting can in fact work[8]. However, few have attempted to sort through the existing empirical evidence and assembled the individual pieces appropriately into one working system[9] that provides functionality which accounting and other business professionals find practical, helpful, or otherwise useful. In fact, most accounting and other business professionals are not convinced that digital financial reporting could ever replace their existing practices, processes, and procedures for creating and sharing financial information.

XBRL-based digital financial reports created by public companies and submitted to the U.S. Securities and Exchange Commission, if skillfully analyzed by a knowledge observer, shows precisely what is necessary to make such digital financial reports work. Ultimately, it is simply a matter of making a few rather basic "tweaks" that will allow digital financial reporting to work as promised.

Higher quality, less cost, more timely

The specific tweaks necessary to make digital financial reporting work appropriately can leverage this extensive treasure-trove of prior work created by regulators and standards setters such as the U.S. Securities and Exchange Commission, the FASB, among others. Implementing those tweaks is in no way

[8] *Financial Report Semantics and Dynamics Theory*, page 28; http://www.xbrlsite.com/2012/Library/Theory-2012-07-20.pdf

[9] *A Theory of a System for Educators and Managers* , a video by Dr. W. Edwards Deming, provides an excellent refresher on how to think about systems. See http://xbrl.squarespace.com/journal/2015/7/24/deming-a-theory-of-a-system-for-educators-and-managers.html

dependent on the regulators. The market can provide useful digital financial reporting. If this is done correctly then the market for digital financial reporting could expand from the current SEC mandate that about 10,000 public companies employ XBRL-based digital financial reporting to approximately 28 million private companies in the United States alone who would very likely find such technology useful. However, to take advantage of this opportunity the market must make digital financial reporting work and provide benefits and other value which makes digital financial reporting of higher quality, less costly, more timely than the current paradigm of unstructured general purpose financial reporting.

With only a little resolve and determination plus being empowered with a good understanding of what it takes to make such technology work as deemed necessary, skillful software vendors can create useful products related to digital financial reporting and ultimately a market for products that add value, products that professional accountants would desire to purchase because they are helpful.

Opportunity exists for those who seek to take the risk, who believe and understand how to make digital financial reporting work. If digital financial reporting is created, if it does work appropriately, and if it does bring added value to the market; then a transformational change would occur and the transformation would create business opportunities for those that had the necessary software tools to enable digital financial reporting.

And so, that is the motivation behind this document: to help people see a path toward digital financial reporting that provides value to accounting professionals and other business professionals. Software vendors and others can decide for themselves whether to choose to take this path.

It is not only my intension to take this path myself, rather I have been working to understand, evolve, and otherwise tune this path and helping a handful of software vendors do the same. It is my intension to document what I have learned, open up an appropriate dialog, and help expand the number of software vendors and accounting professionals who understand these ideas, to help these professionals skillfully execute these ideas.

Having a limited vision and seeing XBRL-based digital financial reports as only “a way to provide information to regulators without the need to rekey the information” is shortsighted and misses the real opportunity. Digital financial reports are much more than not rekeying information; rather they are a completely new approach to creating and interacting with a financial report.

These same approaches can be utilized to also make XBRL-based digital financial reporting using the International Financial Reporting Standards (IFRS) reporting scheme work correctly[10].

And so, at least I will try this path and attempt to make digital financial reporting work broadly in the United States. Perhaps others will employ these ideas for IFRS and expand these ideas globally. My personal focus will be US GAAP reporting for private companies in the United States.

Just as other supply chains such as photography, books, music, films, maps, and others have "gone digital"; so too should financial reporting go digital. In fact, digital financial reporting is inevitable if you think about it.

This document summarizes, organizes, and synthesizes information from many, many other resources. Links and references are provided to those resources which enable you to obtain additional detailed information.

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[10] ESMA seeks volunteers for field tests of the European Single Electronic Format (ESEF), https://www.esma.europa.eu/press-news/esma-news/esma-seeks-volunteers-field-tests-european-single-electronic-format-esef

Digital Financial Reporting Principles

Principles help you think about something thoroughly and consistently. Overcoming disagreements between stakeholders and even within groups of stakeholders is important. Agreement between stakeholder groups and within stakeholder groups contributes to harmony. Lack of agreement contributes to dissonance. Principles help in the communications process.

I would argue that a first step, if not the first step, of arriving at harmony is outlining the interests, perceptions, positions, and risks of each constituency/stakeholder group.

A "stakeholder" is anyone that has a vested interest. Another term for stakeholder is "constituent". A "constituent" is a component part of something.

Foundational to arriving at harmony is having a common conceptual framework including a set of consistent principles or assumptions or world view for thinking about the system. For example, accounting and financial reporting have such a conceptual framework including principles/assumptions such as "materiality" and "going concern" and "conservatism".

This "framework for agreeing" helps the communications process which increases harmony and decreases dissonance. This is about bringing the system into balance, consciously creating the appropriate equilibrium/balance.

The following is a set of principles which professional accountants can use to understand their perceptions, positions, and risks when it comes to financial reports. None of these principles is technical, all should be easy to understand.

The following is a succinct set of principles which helps contemplate digital financial reports.

1. **Prudence dictates that using financial information from an XBRL-based digital financial report should not be a guessing game.**

Safe, reliable, predictable, automated reuse of reported financial information by machine-based processes is preferable to creating a guessing game. Imagine numerous different software developers creating algorithms to use XBRL-based financial information. What helps guarantee that the results returned by each software algorithm are the same? How useful is such an XBRL-based financial report to automated machine-based processes if the report contain defects?

General purpose financial reports tell a story. Different business professionals using different software tools must derive the same meaning from the same financial report. While business professionals are free to interpret the meaning of financial information as they might choose; the meaning itself should be objective and not be subject to interpretation.

2. **A near zero defect financial report is useful, a defective financial report is not**.

It is difficult, perhaps even impossible, for humans to create things that don't have errors. But a conscious command of rigorous processes and standards of excellence can contribute to minimizing defects. But what is an acceptable defect rate? The Six Sigma[11] philosophy offers a target acceptable defect rate of 0.00034% or 99.99966% correct. This philosophy can be applied to the information contained within an XBRL-based digital financial report. Something along those lines is appropriate.

Defects can be identified by taking measurements. The extent to which something is correct can likewise be determined using measurements. But how do you distinguish between something that is correct (i.e. not a defect) and something that is a defect? Rules.

3. **Rules prevent anarchy.**

Anarchy is defined as "a situation of confusion and wild behavior in which the people in a country, group, organization, etc., are not controlled by rules or laws." Rules prevent anarchy.

Rules guide, control, suggest, or influence behavior. Rules cause things to happen, prevent things from happening, or suggest that it might be a good idea if something did or did not happen. Rules help shape judgment, help make decisions, help evaluate, help shape behavior, and help reach conclusions.

Rules arise from the best practices of knowledgeable professionals. A business rule is a rule that describes, defines, guides, controls, suggests, influences or otherwise constrains some aspect of knowledge or structure within some business problem domain.

Don't make the mistake of thinking that rules are completely inflexible and that you cannot break rules. Sure, maybe there are some rules that can never be broken. Maybe there are some rules that you can break. It helps to think of breaking rules as penalties in a football game. The point is that the guidance, control, suggestions, and influence offered by rules is a choice of business professionals.

The meaning of a business rule is separate from the level of enforcement someone might apply to the rule.

4. **The only way to achieve a meaningful exchange of information without dispute is with the prior existence of and agreement as to a standard set of technical syntax rules, business semantics rules, and workflow rules**.

Meaningful exchange relates to exchange without disputes as to precise meaning, it means unambiguous interpretation, it means resolving conflicts and inconsistencies.

Consider this scenario: Two public companies, A and B, each have some knowledge about their financial position and financial condition. They must communicate their knowledge to an investor who is making investment decisions which will make use of the combined information so as to draw some conclusions. All three parties are

[11] Wikipedia, *Six Sigma, Sigma Levels*, retrieved November 25, 2016, https://en.wikipedia.org/wiki/Six_Sigma#Sigma_levels

using a common set of basic logical principles (facts known to be true, deductive reasoning, inductive reasoning, etc.) and common financial reporting standards (i.e. US GAAP, IFRS, etc.), so they should be able to communicate this information fully, so that any inferences which, say, the investor draws from public company A's input should also be derivable by public company A using basic logical principles and common financial reporting standards, and vice versa; and similarly for the investor and public company B.

What goes into a financial report can be subjective, subject to professional judgement. How the report itself functions is completely objective, subject to logical, mechanical, and mathematical rules.

5. Explicitly stated information or reliably derived information is preferable to implicit information.

The rules of logic are well developed and understood. Formal logic is used to precisely describe complex systems such safety critical railway signaling, medical device functionality, and nuclear power systems, or our system of mathematics.

Facts can be true or facts can be false; but a fact cannot be both true and false in the same system. The well-established rules of deductive reasoning and inductive reasoning can be used to reliably derive new facts from existing facts. Logical deduction and induction is a completely different process from implying information. Implying is basically making an educated guess based on incomplete explicit or derived facts. When information is implied, two different rational people can arrive at two different answers to the same question and both can be correct. The important point here is that explicitly provided facts, logically derived facts, and implying information are different processes.

Basically, if information is vague, ambiguous, contradictory, or unclear; a computer process working with such information can, at best, return something that is vague, ambiguous, contradictory, unclear, or nothing at all. It is really that straight forward.

6. **Digital financial reports can be guaranteed to be defect free using automated processes to the extent that machine-readable business rules exist**.

Point #4 above states that meaning can be exchange reliably only to the extent that business rules are provided. Those business rules can come in two forms: human-readable and machine-readable. It is only to the extent that machine-readable business rules are available to automated machine-based processes that those automated processes can guarantee an XBRL-based digital financial report to be defect free. Defect free is defined as the objectivize logical, mechanical, and mathematical relations between reported facts. Beyond those machine-readable business rules, manual processes are necessary to detect and correct defects.

7. When possible to effectively create, machine-based automated processes tend to be more desirable than human-based manual processes because the machine processes are more reliable and cost less.

Machines are good at performing repetitive tasks. Humans are good at other things. Machines should do what machines are good at and can effectively do; humans should do what humans are good at and humans can effectively do and what machine-based automated processes cannot do.

8. **Computers have limited reasoning capacity**.

Computers are machines. Computers are good at performing repetitive tasks, over and over, reliably. Computers are not good at: intuition, creativity, innovation, improvisation, exploration, imagination, judgement, politics, law, unstructured problem solving, non-routine tasks, identifying and acquiring new relevant information, compassion. Machines should do things that machines are good at, humans should do things that humans are good at.

9. **Business rules should be created by knowledgeable business professionals, not information technology professionals**.

Article 9 of the *Business Rules Manifesto*[12] states, that business rules are of, by, and for business people, not information technology people. Business rules should arise from knowledgeable business people. Business people should have tools available to help them formulate, validate, maintain, and otherwise manage rules. Business people should have tools available to help them verify business rules against each other for consistency.

Business professionals need to learn how to create, debug, and maintain the business rules that drives the digital age.

In an interview with *Wired* magazine[13], Barak Obama, president of the United States, discussing artificial intelligence made the following statement about self-driving cars:

> "There are gonna be a bunch of choices that you have to make, the classic problem being: If the car is driving, you can swerve to avoid hitting a pedestrian, but then you might hit a wall and kill yourself. It's a moral decision, and who's setting up those rules?"

This example which relates to self-driving cars points out two things that accounting professionals need to consider when thinking about XBRL-based digital financial reports: (1) who writes the rules, the logic, which software follows, (2) how do you write those rules and put them into machine readable form? Do you want software developers creating your rules?

10. The stronger the problem solving logic, the more a machine can achieve.

Problem solving logic is basically the extent to which a business rules engine can solve problems. Other terms for problem solving logic are expressive power or reasoning capacity. There are two inputs to solving problems: (1) the rules which can be expressed in machine-readable form and (2) the ability of a business rules

[12] Business Rules Group, *The Business Rules Manifesto*, http://www.businessrulesgroup.org/brmanifesto.htm

[13] Wired, *Barack Obama, Neural Nets, Self-driving Cars, and the Future of the World*, https://www.wired.com/2016/10/president-obama-mit-joi-ito-interview/

engine to process those rules. Business rules engines have a problem solving method the most common being forward chaining.

11. **Catastrophic logical failures are to be avoided at all cost; they cause systems to completely fail**.

If a system can break or cease to operate for unknown reasons or at any time, the system is not predictable and therefore not reliable. An easy way to understand this is to think of an infinite loop. If a computer program gets into an infinite loop from which it cannot escape, the program ceases to function. While the maximum problem solving logic is desirable, that must be balanced on the side of safety, predictability, and reliability; erroring on the side of safety.

12. **Complexity cannot be removed from a system, but complexity can be moved**.

The *Law of Conservation of Complexity*[14] states that every software application has an inherent amount of irreducible complexity. That complexity cannot be removed from the software application. However, complexity can be moved. The question is: Who will have to deal with the complexity? Will it be the application user, the application developer, or the platform developer which the application leverages? Poor choices mean hard to use software.

13. **Part of a system is not really that useful**.

Irreducible complexity is explained as follows: A single system which is composed of several interacting parts that contribute to the basic function, and where the removal of any one of the parts causes the system to effectively cease functioning.

So for example, consider a simple mechanism such as a mousetrap. That mousetrap is composed of several different parts each of which is essential to the proper functioning of the mousetrap: a flat wooden base, a spring, a horizontal bar, a catch bar, the catch, and staples that hold the parts to the wooden base. If you have all the parts and the parts are assembled together properly, the mousetrap works as it was designed to work.

But say you remove one of the parts of the mousetrap. The mousetrap will no longer function as it was designed, it will not work. That is irreducible complexity: the complexity of the design requires that it can't be reduced any farther without losing functionality.

A non-functioning system is not useful. A partially functioning system is only partially useful.

14. **Simplicity and simplistic are not the same thing**.

Simplistic entails dumbing down a problem in order to make the problem easier to solve. Simplistic ignores complexity in order to solve a problem which can get you into trouble. Simplistic is over-simplifying. Simplistic means that you have a naïve understanding of the world, you don't understand the complexities of the world.

[14] Larry Tesler, *Law of Conservation of Complexity*, http://www.nomodes.com/Larry_Tesler_Consulting/Complexity_Law.html

Removing or forgetting complicated things does not allow for the creation of a real world solution that actually works.

Simple is something that is not complicated, that is easy to understand or do. Simple means "without complication". An explanation of something can be consistent with the real world, consider all important subtleties and nuances, and still be simple, straight forward, and therefore easy to understand.

Creating something that is complex is easy. Creating something that is simple is hard and requires more work.

A kluge, a term from the engineering and computer science world, refers to something that is convoluted and messy but gets the job done.

15. **Apply double-entry bookkeeping procedures, processes, and techniques to digital financial reports.**

Single-entry bookkeeping[15] is how 'everyone' would do accounting. In fact, that is how accounting was done before double-entry bookkeeping was invented.

Double-entry bookkeeping[16] adds an additional important property to the accounting system, that of a clear strategy to identify errors and to remove them from the system. Even better, it has a side effect of clearly firewalling errors as either accident or fraud. This then leads to an audit strategy. Double-entry bookkeeping is how professional accountants do accounting.

Double-entry bookkeeping was the invention of medieval merchants and was first documented by the Italian mathematician and Franciscan Friar Luca Pacioli[17]. Double-entry bookkeeping is one of the greatest discoveries of commerce and its significance is difficult to overstate.

Which came first, double-entry bookkeeping or the enterprise[18]? Was it double-entry bookkeeping and what it offered that enable the large enterprise to exist; or did the large enterprise create the need for double-entry bookkeeping?

Accountants think differently than non-accountants, it is part of their training. Non-accountants don't realize this and accountants tend to forget or take this for granted. The quality difference between the set of facts that makes up a financial report and all the support for that financial report tends to be much higher than the quality level of non-financial information that is managed by a non-accountant. Why? Because double-entry bookkeeping is ingrained in the processes, procedures, and techniques of professional accountants.

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[15] Wikipedia, *Single-entry Bookkeeping System*, retrieved August 30, 2016, https://en.wikipedia.org/wiki/Single-entry_bookkeeping_system

[16] Wikipedia, *Double-entry Bookkeeping System*, retrieved August 30, 2016, https://en.wikipedia.org/wiki/Double-entry_bookkeeping_system

[17] Wikipedia, *Luca Pacioli*, retrieved August 30, 2016, https://en.wikipedia.org/wiki/Luca_Pacioli

[18] Ian Grigg, *Triple Entry Accounting, A Very Brief History of Accounting, Which Came First - Double Entry or the Enterprise?,* http://iang.org/papers/triple_entry.html

What information technology professionals see as redundancies and opportunities for error are really more similar to a parity check[19] or a checksum[20] and opportunities for making certain that you are not making a mistake.

Every accountant learns that when analyzing an account: beginning balance + additions – subtractions = ending balance. If you know any three values, you can always find the fourth value. But if you know all four values then you can prove that all the values are accurate. The same is true about the facts contained within a financial report. Say *Revenues*, *Cost of Revenues*, and *Gross Profit* are reported in a financial report. If you know those three facts and you know that there is a business rule that specifies that *Gross Profit* = *Revenues* – *Cost of Revenues* and the facts and the business rule are consistent with your expectation; you can rely on the information as being accurate. Apply this technique to all the facts of an XBRL-based digital financial report and you get a near zero defect report.

Accountants, don't under estimate the value of double-entry bookkeeping and the other processes, procedures, and techniques employed to make sure that everything "ticks and ties" and "cross casts and foots". These useful techniques, even perhaps better referred to as ingrained medieval traditions, should make their way into XBRL-based digital financial reports. These medieval techniques are still very relevant even in the digital age.

[19] Wikipedia, *Parity check*, retrieved December 6, 2016, https://en.wikipedia.org/wiki/Parity_bit

[20] Wikipedia, *Checksum*, retrieved December 6, 2016, https://en.wikipedia.org/wiki/Checksum

Appendix I: Important background information related to how computers work

This section provides important background information that serves as a foundation upon which other sections are built. While this information might be stating the obvious, the intension is to bring these ideas into the forefront of one's mind so they can be considered when thinking about digital financial reports.

Computers are machines. Computers sometimes seem to perform magic. Computers do not create that magic. The way the "magic" is created is by skilled craftsmen wielding their tools effectively to make these machines perform useful work. Computers simply follow instructions. Computer science is the domain in which information technologies operate. Notice the "science" part of the term "computer science". Ultimately, making a computer perform work distills down to logic and mathematics.

Computers have four fundamental strengths[21]:

- **Storage**: Computers can store tremendous amounts of information reliably and efficiently.
- **Retrieval**: Computers can retrieve tremendous amounts of information reliably and efficiently.
- **Processing**: Computers can process stored information reliably and efficiently, mechanically repeating the same process over and over, thus taking stored information, retrieving that information, transforming the information, and restoring it.
- **Ubiquitous information distribution**: Computers can make information instantly accessible to individuals and more importantly other machine-based processes anywhere on the planet in real time via the internet, simultaneously to all individuals.

There are a number of major obstacles[22] to harnessing the power of computers to perform work. These major obstacles must be overcome. This is a summary of those major obstacles:

- **Business professional idiosyncrasies**: Different business professionals use different terminologies to refer to exactly the same thing.
- **Information technology idiosyncrasies**: Information technology professionals use different technology options, techniques, and formats to encode and store or retrieve exactly the same information.

[21] Andrew D. Spear, *Ontology for the Twenty First Century: An Introduction with Recommendations*; page 4, http://ifomis.uni-saarland.de/bfo/documents/manual.pdf#Page=4

[22] Ibid.; page 4

- **Inconsistent domain understanding of and technology's limitations in expressing interconnections**: A third obstacle is that information is not just a long list of facts, but rather these facts are logically interconnected and generally used within sets which can be dynamic and used one way by one business professional and some other way by another business professional or by the same business professional at some different point in time. These relations are many times more detailed and complex than the typical computer database can express or handle. Business professionals sometimes do not understand or are otherwise unaware that certain relations even exist.
- **Computers are dumb beasts**[23]: The forth obstacle is that computers don't understand themselves, the programs they run, or the information that they work with. Computers are dumb beasts. What computers do can sometimes seem magical. But in reality, computers are only as smart as the metadata they are given to work with, the programs that humans create, and the data that exists in databases that the computers work with.

As stated, computers are machines; computers are tools. If business professionals, information technology professionals, and knowledge engineers successfully communicate and collaborate and overcome the major obstacles; then useful tools can be created to help business professionals perform useful work such as storing, retrieving, processing, and distributing information. Conscious thought, skillful and well-orchestrated execution will deliver software tools that are simple and elegant; and yet sophisticated and powerful.

And so, how do we build those tools? Information in digital financial reports must be deliberately created to provide clear, consistent, logically coherent, and otherwise unambiguous to make sure a guessing game never takes place. All of the following should be considered when evaluating the functionality or solutions that a tool provides:

- *Complete* solutions are better than *incomplete* solutions.
- *Less expensive* solutions are better than *more expensive* solutions.
- *Powerful* solutions are better than *simplistic* solutions.
- *Easy to maintain* solutions are better than *hard to maintain* solutions.
- *Easy to use* solutions are better than *hard to use* solutions.
- *Good solution performance* is better than *poor solution performance.*
- *More scalable* solutions are better than *less scalable* solutions.
- *Standard* solutions are better than *proprietary* solutions.

Anyone can create something that is sophisticated and complex. It is much harder to create something that is sophisticated and simple. Simple is not the same thing as

[23] Ibid.; page 5

simplistic. "Simple" is not about doing simple things. Simple is the ultimate sophistication. Simple is elegant.

Simplicity is "dumbing down" a problem to make the problem easier to solve. That is not what simple is about. *Simple* is about beating down complexity in order to make sophisticated things simple to use. Making something simple is hard work. Making something complex is easy.

The goal is not to have endless theoretical/philosophical debates about *how* things could be. The goal is to create something that works and is useful: a shared view of reality that will enable us to create a common enough shared reality to achieve some working purpose. The goal is to create useful tools which make things better, faster, and/or cheaper[24].

[24] William Kent, *Data and Reality: A Timeless Perspective on Perceiving and Managing Information in Our Imprecise World*, 3rd Edition, page 149, http://www.bkent.net/Doc/darxrp.htm

Appendix II: Creating digital financial reporting software

Digital financial reporting is not something that is added to current financial reporting processes; rather it is a complete paradigm shift. Just like CAD/CAM software changed how architects, engineers, designers, builders, and processes could interact with blueprints in much the same way digital financial reports will change of professionals interact with financial reports.

1. **Digital financial report creation software is an expert system**. Expert systems[25] are computer programs that are built to mimic human behavior and knowledge. An expert system is computer application that performs a task that would otherwise be performed by a human expert. There are three types of expert systems[26]: classification/diagnosis type, construction type, and simulation type. Digital financial report creation software is a construction type expert system that leverages machine-readable knowledge about creating a financial report. This machine-readable knowledge, also called metadata, assists professional accountants in the process of creating financial reports.
2. **Digital financial report creation software understands financial reports**. Neither Microsoft Word nor Microsoft Excel understands financial reports[27]. Word understands word processing documents and Excel understands what a spreadsheet is. For example, Excel understands that a workbook contains spreadsheets; a spreadsheet contains rows, columns, and cells; and that values go into cells and one cell can be related to another cell or cells. Digital financial report creation software understands that financial reports contain balance sheets and income statements, that balance sheets contain "assets" and "liabilities and equity" and that balance sheets balance (assets = liabilities and equity) among other things about financial reports.
3. **Expert systems leverage metadata**. Recall that metadata is in essence stored "memories" or knowledge. Expert systems read machine-readable metadata which describes a financial report, how the pieces of a financial report are interrelated, the process of constructing a financial report, templates of best practices of how to disclose information, exemplars of how other economic entities disclosed information, etc.; and leverage that metadata to perform work for users of the expert system. Experts systems are essentially driven by such metadata. The more metadata, the more an expert system can do. Said another way, the more metadata, the more knowledgeable the expert system is[28].

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[25] *Understanding Expert Systems Applicability to Financial Reporting*, http://xbrl.squarespace.com/journal/2015/7/15/understanding-expert-systems-applicability-to-financial-repo.html

[26] Frank Puppe, *Systematic Introduction to Expert Systems, Knowledge Representations and Problem-Solving Methods*, page 11

[27] *Understanding Digital Financial Reporting and its Benefits*, http://xbrl.squarespace.com/journal/2015/6/25/understanding-digital-financial-reporting-and-its-benefits.html

[28] It is important to recognize that current software applications used to create financial reports such as Microsoft Word and Excel don't understand anything about financial reports.

Appendix III: Proof of the digital financial report theory and framework

The best way to achieve the correct balance, to arrive at the appropriate equilibrium is to rigorously, consciously, thoroughly, and skillfully test existing digital financial reports and gather empirical evidence that supports specific decisions and choices.

1. **Public company XBRL-base digital financial reports to the SEC proves the theory and framework articulated by the *Financial Report Semantics and Dynamics Theory***[29]. The publicly available XBRL-based digital financial reports of 7,000 U.S. public companies prove the theory and framework. Successfully loading these reports into the model which is explained by the framework and theory offers strong evidence. Details of this proof can be found in the *Financial Report Semantics and Dynamics Theory*[30].
2. **A set of digital financial reporting principles exists that are universally applicable to every digital financial report**. These common-sense digital financial reporting principles are self-evident[31] and are common to every XBRL-based public company financial filing to the SEC.
3. **A set of minimum criteria exists for reading information from a digital financial report**[32]. If each of these minimum criteria are not met, then information reported in a digital financial report is at a minimum unreliable and potentially unusable. These minimum criteria are observable and testable in XBRL-based digital financial reports submitted to the SEC.
4. **A set of fundamental accounting concept relations which never change exist and are universally applicable across all digital financial reports**[33]. The 7,000 publicly available XBRL-based digital financial reports provide empirical evidence to support these basic, common sense relations between reported facts. The ideas shown by the basic, common sense fundamental accounting concept relations can be employed in other areas of a digital financial report. They are examples of principles.
5. **Financial reporting conceptual frameworks documented using books can contain ambiguities and inconsistencies**[34]. Because financial reporting conceptual frameworks are written in books (i.e. not in machine-readable terms); testing the conceptual preciseness of the conceptual framework can prove difficult. However, if the conceptual framework of a reporting scheme (such as US GAAP, IFRS, etc.) is articulated in machine-

[29] Rene van Egmond and Charles Hoffman, *Financial Report Semantics and Dynamics Theory*, http://xbrl.squarespace.com/fin-report-sem-dyn-theory/

[30] Ibid.; page 28.

[31] *Digital Financial Reporting Principles*, http://www.xbrlsite.com/2015/Library/DigitalFinancialReportingPrinciples-2015-01-05.pdf

[32] *Arriving at 2014 Digital Financial Reporting All Stars: Summary*, page 2, http://www.xbrlsite.com/2015/Library/AnalysisSummary2014_ArrivingAtDigitalFinancialReportingAllStars.pdf

[33] *Public Company Quality Continues to Improve, Two Generators at 90%*, http://xbrl.squarespace.com/journal/2015/10/1/public-company-quality-continues-to-improve-two-generators-a.html

[34] *Differentiating Alternatives from Ambiguity*, http://www.xbrlsite.com/2015/Library/DifferentiatingAlternativesFromAmbiguity.pdf

readable form, such as a machine-readable ontology; computers can be leveraged to test the conceptual framework of the reporting scheme, reducing ambiguity and increasing the preciseness of the conceptual framework. Any vagueness, inconsistencies, logically incoherent, and ambiguities in the definitions and principles used in financial reporting standards should not be seen as "alternatives" or "options"; they are unintended errors in the standards.

6. **Concepts can be organized into distinct classes**[35]. For example "current assets" is a class of concept that is different than the "revenues" class of concepts.
7. **Extension concepts created must relate to some existing class of concept or member of such class and should explicitly indicate which class or class member**[36]. If an economic entity feels the need and can justify the creation of a concept that does not exist in the US GAAP XBRL Taxonomy; the economic entity should provide this justification in the documentation for the extension concept it creates and should create an XBRL definition relation of the type "general-special" to explicitly indicate which class or member of a class to which the extension belongs.

[35] *Phenomenon Points to Need for Global Standard Way to Define a Class using XBRL*, http://xbrl.squarespace.com/journal/2014/9/19/phenomenon-points-to-need-for-global-standard-way-to-define.html

[36] See generally, http://www.xbrlsite.com/2015/fro/us-gaap/html/Classes; and specifically, http://www.xbrlsite.com/2015/fro/us-gaap/html/Classes/index_Summary.html; and http://xbrl.squarespace.com/journal/2014/9/1/understanding-the-problem-of-changing-a-concept-class.html

Appendix IV: Issues to be Addressed

This *Digital Financial Reporting Manifesto* proposes to the global community of professional accountants that a digital machine-readable version of a general purpose financial report *can* and *ought to* exist.

XBRL-based digital financial reports by public companies to the U. S. Securities and Exchange Commission are the best example of and provide excellent empirical evidence as to what digital financial reports are, how they work, what it takes to make them work, and for testing ideas to prove that the ideas are sound.

Those XBRL-based digital financial reports do contain imperfections, but they also contain many, many correct examples. Skillfully distinguishing the correct from the incorrect and figuring out why something is incorrect helps one determine what "correct" looks like and how to achieve "correct".

There are only a handful of tweaks that are necessary in order to make XBRL-based public company financial reports to the SEC work for private companies. Mainly, those tweaks relate to making the framework used explicit and obvious. The following is a summary of those minimum specific tweaks:

1. Make explicit the currently implied notion of *class* in the US GAAP XBRL Financial Reporting Taxonomy, the definition of which should be consistent with the OWL 2 DL definition of *class*[37].
2. Assure that every element[38] in the US GAAP Financial Reporting XBRL Taxonomy is part of one or more Class. (i.e. there are "class-subclass" relations).
3. Never allow a reporting economic entity to change an element's class. (i.e. reporting economic entities cannot randomly move elements around).
4. Every economic entity extension element created MUST be explicitly tied to some existing US GAAP Financial Reporting XBRL Taxonomy concept or concept class. (this can be achieved using XBRL definition "general-special" relations.
5. Maximize the number of business rules which formally describe the relations between US GAAP Financial Reporting XBRL Taxonomy elements and unchangeable relations that exist within US GAAP.

If software vendors understand the information in this document and use these ideas they can create software that makes digital financial reporting better than current approaches to creating a financial report.

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[37] *Frame Language*, Wikipedia, retrieved October 10, 2015, https://en.wikipedia.org/wiki/Frame_language (Note that the object oriented programming and UML definitions of "class" and the frame language definition of "class" are different. The OWL 2 DL definition of class is consistent with the frame language definition of class)

[38] Note that the term "element" refers to one of: [Table], [Axis], [Member], [Line Items], Concept or [Abstract]. [Table] = Hypercube; [Axis]=Dimension; [Line Items] = Primary Items.

The quality of XBRL-based digital financial reports has been improving for several years[39]. There are specific reasons for these improvements. The tweaks articulated above will expedite the quality improvement process by making issues conscious to both software vendors and creators of XBRL-based digital financial reports.

Once "works" has been properly defined and consciously understood by creators of XBRL-based digital financial reports, then such reports will be *effective*. But then software vendors will understand how to make their product both *effective*, but also *efficient*. Then, digital financial reports will begin showing their benefits.

While this might not seem intuitive, if one considers the difference between manually created blueprints and blueprints created using CAD/CAM software then one could imagine the benefits offered by digital financial reporting[40].

[39] See comparison of 2014, 2014, and through May of 2015, Retrieved November 7, 2015; http://www.xbrlsite.com/2015/Library/ComparePeriods.jpg

[40] *Understanding Digital Financial Reporting and its Benefits*, http://xbrl.squarespace.com/journal/2015/6/25/understanding-digital-financial-reporting-and-its-benefits.html

Appendix V: Helpful Resources

The following is a summary of the most helpful resources that I have come across that are readable by business professionals, tend to provide both big picture and detailed information, and heavily influence the information in this document. I have provided the name of the resource and a summary of what understanding I got out of the resource. Information technology professionals will likely find the two accounting resources particularly helpful if they want to really understand the software they are building.

Data and Reality[41], by William Kent: (162 pages) While the first and last chapters of this book are the best, the entire book is very useful. The primary message of the *Data and Reality* book is in the last chapter, Chapter 9: Philosophy. The rest of the book is excellent for anyone creating a taxonomy/ontology and it is good to understand, but what you don't want to do is get discouraged by the detail and then miss the primary point of the book. The primary point of this book can be summarized: The goal is not to have endless theoretical/philosophical debates about how things could be. The goal is to create something that works and is useful. A shared view of reality. Something that enable us to create a common enough shared reality to achieve some working purpose.

Everything is Miscellaneous[42], by David Wenberger: (277 pages) This entire book is useful. This is very easy to read book that has two primary messages: (1) Every classification system has problems. The best thing to do is create a flexible enough classification system to let people classify things how they might want to classify them, usually in ways unanticipated by the creators of the classification system. (2) The difference between the first order of order, second order of order, and the third order of order; the power of metadata.

Models. Behaving. Badly.[43], by Emanual Derman: (231 pages) The first 100 pages of this book are the most useful. If you read the *Financial Report Semantics and Dynamics Theory*, you got most of what you need to understand from this book. But the book is still worth reading. It explains extremely well how it is generally one person who puts in a ton of work, figures something out, then expresses extremely complex stuff in terms of a very simple model and then thousands or millions of people can understand that otherwise complex phenomenon.

Systematic Introduction to Expert Systems: Knowledge Representation and Problem Solving Methods[44], by Frank Puppe: (350 pages) The first three chapters of this book, about 25 pages, are an excellent introduction to expert systems and is easily understandable to a business professional. The second section of this book

[41] See, http://xbrl.squarespace.com/journal/2014/7/28/data-and-reality-what-is-the-purpose-of-sec-xbrl-financial-f.html
[42] See, http://xbrl.squarespace.com/journal/2011/1/31/us-gaap-taxonomy-build-it-to-allow-reoganization.html
[43] See, http://xbrl.squarespace.com/journal/2014/7/20/updated-financial-report-semantics-and-dynamics-theory.html
[44] See, http://xbrl.squarespace.com/journal/2015/7/15/understanding-expert-systems-applicability-to-financial-repo.html

explains how expert systems work and the moving pieces of expert systems, it is also fairly straight forward to grasp. The last to sections get technical, but are still understandable, and provide what amounts to an inventory of problem solving approaches and how to best implement those approaches in software. Information technology professionals would find this more useful.

Intermediate Accounting, Seventh Edition, by J. David Spiceland, James F. Sepe, and Mark W. Nelson: (1339 pages) This is a college textbook. The most useful chapter is Chapter 1: *Environment and Theoretical Structure of Financial Accounting*; particularly PART B, The Conceptual Framework. That first chapter is only 35 pages. Every accountant learns this information. Very few seem to remember it though.

Wiley GAAP 2011, Interpretation and Application of Generally Accepted Accounting Principles, by Steven M. Bragg: (1351 pages) This resource is very helpful to accountants. Again, the most useful chapter is Chapter 1 Researching GAAP Matters covers the conceptual framework of GAAP (i.e. US GAAP).